



Nimble Approach: fast, adapting, calculating and ethically mindful approach to managing colorectal cancer screening programmes during a pandemic

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ABSTRACT

Objective To describe a conceptual framework that provides understanding of the challenges encountered and the adaptive approaches taken by organised colorectal cancer (CRC) screening programmes during the initial phase of the COVID-19 pandemic.

Design This was a qualitative case study of international CRC screening programmes. Semi-structured interviews were conducted with programme managers/leaders and programme experts, researchers and clinical leaders of large, population-based screening programmes. Data analysis, using elements of grounded theory, as well as cross-cases analysis was conducted by two experienced qualitative researchers.

Results 19 participants were interviewed from seven programmes in North America, Europe and Australasia. A conceptual framework ('Nimble Approach') was the key outcome of the analysis. Four concepts constitute this approach to managing CRC screening programmes during COVID-19: Fast (meeting the need to make decisions and communicate quickly), Adapting (flexibly and creatively managing testing/colonoscopy capacity, access and backlogs), Calculating (modelling and actively monitoring programmes to inform decision-making and support programme quality) and Ethically Mindful (considering ethical conundrums emerging from programme responses). Highly integrated programmes, those with highly integrated communication networks, and that managed greater portions of the screening process seemed best positioned to respond to the crisis.

Conclusions The Nimble Approach has potentially broad applications; it can be deployed to effectively respond to programme-specific challenges or manage CRC programmes during future pandemics, other health crises or emergencies.

INTRODUCTION

The COVID-19 pandemic has had a dramatic impact on healthcare delivery globally. Substantial strain on healthcare systems due to anticipated or actual large numbers of patients with COVID-19 requiring care resulted in non-emergency medical and

Summary box

What is already known about this subject?

► Colorectal screening programmes have been dramatically affected by the COVID-19 pandemic. Because programmatic screening (where all persons in a target population are invited for screening) requires complex standardised processes and procedures, rapid adaptation is particularly challenging.

What are the new findings?

► The 'Nimble Approach' to managing colorectal cancer screening programmes during COVID-19: Fast (making decisions and communicating quickly), Adapting (being flexible and creative), Calculating (using modelling and monitoring to inform decision-making) and Ethically Mindful (considering ethical conundrums emerging from programme responses). Programmes that were highly integrated and organised and that managed more aspects of their screening process than others seemed best positioned to respond to the crisis.

How might it impact on clinical practice in the foreseeable future?

► Adopting the 'Nimble Approach' for pandemic/crisis planning, management and recovery could enable screening programmes to better address emergent and unpredictable challenges.

preventive services being curtailed for periods of time in most jurisdictions.¹⁻⁵ Cancer screening activities were also suspended or considerably slowed down.⁶⁻⁸ Programmatic screening (where all persons in a target population are invited for screening) is a recommended approach to reducing the burden of cancer incidence, morbidity and mortality.⁹ These programmes are generally complex and require substantial organisation, with standardised processes and procedures,¹⁰ thus stopping or starting such programmes



quickly or making major adaptations is a considerable undertaking.

Organised programmatic colorectal cancer (CRC) screening with faecal immunochemical testing (FIT) is a multistep process that includes invitation, kit administration and return, and follow-up of screen positive patients with confirmation colonoscopy. Although the 'at home nature' of the screening modality avoids contact with the health system initially, screen positive patients do require contact for follow-up investigations. Many jurisdictions have greatly curtailed endoscopy services during periods of the pandemic—for example, on 3 April 2020 the British Society of Gastroenterology recommended temporary suspension of all but emergency and essential procedures¹¹ and subsequently the number of colonoscopies performed in England fell by 92%.¹² Similar recommendations and reductions in endoscopy were seen in many jurisdictions and required CRC screening programmes to adapt rapidly.^{13–16} There have been a small number of publications detailing steps individual programmes have taken in response to the pandemic,^{17–22} however we lack knowledge and understanding of generalisable approaches taken by screening programmes to adapt to emergent pandemic conditions. This is important for future disaster planning and to help facilitate planning as the current pandemic progresses. We conducted this qualitative study of the responses of population-based CRC screening programmes to the pandemic and developed a conceptual framework for understanding these responses.

METHODS

We used a qualitative case study method²³ to examine the experiences of CRC programme leaders to understand, describe and characterise their initial responses to the COVID-19 pandemic (March to December 2020). The study results are reported in compliance with the Standards for Reporting Qualitative Research reporting guidelines.²⁴

Purposeful and snowball sampling strategies were used to recruit participants from CRC programmes in North America, Europe and Australasia to participate in semi-structured qualitative interviews. Participants included academics/research scientists, decision-makers at the programme and government/senior policy levels, as well as clinicians: gastroenterologists (including department heads), clinical/medical directors, programme/operations directors, and managers of established organised CRC screening programmes that serve large, defined populations (eg, province, a state or a country). Potential participants were contacted by email and were sent study details and consent forms. The consent form was reviewed with participants at the start of the interview and verbal permission to record the interview via Zoom technology was sought and granted.

An experienced qualitative methodologist (MF) conducted 19 semi-structured interviews across seven

programmes between June and December 2020. Topic areas included programme characteristics and status, pandemic planning, decision-making and planning about pausing and restarting programmes and challenges to managing (online supplemental appendix 1, Interview Guide). Interviews lasted approximately 45–90 min, were audio-recorded, transcribed verbatim and audited to ensure accuracy and maximise research rigour.²⁵ Data collection continued until information redundancy, that is, additional data were similar to what we were seeing in our preliminary analyses.^{26–28}

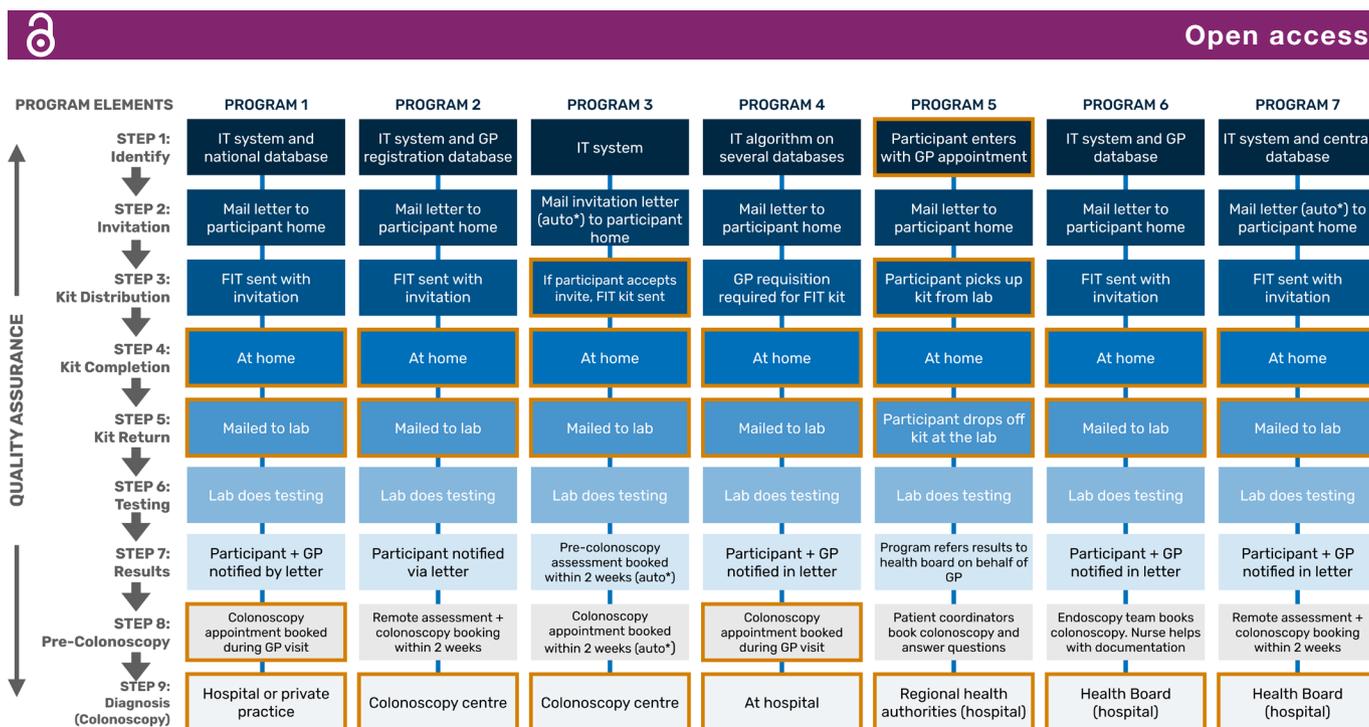
Data analysis, which drew on elements constructivist grounded theory²⁹ included an initial process of open, descriptive and in vivo coding aimed at understanding programmes, processes, actions and then focused coding—sorting and organising the codes—to discern similarities and differences between and across them. Memos that described the data and emergent analytical ideas were written, and a codebook was used to track ongoing changes to definitions and to ensure consistency in coding between the two qualitative methodologists (MF and NAB). Data were double coded in instances of discrepancies between coders. NVivo data management software V.12 (QSR International) was used to help organise data and facilitate analysis.

Cross-case analysis of programmes constituted third stage analysis.^{30 31} An in vivo code ('being nimble') was discerned as a key common concept across all cases. The next stage of analysis involved identifying the dimensions/categories and meaning of this concept. A final stage of analysis involved discerning the similarities and contradictions within these dimensions/categories.

FINDINGS

The final sample included seven programmes from North America, Europe and Australasia, and 19 participants including programme managers/leaders (8) and programme experts, researchers and clinicians (11); there were 13 women and 6 men.

In general, there are seven steps to CRC screening process in the programmes: invitation, FIT kit distribution, completion, return, testing, communicating results and diagnosis and treatment (with or without pre-colonoscopy assessment in some cases and colonoscopy). The approach of each programme to these steps is detailed in figure 1. Eligible participants are enrolled in the programmes via identification in multiple health and administrative databases or through their general practitioners (GPs). Participants are invited to screen via letters. Some programmes send test kits with invitation letters, others require requisitions from GPs to central laboratories that then mail kits to patients, or patients pick kits up from the laboratories. Completed kits are mailed back or dropped-off to the laboratories. All interviewed programmes currently use FIT. Patients are informed of their results directly and/or through their GPs. Confirmatory colonoscopy is scheduled by GPs or



An orange border indicates a screening step that is in control of the participant

* Auto indicates a screening step that is automatically performed by a computer system (algorithm)

Figure 1 Map of the key steps to colonoscopy, during the process for bowel cancer screening in seven international programmes. FIT, faecal immunochemical testing; GP, general practitioner; IT, information technology.

directly by programmes and are done in hospitals and/or free-standing clinics. All programmes had some form of patient tracking (eg, screening reminder systems). In some programmes, patient/nurse coordinators meet with patients and ‘navigate’ them through the entire screening process.

The Nimble Approach framework

The Nimble Approach is a framework that conceptualises how CRC screening programme leaders responded to the COVID-19 pandemic (figure 2). It depicts their ability to ‘flex and respond’ (Participant (P) 18); to quickly, ethically and creatively adapt and adopt in a context marked by difficult, complex and constantly evolving dynamics and uncertainties (‘evolving scene every week or every few days’ (P10), in often ‘clunky’ (P19) bureaucracies and healthcare systems where ‘nothing happens fast, new decisions do not happen quickly’ (P2) and with no prior roadmaps for decision-making. (online supplemental appendix 2, quote table)

Fast: decision-making and communicating about programmes

‘Fast’ characterises the decision-making about whether to suspend or continue programmes and the strategies they used to expedite communication with teams, other programmes and patients. Decisions in the initial phase of the pandemic were made under conditions of uncertainty and constant flux (‘really the lack of information that no one had about what was going to happen and what the future held...new information constantly coming through’ (P6); ‘nothing was etched in’ (P5)).

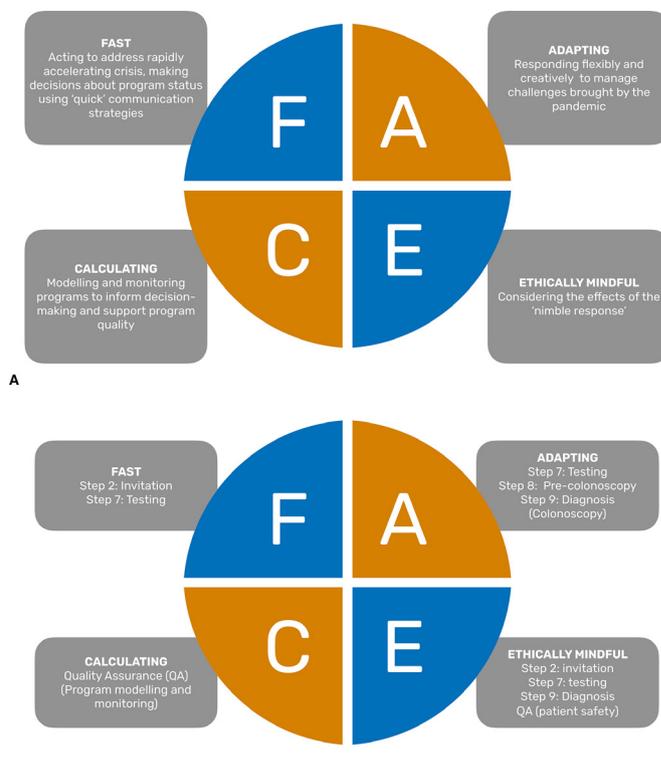


Figure 2 (A) The Nimble Approach: key programme management concepts in response to COVID-19. (B) The Nimble Approach: FACE applied to steps in the bowel cancer screening process.

**Table 1** Representative quotes from interviews related to 'Fast' concept**FAST — acting quickly to address rapidly accelerating crisis—making decisions about suspending or continuing programmes, deploying ad hoc strategies to expedite communication with teams, other programmes.**

I think, for instance all through the—those very rapid changes during the height of the pandemic, we were constantly talking with each other (other screening programs) and saying “are you considering to do, for instance not refer onwards for colonoscopy or are you considering to stop the invitations”, or—we have shared, for instance materials that we have produced for informing participants and how the appointment will look like in COVID-19 situations.	PR6 P10
... Flexible and nimble and just listening to, you know, see on a daily basis what's going on, what the environment is like. I don't think any of these things are etched in. And we're all living—learning to live with a little bit of uncertainty.	PR5 P5
So, very quickly our multidisciplinary team (MDT) meetings moved from face-to-face to virtual. And systems came in place to allow clinicians to continue to discuss patients and to plan treatment schedules in a virtual way and reduce their own risk of infection. ...There was also a lot of very quickly established collaborations across the oncology sector that really allowed people to work together in a way that we had never seen before. ... there were a number of changes that really were quite significant and happened fast in a way that health reform hasn't occurred in the past. ...There were a number of different organisations and agencies came together who had not done that before. And I think that was quite significant.... a year ago the concept that I could work from home and have Zoom meetings with people ... incredible really. We could never have done this and yet we very quickly established those systems and the same with Telehealth with patients and with MDT's	PR1 P15

Only one programme had a pandemic plan, so decisions were ad hoc or on the fly and drawn from programme leaders' expertise and shared experiences ('...we had to learn and develop our processes on the hoof really' (P17); 'we were constantly talking with each other...' (P10)). Participants said their decisions to pause or not pause invites, recalls and testing were made quickly, sometimes with or without government directives, after consideration of risks and outcomes (eg, disease transmission risk, resource capacity). (table 1)

In complex programme organisations, decision-making and approvals for policy and internal and stakeholder communications are multitiered and often slow. During the pandemic, programmes expedited these processes using strategic language. 'Technical guidance' one participant said, was used 'to get around the idea that we were making policy or giving them instructions' (P18). In another programme 'guidances', which generally take weeks/months to be approved and disseminated were reframed as 'tip sheets' so that vital information could be quickly and widely shared ('If you create what we call a 'tip sheet,'...then you can actually disseminate it, send it around as much as you want to whoever you want' (P3)).

With the lockdowns, patients were advised to avoid or reduce travel, workers were obliged to work from home and communication became a challenge. Participants said they increased their use of technologies such as telemedicine, webinars and videoconferencing. Where these had not been fully embraced, they were immediately incorporated into daily practice ('very quickly our multidisciplinary team meetings moved from face-to-face to virtual') (P5), including virtual clinics for patients ('...what I've seen in my institution is very promptly they would be assessed by video, by telemedicine by the cancer surgery team. (P3)). Social media was also used to communicate with the public about programme status.

Adapting: testing/colonoscopy Services

A second feature of the Nimble Approach framework is adapting. It refers to the ways programme leaders adapted and adopted their management of testing/colonoscopy capacity, access and backlogs during COVID-19. Screening programmes access colonoscopies through hospitals and freestanding clinics. With hospitals ramping down non-essential services, closures of some free-standing clinics and reduced hospital capacity and resources (redeployed staff, personal protective equipment shortage, limited capacity for colonoscopies), programme leaders responded to the need for continued access using a prioritisation process. One participant defined prioritisation as 'putting on hold something that's not absolutely urgent for a given individual's immediate health' (P2). A key question that guided prioritisation decisions was 'in a circumstances where you've got very little capacity, who do you prioritise?' (P18). Several streams of patients who needed access to colonoscopy services had to be considered: symptomatic, FIT positives and surveillance (post cancer screening follow-ups, post-polypectomy surveillance). (table 2)

Prioritisation reflected a pyramid shape, with 'the smallest number of high-risk people at the top, out to the largest number of people at average population risk, at the bottom' (P18). Participants said patients were prioritised via a process of risk stratification, based on whether their cases were urgent and emergent, whether they needed care but could be delayed during the pandemic and whether they could wait until after the pandemic. Parameters for stratifying patients varied between programmes but included age, gender, FIT result or concentration ('the higher the FIT concentration, the higher the risk' (P6, P7)), on risk for colon cancer, and on acuteness of symptoms.

Symptomatic patients are outside screening programmes but they influence colonoscopy capacity and

Table 2 Representative quotes from interviews related to ‘Adapting’ concept

ADAPTING — responding flexibly and creatively to manage challenges brought by the pandemic. How programme leaders adapted and adopted their management of testing/diagnosis/colonoscopy capacity, access and backlogs during COVID-19.

...we came up with different priority levels; A being the top, very urgent and B and C but we also increased, added this Category D, for ‘DO NOT Perform’, at any time, in or out of the pandemic, there’s this list of screening, average risk colonoscopy and surveillance for low-risk adenomas that should just never be done, just remove them from your list, you know.	PR4 P3
So certainly there was a backlog, and we undertook, we looked at creating a bit of a lift for the health authorities, of their patients, and we created a bit of an algorithm to risk stratify the patients, incorporating how long they’ve been waiting since their abnormal FIT, and gender, patient age and the FIT value.	PR5 P6
So, ther—there were discussions among the leads in the screening centres about how you would identify those ones who are particular risk. So one suggestion was that you would base it on the FIT concentration, the higher the FIT concentration the higher the risk and there is truth in that.	PR3 P7

FIT, faecal immunochemical testing.

access. Several participants explained that some symptomatic patients were sometimes prioritised over FIT + patients where the latter were considered ‘not urgent, urgent’ (P2, P9). Patients with positive FITs and a family history of cancer were prioritised over those with no family history. Patients undergoing surveillance also had lower priority than FIT positives and therefore may not have had access to colonoscopies during the pandemic.

Revising screening protocols/adopting new CRC-COVID-19 guidelines was another adaptive undertaking by programmes. These guidances, which included descriptions of prioritisation schemas, helped to create additional colonoscopy capacity and clear backlogs at programme restart by reducing the number of people eligible for colonoscopies. Another participant explained how in their programme, the protocol for screening using FIT and colonoscopy was being changed to facilitate greater colonoscopy capacity by using FIT for people who are at average risk or have had low risk polyps in the past (P2).

Calculating - modelling and monitoring programmes

There was extensive use of modelling and monitoring to inform decision-making about programme pauses and restarts, capacity management, impacts and harms mitigation. Participants said they used modelling to evaluate options (‘if you want to do this, is that worse than doing that’) and to answer questions about the consequences of the pause and restart (‘if bowel screening misses this

many people and extends the interval for this many people, how many cancers (do) we think we get’ (P18); ‘how many people will have died because the screening process was not in place’ (P7). For programmes that did not pause, modelling was used to predict potential harms (‘modelling suggest there’s a significant reduction in lives saved if we were paused’ (P8)) and to support decision-making (table 3).

At restart, participants said they used modelling to inform future planning, to answer questions such as ‘given that we are going to have reduced capacity for colonoscopies, what should we use them for’ (P18) and ‘what should be done in the event of a second wave’ (P14). Modelling was also used to understand system capacity, to answer questions such as length of time to colonoscopy, length of time to clear colonoscopy backlogs, programme recovery and how to ‘risk stratify the patients’ who were waiting for colonoscopies.

Increased monitoring (additional analyses and evaluations to routine monitoring) of programme outcomes and performance was another calculating activity that programme leaders used to manage programmes. Monitoring could, participants said, inform decisions as the pandemic progressed, understand attitudinal changes toward screening uptake (‘that’s one of the most serious considerations for any pause...’ (P10) and retention rates (‘I think the effect that COVID-19 has on behaviour and

Table 3 Representative quotes from interviews related to ‘Calculating’ concept

CALCULATING — modelling and monitoring programmes to inform decision-making and support programme quality.

... we used the model to see how we could reduce the colonoscopy demand in such a way that it would have the least impact on preventive deaths and preventive cancer cases. And we looked at different measures to decrease colonoscopy demand. We looked at skipping an age group for invitation, we looked at extending the interval and we looked at lowering the cut-off. And we found that lowering the cut-off was the best way to reduce colonoscopy demand without, well at least with the least impact on preventive deaths.	PR7 P14
I think part of the issue is that people are a bit scared to come in for colonoscopy, and I think one of the things that we’re anticipating once the colonoscopy starts again, is we may actually not have as good an uptake of colonoscopy as we were expecting, because I think people are still very wary about coming into hospitals.	PR2 P6
We are monitoring the response of individuals... how the uptake is going but also, we are actually working with our research team to try and see whether we can measure any impact of the delay and of change of attitudes.	PR12 P10

**Table 4** Representative quotes from interviews related to ‘Ethically Mindful’ concept

ETHICALLY MINDFUL — considering the effects of the ‘nimble response’. Programme access challenges—delays, bottlenecks created in programme process (invitations, testing, diagnosis, capacity management) and quality assurance concerns (emotional well-being and safety of programme patients).

... and we measure and evaluate the quality of the programme in every step of the process. So the concept is that cancer screening is a process. First of all, its population based and organised.... Number 2, <i>it's not a single test, it's a process</i> . It's a series of steps and as we run and operate the programme we measure and report on the quality and performance of every step in the path.	PR4 P1
It became very clear early on in the pandemic that colonoscopy had just stopped. People weren't getting colonoscopies, except under extreme emergency situations. And it became, you know, pretty clear that we were building up a backlog of people who weren't going to get their colonoscopy for the foreseeable future.... I think it's ethically unsound to say to somebody, "You've got a positive test but it's not very positive, so you'll just have to wait" because you're going to engender a lot of anxiety by doing that.	PR2 P12
...in some smaller communities there weren't any cases of COVID-19. And so those smaller centres wanted to continue with screening.... I think that was a bit difficult for places where they basically had no COVID-19. They knew there were these patients waiting to have colonoscopies done and they weren't working. They had all these staff, all of these nurses at the endoscopy clinic, these physicians that didn't have anyone to scope. And they felt like, you know, these resources are so precious to us because, you know, they're limited, that they were being wasted now.	PR5 P6

people's willingness to participate in screening is going to be very interesting' (P5)).

Ethically mindful- considering dilemmas in COVID-19 response management

Being ethically mindful, the fourth feature of the Nimble Approach framework characterises the participants' considerations of ethical conundrums that emerged in their adapting and calculating approaches to programme management; that is, issues related to invites/recall letters, testing, prioritisation and capacity management. The concept of screening as a process and not a one-off test informed these ethical considerations. There is, one participant said, 'a moral obligation on the part of the State that if it is going to invite people to screen then it must have capacity to complete the process' (P18). This ethical dilemma was suggested in the question to one programme leader from a clinician, 'how can you offer all of these people screening, when I tried to get them into follow-up and there is no place, I can put them in?' (P14) (table 4).

Participants noted concerns about bottlenecks for FIT testing and colonoscopies; kits were returned but not tested or had to be spoilt (P7, P10); and people were FIT positive but 'were not scheduled for a colonoscopy yet' (P14). One participant maintained that it was 'inappropriate to have literally thousands of people with positive results and no way of investigating' (P12). They also expressed concerns about the uneven effects of COVID-19 and the associated uneven access to colonoscopies. Colonoscopies were restricted or paused depending on COVID-19 case numbers and regions; decisions to provide them were localised, sometimes 'facility by facility' (P3) in the same city. This resulted in idled resources while patients waited for colonoscopies.

Participants also noted concerns about patient safety during colonoscopies ('how can WE guarantee that if somebody steps into a colonoscopy centre, that there is no coronavirus, that the colonoscopy centre can guarantee 1-1/2 metres distance?' (P11), and about patients' emotional well-being related to delayed diagnoses; for example, FIT + patients who were unable to get prompt

access to confirmatory colonoscopies. Their concerns also extended to screening retention rates, potential harms of delayed diagnoses and undiagnosed cancers.

The tensions of the Nimble Approach

There were, as suggested in the 'ethically mindful' discussion, tensions inherent in the Nimble Approach; these were partly shaped by the nature of the screening environment (eg, population size; programme design and governance (state/national), political environment and the regionalised effects of COVID-19). There was tension between 'fast' decision-making, 'adapting' and programme governance where state-level governed programmes have one 'on/off switch' (P2) but decisions needed to be localised because of uneven COVID-19 effects. Regionalised stop/restart decisions led to 'huge inconsistencies' in programmes (table 5).

Tensions were also suggested between 'fast' and 'calculating' and programme governance. Delays in getting necessary 'fulsome information' (P6) from governing bodies and health boards slowed modelling or measuring activities that could inform programme quality and decision-making. Further, not all programmes had the resources needed to conduct increased or additional monitoring activities; these activities had to be outsourced to get necessary data in a timely way. Although programmes with capacity for additional modelling might be able to more effectively adapt to changing conditions (eg, use data to develop more effective prioritisation schemas), the constantly evolving nature of the pandemic and corresponding shift in knowledge might inhibit their ability to be nimble. Also, the quick pivot to increased technology use was not universally successful. In some programmes, virtual clinics were not fully used because providers had uneven access to, and inadequate training and/or comfort with, these technologies. In some programmes, information technology systems were described as cumbersome in their patient tracking and recall capabilities.

There was also tension between 'adapting' (colonoscopy/prioritisation) and 'calculating' (quality assurance, patient safety and modelling). There were, one

Table 5 Representative quotes from interviews related to ‘Tensions’ concept

The tensions of the Nimble Approach.

I don't think it [programme management] was nimble at all. [Laughter] ...it's very clunky because it's actually run from a huge bureaucracy.... It's not run anywhere local, there's no nimble about it.	PR1 P19
It seemed like a long time; it could have been 3 weeks I'm not sure, to FINALLY get that document approved, and to FINALLY be able to circulate it. And in the end, it was never really broadly circulated, it sounds like, to those you know, to all levels of people involved in cancer care and screening. So it's very unfortunate. And it was, I think by now it got to the appropriate recipients and it's had its effect but it could have had even more impact if we, if a communication strategy had been ironed out.	PR4 P3
I mean, the overwhelming one [challenge] is the inability for the health boards to provide colonoscopy. That's, that's it really. The, the actual central laboratory runs really well, we don't have any problems with it. The, the turnover is very fast and the quality control checks have all been very good. So, it's not, it's not an issue with the actual screening centre, it's all-around colonoscopy capacity. And one of the challenges ... is the variability between the different health boards in terms of colonoscopy waiting times. And that is something that, I suspect will be exaggerated in the coming months.	PR2 P12

participant noted, ‘always concerns about quality’ but during the pandemic, ‘routine quality assurance activities—visits, measuring of standards... assessment of data, the regular meeting and things was very significantly stepped back’ (P18). There was tension within the ‘adapting’ strategy; for example, prioritising to increase colonoscopy capacity conflicted with the ‘overwhelming inability for health boards to provide colonoscopy capacity’ (P12). Participants also acknowledged that rationing colonoscopies might lead to missed cancers or stage shifts (P7).

Our analysis suggests some characteristics of nimbler programmes. Although some participants described their programmes and organisations as ‘large’, ‘bureaucratic’, ‘clunky’ and not very nimble (P19), if they managed the entire CRC screening process, they were arguably more effective than those with only partial management (invitations, kit distributions). Programmes with highly integrated communications systems (with programmes, health boards, GPs and hospitals), that had resources to do additional, ample modelling and monitoring, that were highly automated and integrated, and with smaller populations appeared to be nimbler. All programmes could easily ‘turn off the tap’ (P2, P3) of invite/recall letters but highly integrated programmes had more flexibility, they could more effectively manage the uneven regional effects of COVID-19 and its ‘marked inequalities’ (P12) because they could monitor national and local capacity, align invitations with capacity and offer patients flexibility in accessing colonoscopies based on local COVID-19 infection numbers.

DISCUSSION

Using qualitative data from a study of international CRC programme leaders and experts, we developed a conceptual framework for understanding how CRC programmes responded to the initial phase of the COVID-19 pandemic useful for management of future pandemics or other health crises. The Nimble Approach framework is defined by four concepts: Fast, Adapting, Calculating and Ethically Mindful. Although the approach includes activities that CRC programmes may have used prior to

the pandemic (adapting and calculating), the rate and intensity with which these were implemented and exemplified in practice was accelerated during this time.

The findings align with published accounts of responses by individual breast, cervical, colorectal and lung cancer screening programmes.^{6 17 19 20 22 32–41} The literature ranged from reports from individual screening clinics or jurisdictions, to national cancer screening approaches. For example, Acuti Martellucci *et al*³³ describe their approach to quickly adapt the cervical cancer screening programme in Ancona to accommodate social distancing and avoid potential overcrowding. This included a change from non-fixed to fixed appointment time slots.³³ The national breast and CRC screening programmes in the Netherlands were suspended on 16 March 2020 and invitations for screening were gradually restarted beginning in May 2020.^{6 40 42} In Australia, the pandemic has not widely affected kit distribution which is mailed to participants.¹⁹ However, a lower kit return rate and challenges with colonoscopy resources have been noted during this time as staff were redeployed to help in other critical areas.¹⁹ These accounts allude to two of the main challenges that programmes across jurisdictions will likely need to address even after the pandemic, which are lower participation in CRC screening and the backlog in diagnostic follow-up that has been aggravated by this crisis.⁴³

Our findings provide a more fulsome understanding of the many adaptive approaches taken by screening programmes during this time and illustrate some key characteristics for nimbler programmes. For example, being able to manage the entire CRC screening process, having integrated communications internally and with key external stakeholders and automated processes facilitated the nimbler response. Designing programmatic screening programmes to enable rapid adaptation can help ensure programmes are set-up and better prepared in anticipation of future waves of the COVID-19 pandemic or other crises. This is in alignment with lessons learnt from other disasters in regard to interruption of cancer screening services.⁴⁴ Using the Nimble Approach is also likely to mitigate the impact of COVID-19 on incidence and mortality as modelling studies show that screening



programmes that can minimise delays have a more modest impact on these outcomes.^{45–49} However, impact on other outcomes like stage of diagnosis are likely inevitable for those with delayed diagnosis.

The tensions raised by study participants in trying to be nimble included a variety of ethical dilemmas around invitations, testing and capacity management. Programmes needed to make calculated decisions about whether to invite people to (re)screen, however, they also needed to consider prioritisation of those requiring diagnostic follow-up. This dilemma was further complicated by the anxiety and stress that some patients may experience when waiting with positive results and the local effects of COVID-19 on resources and capacity. Our study suggests that while these decisions can be extremely challenging, they are important and necessary considerations to being fast, adapting, calculating and ethically mindful. A prioritisation model for CRC screening and colonoscopy follow-up was essential during this time and has also been alluded to by others.^{18 35 44 50 51} The need for this type of prioritisation protocol is likely to extend to other crises and may also be useful in addressing the lingering backlog in screening and diagnosis resulting from the pandemic.^{43 52} For example, Kadakuntla *et al*⁵⁵ suggest additional stratification risk factors than what the participants in our study mentioned, including obesity, race/ethnicity, personal medical history, lifestyle and dietary factors. Walker *et al*⁴³ were also able to identify which groups were more likely to experience diagnostic delay in 2020 which included those in the oldest age category, those in lower-income neighbourhoods and those likely living on a First Nation reserve. Being able to quickly revise prioritisation protocols to respond to resource capacity limitations in real-time is facilitated by being fast, adapting, calculating and ethically mindful and programmes that have processes in place to swiftly pivot and revise protocols are likely to maximise their limited resources.

The utility of the Nimble Approach framework may extend beyond pandemic/crisis planning as screening programmes will also need to recover from the pandemic effectively and creatively by addressing the backlog in screening and diagnosis and ramping up screening participation.^{43 53} Additionally, the pandemic has also changed the landscape of primary care with the very rapid transition to virtual care/telehealth in some jurisdictions, which may require further adaptations from the programmatic screening perspective to align CRC screening delivery processes with these new processes. Moreover, this framework may be useful in responding to other unexpected issues, for example, the unexpectedly high rate of false positive results experienced in British Columbia's CRC screening programme.⁵⁴ These types of adaptations to programmatic screening programmes are likely to require many innovative solutions and the Nimble Approach could be used to facilitate this process and response.

Strengths and limitations

The conceptual framework offers an understanding of how CRC programme leaders managed their programmes during the initial phase of COVID-19. The framework has relevance for other contexts, ones that are characterised by emerging and emergent health crisis, fluidity and uncertainty. It also has relevance for other screening programmes that encounter emergency situations, crises that involve complex systems and health-care processes that entail stepwise procedures. Our study consists of data from a sample of screening programmes, with good representation across jurisdictions (North America, Europe and Australasia) and diverse roles and responsibilities across the CRC screening continuum (programme managers/leaders, experts, researchers and clinicians). While not all participants were decision-makers, our sample included 7 distinct programmes and 19 key informants providing an in-depth understanding of the challenges programmes faced and actions taken from a variety of perspectives. The interviews were conducted during the early phases of the pandemic (March to December 2020), thus our findings and the conceptual framework are reflective of that specific point in time.

CONCLUSION

The Nimble Approach framework that was developed from our analysis of the study data offers guidance for programme leaders during the current COVID-19 pandemic about the balancing necessary to respond to a constantly evolving and uncertain situation. Acting quickly (fast), responding flexibly (adapting) and modelling and monitoring programmes (above that done as routine programmatic monitoring) to inform decision-making (calculating) is done while being mindful of how decisions are likely to impact the population (ethically mindful). The framework reflects the experiences of the initial phases of the pandemic but it has utility for the ongoing COVID-19 pandemic, future pandemics and other crises where challenges on healthcare resources and endoscopy capacity are likely imminent and additional capacity to continue addressing backlog in diagnostic delay is needed. Further research is needed to more fully develop and grow the utility of the framework including evaluation of the framework against screening outcomes and comparison of performance across programmes with various approaches.

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REFERENCES

- Mathews KS, Seitz KP, Vranas KC, *et al.* Variation in initial U.S. Hospital responses to the coronavirus disease 2019 pandemic. *Crit Care Med* 2021;49:1038–48.
- Indolfi G, Stivala M, Lenge M, *et al.* Impact of SARS-CoV-2 pandemic and strategies for resumption of activities during the second wave of the pandemic: a report from eight paediatric hospitals from the echo network. *Front Public Health* 2021;9:630168.
- Gomez D, Dossa F, Sue-Chue-Lam C, *et al.* Impact of COVID 19 on the provision of surgical services in Ontario, Canada: population-based analysis. *Br J Surg* 2021;108:e15–17.
- COVID-19 significantly impacts health services for noncommunicable diseases, 2020. Available: <https://www.who.int/news/item/01-06-2020-covid-19-significantly-impacts-health-services-for-noncommunicable-diseases>
- Puricelli Perin DM, Elfström KM, Bulliard J-L, *et al.* Early assessment of the first wave of the COVID-19 pandemic on cancer screening services: the International cancer screening network COVID-19 survey. *Prev Med* 2021;151:106642.
- Dinmohamed AG, Cellamare M, Visser O, *et al.* The impact of the temporary suspension of national cancer screening programmes due to the COVID-19 epidemic on the diagnosis of breast and colorectal cancer in the Netherlands. *J Hematol Oncol* 2020;13.
- Alkatout I, Biebl M, Momenimovahed Z, *et al.* Has COVID-19 affected cancer screening programs? A systematic review. *Front Oncol* 2021;11:675038.
- Chiu H-M, Su C-W, Hsu W-F, *et al.* Mitigating the impact of COVID-19 on colorectal cancer screening: organized service screening perspectives from the Asia-Pacific region. *Prev Med* 2021;151:106622.
- Screening programmes: a short guide. increase effectiveness, maximize benefits and minimize harm, 2020. Available: <https://apps.who.int/iris/bitstream/handle/10665/330829/9789289054782-eng.pdf>
- Miles A, Cockburn J, Smith RA, *et al.* A perspective from countries using organized screening programs. *Cancer* 2004;101:1201–13.
- GI endoscopy activity and COVID-19: next steps, 2020. Available: <https://www.bsg.org.uk/covid-19-advice/gi-endoscopy-activity-and-covid-19-next-steps/>
- Morris EJA, Goldacre R, Spata E, *et al.* Impact of the COVID-19 pandemic on the detection and management of colorectal cancer in England: a population-based study. *Lancet Gastroenterol Hepatol* 2021;6:199–208.
- Stevens SP. Important and urgent - next steps on NHS response to COVID-19, 2020. Available: <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/urgent-next-steps-on-nhs-response-to-covid-19-letter-simon-stevens.pdf>
- Pandemic planning clinical guideline for patients with cancer, 2020. Available: <https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/64736>
- Population screening programmes temporarily on hold, 2020. Available: <https://www.rivm.nl/en/news/population-screening-programmes-temporarily-on-hold>
- You are not on this path alone: cancer care continues in the midst of COVID-19, 2020. Available: <http://www.bccancer.bc.ca/about/news-stories/news/2020/you-are-not-on-this-path-alone-cancer-care-continues-in-the-midst-of-covid-19>
- Patel S, Issaka RB, Chen E, *et al.* Colorectal cancer screening and COVID-19. *Am J Gastroenterol* 2021;116:433–4.
- Habib Bedwani N, English W, Coda S, *et al.* Developing a prioritization model for endoscopy and colorectal cancer 2-week wait referrals during the COVID-19 pandemic-is faecal immunochemical testing the answer? *Br J Surg* 2021;108:e18–19.
- Felletto E, Grogan P, Nickson C, *et al.* How has COVID-19 impacted cancer screening? adaptation of services and the future outlook in Australia. *Public Health Res Pract* 2020;30. doi:10.17061/phrp3042026. [Epub ahead of print: 09 12 2020].
- Del Vecchio Blanco G, Calabrese E, Biancone L, Del Vecchio G, Blanco E, *et al.* The impact of COVID-19 pandemic in the colorectal cancer prevention. *Int J Colorectal Dis* 2020;35:1951–4.
- Turnbull C. Effect of COVID-19 on colorectal cancer care in England. *Lancet Gastroenterol Hepatol* 2021;6:152–4.
- Villain P, Carvalho AL, Lucas E, *et al.* Cross-Sectional survey of the impact of the COVID-19 pandemic on cancer screening programs in selected low- and middle-income countries: study from the IARC COVID-19 impact Study Group. *Int J Cancer* 2021;149:97–107.
- Yin RK. *Case study research : design and methods*. Thousand Oaks, Calif.: Sage Publications, 2009.
- O'Brien BC, Harris IB, Beckman TJ, *et al.* Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med* 2014;89:1245–51.
- Poland BD. Transcription quality as an aspect of rigor in qualitative research. *Qualitative Inquiry* 1995;1:290–310.
- Patton MQ. *Qualitative evaluation and research methods*. 2nd ed. Thousand Oaks, CA, US: Sage Publications, Inc, 2002.

- 27 Guest B BA, Johnson L. How many interviews are enough?: an experiment with data saturation and variability. *Field Methods* 2006;18:59–82.
- 28 Kuzel AJ. Sampling in qualitative inquiry. In: *Doing qualitative research*. Thousand Oaks, CA, US: Sage Publications, Inc, 1999: 31–44.
- 29 Charmaz K. *Constructing Grounded theory: a practical guide through qualitative analysis*. SAGE Publications, 2006.
- 30 Khan Samia VR. Cultivating the Under-Mined: Cross-Case Analysis as Knowledge Mobilization. In: *Forum qualitative Sozialforschung / Forum: qualitative social research*. 9, 2008.
- 31 Ayres L, Kavanaugh K, Knafel KA. Within-case and across-case approaches to qualitative data analysis. *Qual Health Res* 2003;13:871–83.
- 32 Basu P, Alhomoud S, Taghavi K, et al. Cancer screening in the coronavirus pandemic era: adjusting to a new situation. *JCO Glob Oncol* 2021;7:416–24.
- 33 Acuti Martellucci C, Morettini M, Flacco ME, et al. Delivering cervical cancer screening during the COVID-19 emergency. *BMJ Sex Reprod Health* 2021;47:296–299.
- 34 Milanese G, Sabia F, Sestini S, et al. Feasibility and safety of lung cancer screening and prevention program during the COVID-19 pandemic. *Chest* 2021;160:e5–e7.
- 35 Kadakuntla A, Wang T, Medgyesy K, et al. Colorectal cancer screening in the COVID-19 era. *World J Gastrointest Oncol* 2021;13:238–51.
- 36 Nyante SJ, Benefield TS, Kuzmiak CM, et al. Population-level impact of coronavirus disease 2019 on breast cancer screening and diagnostic procedures. *Cancer* 2021;127:2111–21.
- 37 As pandemic continues, screening concerns grow. *Cancer Discov* 2021;11:pp. 214–215.
- 38 Miller MJ, Xu L, Qin J, et al. Impact of COVID-19 on Cervical Cancer Screening Rates Among Women Aged 21–65 Years in a Large Integrated Health Care System - Southern California, January 1–September 30, 2019, and January 1–September 30, 2020. *MMWR Morb Mortal Wkly Rep* 2021;70:109–13.
- 39 Song H, Bergman A, Chen AT, et al. Disruptions in preventive care: mammograms during the COVID-19 pandemic. *Health Serv Res* 2021;56:95–101.
- 40 Dinmohamed AG, Visser O, Verhoeven RHA, et al. Fewer cancer diagnoses during the COVID-19 epidemic in the Netherlands. *Lancet Oncol* 2020;21:750–1.
- 41 Campbell C, Sommerfield T, Clark GRC, et al. COVID-19 and cancer screening in Scotland: a national and coordinated approach to minimising harm. *Prev Med* 2021;151:106606.
- 42 Kortlever TL, de Jonge L, Wisse PHA, et al. The National FIT-based colorectal cancer screening program in the Netherlands during the COVID-19 pandemic. *Prev Med* 2021;151:106643.
- 43 Walker MJ, Meggetto O, Gao J, et al. Measuring the impact of the COVID-19 pandemic on organized cancer screening and diagnostic follow-up care in Ontario, Canada: a provincial, population-based study. *Prev Med* 2021;151:106586.
- 44 Puricelli Perin DM, Christensen T, Burón A, et al. Interruption of cancer screening services due to COVID-19 pandemic: lessons from previous disasters. *Prev Med Rep* 2021;23:101399.
- 45 de Jonge L, Worthington J, van Wifferen F, et al. Impact of the COVID-19 pandemic on faecal immunochemical test-based colorectal cancer screening programmes in Australia, Canada, and the Netherlands: a comparative modelling study. *Lancet Gastroenterol Hepatol* 2021;6:304–14.
- 46 Kregting LM, Kaljouw S, de Jonge L, et al. Effects of cancer screening restart strategies after COVID-19 disruption. *Br J Cancer* 2021;124:1516–23.
- 47 Yong JH, Mainprize JG, Yaffe MJ, et al. The impact of episodic screening interruption: COVID-19 and population-based cancer screening in Canada. *J Med Screen* 2021;28:100–7.
- 48 Breast Screening Working Group (WG2) of the Covid-19 and Cancer Global Modelling Consortium, Figueroa JD, Gray E, et al. The impact of the Covid-19 pandemic on breast cancer early detection and screening. *Prev Med* 2021;151:106585.
- 49 Jen GH-H, Yen AM-F, Hsu C-Y, et al. Modelling the impacts of COVID-19 pandemic on the quality of population-based colorectal cancer screening. *Prev Med* 2021;151:106597.
- 50 Miglioretti DL, Bissell MCS, Kerlikowske K, et al. Assessment of a Risk-Based approach for triaging mammography examinations during periods of reduced capacity. *JAMA Netw Open* 2021;4:e211974.
- 51 Croswell JM, Corley DA, Lafata JE, et al. Cancer screening in the U.S. through the COVID-19 pandemic, recovery, and beyond. *Prev Med* 2021;151:106595.
- 52 Marcondes FO, Cheng D, Warner ET, et al. The trajectory of racial/ethnic disparities in the use of cancer screening before and during the COVID-19 pandemic: a large U.S. academic center analysis. *Prev Med* 2021;151:106640.
- 53 Castanon A, Rebolj M, Pesola F, et al. Recovery strategies following COVID-19 disruption to cervical cancer screening and their impact on excess diagnoses. *Br J Cancer* 2021;124:1361–5.
- 54 G. Society. BC colorectal cancer screening test suspended, 2017. Available: <https://badgut.org/bc-colorectal-cancer-screening-test-suspended/>

Appendix 1:

Semi-structured Interview Guide for Key Informants

[The interview guide includes examples of general questions that will be asked to key informants.]

Thank you for agreeing to participate in this study. This interview will require about 30-45 minutes. I will be asking you several questions about your colorectal cancer screening program and the impact of COVID-19 on your program. We want to find out how you are making decisions about the program during the pandemic, what the status of your program is, and when you are planning of resuming screening. This conversation will be recorded and transcribed. If you are willing we would like to make a transcript of this interview available to help guide other screening programs, however you may request that your interview is not released. You will be able to review the transcription to correct any aspects, and to redact any part of the transcript. No identifying information revealed in publication of results. Before we begin, do you have any questions?

1. Please describe the organization that you work for and your role.
2. We would like to ask about/confirm some key characteristics of your screening program (note we will obtain as much information about the program beforehand so that much of this information would require confirmation vs. extensive descriptions and explanations)
 - a. Who does your program target for screening
 - b. What types of screening tests are offered?
 - c. How often is testing offered?
 - d. How are people invited for participation?
 - e. How do you track them?
 - f. How are positive tests followed up? Do you have navigation? Can you tell me about how navigation is used in your program?
 - g. Are there available documents that would help us understand how your program usually functions? Would you be able to provide access/links to this information?
3. When did your organization start planning a response to COVID-19? Did your program have a pre-existing pandemic or critical incident/disaster plan in place beforehand?
4. If you stopped screening, on what date did you stop screening? If you have not stopped screening, are you considering stopping in the near future?
5. What were the key things you considered when making the decision when/if to stop screening?
6. What elements of screening were stopped (if any)? For example, were invitations for screening stopped or continued? Did tests continue to be sent/given to people? Did returned

- tests continue to be processed? Did confirmatory colonoscopy for people with positive tests continue?
7. Who were the people involved in the decision-making for your organization?
 8. Can you describe the process of decision-making about stopping CRC screening? Can you give us some insight into how that process went?
 9. How are decisions being made moving forward?
 - a. Are there any documents you could share with us that relate to how decisions were made about your program's response to the pandemic?
 - b. Are there any internal/external communications that could be shared?
 - c. Could you provide information about communication to providers or the public? For example, were changes made to your website? When did communications happen?
 - d. How did the field (primary care, endoscopy) etc respond to these decisions? Were they consulted? How did they receive information on the program's decisions?
 - e. Were there any unforeseen consequences to the decisions that were taken?
 10. What measures have been taken with respect to individuals who were in the process of screening?
 - a. What has happened to requisitions?
 - b. What has happened to returned kits?
 - c. What has happened to individuals with positive screening tests (ask if program uses stool based screening or flexible sigmoidoscopy)?
 - d. What is currently happening to patients found to have colorectal cancer on confirmatory colonoscopy? Is there still access to navigation, diagnostic evaluation (CT scans) and treatment (surgery, chemotherapy) in your jurisdiction?
 11. Has there been any public response because of cessation of screening, or delay for individuals in the process of screening? For example, were changes in the screening program covered in the press? If there was a public response how would you characterize this?
 12. What is your plan for resumption of screening? Who will be making the decision (at what level in your organization) to resume screening?
 13. What are the key considerations for resumption?
 - a. Will there be a period before screening resumes to allow catch up of diagnostic tests and cancer treatment?
 - b. How will the "pent up demand" be managed
 - c. What will happen to those who were in the process of screening (had received invitations, had requested kits)?
 - d. What are the financial considerations for re-starting the program
 - e. Are you planning on measuring the impact of ceasing screening during COVID – if so, how?

- f. Do you have innovations/apps/web based platforms that you are creating as a part of your plan to resume screening?
 - g. Are you planning changes to the program design or implementation upon restarting? Will these changes be temporary or permanent? If temporary, how will you decided to resume usual policies and procedures?
 - h. Are you sharing information with other screening programs (ie perhaps other CRC programs or other types of cancer – breast, cervix etc)? Has this been useful? And if so how?
14. How are you informing the public about your plan for restarting your screening program? What has the response been? Have you engaged the public in your plans to resume?
15. How are you informing other stakeholders about your plan?
16. What are the major challenges you have experienced with respect to managing your screening program during the pandemic? Have unanticipated events occurred?
 - a. How have you managed these challenges?
 - b. What has helped to overcome these challenges?
 - c. What has made managing your program more difficult/easy?
17. Who are the other people in your program who could give us key insights into the management and delivery of your screening program during the pandemic?
18. We are hoping to talk with other individuals who are also managing screening programs during the pandemic, can you suggest anyone?

Thank you for taking the time to speak with me.

Appendix 2: Sample Quotations Illustrating “*The Nimble Approach*”

FAST – Acting quickly to address rapidly accelerating crisis - making decisions about suspending or continuing programs, deploying ad hoc strategies to expedite communication with teams, other programs	
...you know, it's interesting to see how people responded but like we operate in a very large and bulky and cumbersome healthcare system, right? Like nothing happens fast in the healthcare, new decisions don't happen quickly in the healthcare system. You know everything with COVID was happening like rapidly, in rapid time and like, you know, I kept on referring to COVID time like if you did something last week it was as if, in the before times, before COVID it would be like it was, you know, years old but last week would be equivalently old too, you know, years old, so trying to sort of be nimble in the way that we needed to be nimble is very challenging in this healthcare system.	Pr4, P2
I think really the lack of information, that no one had about what was going to happen and what the future held. So, it felt like things were, you know we were having to sort of re-evaluate where we were at constantly because there would be new information coming through.	Pr5, P6
... Flexible and nimble and just listening to, you know, see on a daily basis what's going on, what the environment is like. I don't think any of these things are etched in. And we're all living- learning to live with a little bit of uncertainty.	Pr5, P5
I think, for instance all through the- those very rapid changes during the height of the pandemic, we were constantly talking with each other and saying “are you considering to do, for instance not refer onwards for colonoscopy or are you considering to stop the invitations”, or- we have shared, for instance materials that we have produced for informing participants and how the appointment will look like in COVID situations.	Pr6, P10

<p>...and I have close connections with many of the other [locations] in terms of, as we were all making decisions there was a fair number of emails back and forth, like “what are you doing for this?”, “how are you handling this?”</p>	Pr1, P4
<p>...we halted all of that in early March when there started to be restrictions in place. And that was just a decision that was just made unilaterally by our OD.</p>	Pr5, P6
<p>We stopped sending out new invitations and first of all we said, ‘If you still have an invite at home, if you still have a test, you’re still able to send in the test and we’ll analyze it and we’ll make sure that you’ll, you’ll be seen.’ So that’s what, what we first stopped, like new invitations. But the program went on with the tests we already had been sending out.</p>	Pr9, P9
<p>There's two elements to the program that ultimately ceased but were not formally ceased because of a particular position that was taken, but in practice they came to an end. And in fact, the way the media handled it, they saw this as being the program ceasing but it just wasn't formally described as such.</p>	Pr3, P7
<p>... I think creating the communication materials is always a challenge and making sure there’s consistency and that all of our stakeholders are comfortable with the communication that’s happening.</p>	Pr5, P5
<p>... we have to get our communications pieces all lined up in a good way... we would make sure that the comms from [first level authority] and the comms from the [second level authority] are comfortable... with respect to the content and the timing, and we would really- our part of it would be to make sure that the various, let’s call them stakeholders are not surprised by it. ... we’re not an isolated program, we’re integrated with the other aspects of the health system. ...we’re asking of ALL the various actors in the process that is screening, from family docs, to labs, to pathologists, to endoscopists, to ah, imaging, ah, hospitals, ahm, private offices, clinics, you name it. All of those folks, all of those settings and facilities, and all of those various physicians and their staff all need to be taken into account....</p>	Pr4, P1

<p>It seemed like a long time; it could have been three weeks I'm not sure, to FINALLY get that document approved, and to FINALLY be able to circulate it. And in the end it was never really broadly circulated, it sounds like, to those you know, to all levels of people involved in cancer care and screening. So it's very unfortunate. And it was, I think by now it got to the appropriate recipients and it's had its effect but it could have had even more impact if we, if a communication strategy had been ironed out. I think this was really a witness of this</p>	Pr1, P3
<p>So, I don't know who thought of the virtual connects, but, you know, that was very rapidly suggested as possible. We called it technical guidance to get around the idea that we were making policy or giving them instructions. But, you know, there's a whole ton of technical guidance that went out.</p>	Pr3, P18
<p>If you create what we call a 'tip sheet,'... then you can actually disseminate it, send it around as much as you want to whoever you want; the tip sheet. [Yeah] So there's been, I would say now there's probably been around 20 tip sheets from all of the areas ...trying to tell their group, 'do this, do that, don't do this, don't do that.' [Laughs] [Yeah] So it's been weird. But that's what we found. So this week, actually just yesterday and today, it's been disseminated, we've sent this tip sheet about prioritisation` of procedures as you resume activities. And also about considerations as you restart, you know, that, the important infection control and prevention measures that any unit needs to consider.</p>	P1, P3
<p>So, we tried to create ways to communicate, and so we learned that to have guidance, if you publish such a thing as a guidance or a guideline, [organisation] needs to have its say about it. And then you add weeks and weeks of review and this and that. But if you create what we call a 'tip sheet,' 'tip sheet', very bad name, then you can actually disseminate it, send it around as much as you want to whoever you want; the tip sheet. [Yeah] So there's been, I would say now there's probably been around 20 tip sheets from all of the areas of [organisation] trying to tell their group, 'do this, do that, don't do this, don't do that.' [Laughs] [Yeah] So it's been weird. But that's what we found. So this week, actually just yesterday and today, it's been disseminated, we've sent this tip sheet to Endoscopy Services about prioritisation of procedures as you resume activities. And also about considerations as you restart, you know, that, the important infection control and prevention measures that any unit needs to consider.</p>	Pr4, P3

<p>Well looking back, I think what we, what was difficult was that everybody was working from home all of a sudden, which made it really difficult to quickly connect and communicate with, with everyone in the team. And, you know when [Name of colleague] talks to, to me and I talk to somebody else and that person talks to somebody else, it goes, it really, the message won't be as clear as it comes from either top down, or from the down to the top... it's not so easy when everybody all of a sudden at home and who's talking with who? And normally we have like easy contacts and now .. that made it, made it quite difficult I would say. [Okay] That was a- was a challenge, because normally we are all in the same room, you know [Okay] and you could just say, "Hey, what's this?"</p>	Pr7, P9
<p>So, very quickly our multidisciplinary team meetings moved from face-to-face to virtual. And systems came in place to allow clinicians to continue to discuss patients and to plan treatment schedules in a virtual way and reduce their own risk of infection. ... There was also a lot of very quickly established collaborations across the oncology sector that really allowed people to work together in a way that we had never seen before. ... there were a number of changes that really were quite significant and happened fast in a way that health reform hasn't occurred in the past. ... There were a number of different organisations and agencies came together who had not done that before. And I think that was quite significant... a year ago the concept that I could work from home and have Zoom meetings with people ... incredible really. We could never have done this and yet we very quickly established those systems and the same with Telehealth with patients and with MDT's.</p>	Pr1, P15
<p>... it's a bit of a facility by facility, so what I've seen in my institution is very promptly they would be assessed by video and you know, by telemedicine by the cancer surgery team.</p>	Pr4, P3
<p>The one thing we have noticed with Telehealth though is that the majority of Telehealth consultations in [country] are by telephone, not by video. [Yes] And there are significant limitations to that, to do with patient health, to do with diagnosis of symptoms and signs that are difficult to see. To do with establishing empathy and trust between doctors and patients, particularly in situations where the patient didn't have a relationship with that doctor beforehand. [Yes] And so, I think really the use of Telehealth with video conference is really something that should be encouraged.</p>	Pr1, P15

ADAPTING – Responding flexibly and creatively to manage challenges brought by the pandemic. How program leaders adapted and adopted their management of testing/diagnosis/colonoscopy capacity, access and backlogs during COVID19.	
<p>So first time around, as I say we were, you know, having to adopt and adapt, you know, almost- and things, policies were changing and evolving and being consolidated pretty much day-by-day.</p> <p>...It wasn't the easiest of things to do but we did go, we, we attempted to set national guidelines as to how that [<i>prioritisation</i>] should be done. But basically, we, we were able to ask screening centres to identify all those individuals who had submitted a test and had been told that they had a positive test and that they needed to have something done. So that immediately starts to narrow it down to all those that had a positive FIT test. And then we said, "Fine. Can you then tell us how high was their FIT test and whether this was their first, or second, or third, or fourth, or fifth round of screening? [Okay] Because clearly, if people had been through a previous round, so for example, you know we call them up every two years so if people had had a test two years ago that had led to a colonoscopy, [Right] and the colonoscopy was normal, we advised that those individuals, regardless of their level of their FIT test, probably did not need to come for another colonoscopy urgently.</p>	Pr3, P17
<p>So, ther- there were discussions amongst the leads in the screening centers about how you would identify those ones who are particular risk. So one suggestion was that you would base it on the FIT concentration, the higher the FIT concentration the higher the risk and there is truth in that.</p>	Pr3, P7
<p>I mean, normally we're not told what the person's actual numerical FIT value was, we just know this list of people have a FIT value of at least 120. But for a period of time, we were told the numerical value so that we could start scoping the highest FIT values first of all, if required.</p>	Pr3, P16

<p>...we did as a part of the pandemic response issue a document that said, that sort of prioritized all services related to cancer so that would include say, you know, cancer surgeries for people who are having terrible pain, those were considered priority A and would go ahead. And then there was a limited number of things that were in priority A that we recommended that should continue even if a pandemic was on. Then there's a bunch of stuff in priority B, which is sort of the way it was phrased was, you know, these things could continue depending on the impact locally.... you know, priority A should continue and some elements in priority B could continue and then priority C which were things like, included, I think like things like survivorship appointments, like if someone's had cancer and going back for appointments and screening that those were advised that they, in the context of a pandemic, should not be undertaken.</p>	Pr4, P2
<p>... so FIT positive colonoscopies were identified as a Priority B, so patients with those positive FIT results it is highly suspicious for cancer, so we follow up and confirmatory testing is recommended during the pandemic</p>	Pr4, P4
<p>So the colonoscopy leads in [country] got together and had a discussion about, 'okay, well, what's considered urgent and emergent services versus not urgent services?'</p>	Pr5, P5
<p>And until ...March the colonoscopy services continued to see the people referred from screening. I think from, probably from ... March, but let's say from the end of March all colonoscopy services ... stopped. It was only EMERGENCY colonoscopy, so only if there was a complete block- blockage of the passage or something like that, so only emergency colonoscopies were being delivered.</p> <p>And we had the agreement with our hospital, with our health boards that individuals that were waiting for colonoscopy, those that are referred from a screening program are of the highest clinical priority as opposed to those symptomatic ... we know that the cancer yield from 160 micrograms FIT is quite a lot higher than the cancer yield from someone being referred for symptoms only, without the FIT test.</p> <p>... we worked with all our teams to clear the surveillance backlogs early ... [organisation] published the new guidelines for who should be in surveillance which resulted in quite a bit of reduction.</p>	Pr6, P10

<p>...we came up with different priority levels; A being the top, very urgent and B and C but we also increased, added this Category D, for 'DO NOT Perform', at any time, in or out of the pandemic, there's this list of screening, average risk colonoscopy and surveillance for low-risk adenomas that should just never be done, just remove them from your list, you know</p>	Pr4, P3
<p>So certainly there was a backlog, and we undertook, we looked at creating a bit of a lift for the health authorities, of their patients, and we created a bit of an algorithm to risk stratify the patients, incorporating how long they've been waiting since their abnormal FIT, and gender, patient age, and the FIT value.</p>	Pr5, P6

CALCULATING: Modelling and monitoring programs to inform decision-making and support program quality	
And then, what we've been doing is we've conducted some modelling to understand the backlog of colonoscopies in the system to help us understand, as the system ramps up procedures, how long is that going to take and what capacity does the system have... we've done some modeling and looking at it, [catching up on backlogs] and we do feel that eventually we will. I think how soon depends on "do we have more than one wave, um, of the pandemic", as well as how soon do we get a vaccination such that the reduced capacity due to physical distancing at hospitals, etcetera, is no longer impacting care. So, I think that at some point in time we will catch up, but how soon that is, is, ah, depends on many factors that are yet to be seen.	Pr4, P4
.... So I think it's, we start and then we monitor colonoscopy provision and waiting times and there's potentially if colonoscopy starts, if there's, if there's a major effect on colonoscopy by a second wave, we may have to pause the program again. But [Yeah] we're, we're hoping not.	Pr2, P12
So we actually just did an analysis with our macro-simulation model where we looked at, ahm, 'what if there would be a second wave and we wouldn't have full colonoscopy capacity again?' We could do three things, basically. We could say, 'okay, to meet these lower capacity' we could, as I said, 'increase the cutoff for a positive FIT', so increase when we think somebody's positive because that automatically means fewer people are referred. Of course it means that cancers will be missed. The other thing we can do is delay the invitations temporarily so rather than inviting people every two years we're going to invite them every two and a half years, for example, after two and half years. And the third thing we can do, and these are all temporary measures, of course, the third thing we could do is maybe not invite the 55-year-olds yet and wait until they're 57. Or if people have had two negative screens not invite the 61 or 63-year-olds at this time but invite them two years later. So those are all three measures that we could take if we wanted to reduce the colonoscopy demand. And so we used the model to look at these three different measures.	Pr7, P14
... [we're] 'looking at time to colonoscopy and looking at findings of colonoscopies... the rate of colorectal cancer, the state of colorectal cancer was in patients who suffered delays relates to closures.	Pr5, P6

... the other things that we are doing is making an assessment of how many people will have died because the screening process was not in place.	Pr3, P7
... we used the model to see how we could reduce the colonoscopy demand in such a way that it would have the least impact on preventive deaths and preventive cancer cases. And we looked at different measures to decrease colonoscopy demand. We looked at skipping an age group for invitation, we looked at extending the interval, and we looked at lowering the cutoff. And we found that lowering the cutoff was the best way to reduce colonoscopy demand without, well at least with the least impact on preventive deaths.	Pr7, P14
We did initially commission some modelling work that would tell us what the impact would be of any pause to the bowel cancer screening program.... we did that in advance of any changes to the, to the decision, to know how we might mitigate those risks.... modelling would suggest there's a significant reduction in lives saved because of the cancer screening, if we were to have paused it.	Pr1, P8
I think part of the issue is that people are a bit scared to come in for colonoscopy, and I think one of the things that we're anticipating once the colonoscopy starts again, is we may actually not have as good an uptake of colonoscopy as we were expecting, because I think people are still very wary about coming into hospitals.	Pr2, P12
We are monitoring the response of individuals... how the uptake is going but also, we are actually working with our research team to try and see whether we can measure any impact of the delay and of change of attitudes.	Pr6, P10
We'll be able to compare our previous retention rate to current retention rate to see if there's been a change in behaviour of the population, you know, presumably due to COVID but we don't know that yet.	Pr5, P5

ETHICALLY MINDFUL - Considering the effects of the ‘nimble response’. Program access challenges - delays, bottlenecks created in program process (invitations, testing, diagnosis, capacity management) and quality assurance concerns (emotional well-being and safety of program patients).	
... and we measure and evaluate the quality of the program in every step of the process. So the concept is that cancer screening is a process. First of all, its population based and organized.... Number 2, <i>it's not a single test, it's a process</i> . It's a series of steps and as we run and operate the program we measure and report on the quality and performance of every step in the path.	Pr4, P1
And particularly you see, unlike other jurisdictions we have standards that are, you know, they're cast in stone, they're written in stone so you know, you can't, you can't really say, "oh well, you know we, you'd normally do four colonoscopies in a session, can you just squeeze in another couple? That will process them more quickly". Well, that's, that's not available. So what are we doing?	Pr3, P7
...this is what we've done in conversation with the [cancer screening organisation] "Okay this is what we see, this is what the field is giving us, this is what the colonoscopy centers tell us what is possible.... What is worse and what is important?" We more or less worked together to <i>figure out an ethical, an ethical and doable way</i> , yeah.	Pr7, P11
It was a- well, it was [organisation's] decision to reduce service provision in the [region]. And so, without having certainty about colonoscopy services being available for non-urgent indications, the recommendation was to not offer FIT screening as there is no follow up available.	Pr5, P5
... the risk in pausing is obviously that you have a delay in diagnosis. And we know that bowel cancer screening is effective in reducing deaths from bowel cancer. So if you have a delay in diagnosis and a delay in the finding and responding to a positive [FIT], then it will have an impact on increased deaths from bowel cancer in the long term. And that's what we found from our modelling.	Pr1, P15
It became very clear early on in the pandemic that colonoscopy had just stopped. People weren't getting colonoscopies, except under extreme emergency situations. And it became, you know, pretty clear that we were building up a backlog of people who weren't going to get their colonoscopy for the foreseeable future.... I think it's ethically unsound to say to	Pr2, P12

somebody, “You’ve got a positive test but it’s not very positive, so you’ll just have to wait” because you’re going to engender a lot of anxiety by doing that.	
...The big concern... their main concern is that they have not seen as many new cases as they are used to. ... it’s the knowledge of those undiagnosed cancers out there, [Yeah] that we know are out there, that we’re not getting to. ... we know these diseases are there and we know they’re building up and they’re progressing, you know.	Pr4, P3
...in some smaller communities there weren’t any cases of COVID. And so those smaller centres wanted to continue with screening.... I think that was a bit difficult for places where they basically had no COVID. They knew there were these patients waiting to have colonoscopies done and they weren’t working. They had all these staff, all of these nurses at the endoscopy clinic, these physicians that didn’t have anyone to scope. And they felt like, you know, these resources are so precious to us because, you know, they’re limited, that they were being wasted now.	Pr5, P6
... In many units they [confirmatory colonoscopies] were not provided during the period of service reduction. But again, that’s up to each hospital what they wanted to provide for services based on the directive from the Ministry. [Okay] So some areas were providing follow-up FIT colonoscopies and some were not.	Pr5, P5
...a part of [country] called the [specific location] is experiencing issues, because ... we’ve locked down, any restrictions on travel, it meant they didn’t have the workforce supply for a while there to get through their colonoscopies. Whereas in other States, they’ve actually fast-tracked all their colonoscopies.	Pr1, P8
... I think the ethical question was more, “okay, can we guarantee if someone has an, an inconclusive result that there’s still a spot at the colonoscopy centre, so that we can still help that individual and that we do not have this individual unnecessarily worrying about the potential colon cancer”... how much do you let individuals unnecessarily worry? ... how can WE guarantee that if somebody steps into a colonoscopy centre, that there is no CORONA virus, that the colonoscopy centre can guarantee 1-1/2 meters distance, et cetera.	Pr7, P11

THE TENSIONS OF THE NIMBLE APPROACH	
I don't think it [program management] was nimble at all. [Laughter] ...it's very clunky because it's actually run from a huge bureaucracy in [capital]. It's not run anywhere local, there's no nimble about it.)	Pr1, P19
The challenge is that we have a program that is designed in a way that we're not really in control of the program... You know, we're really dependent on the activities at the primary care level for what's going on. And so, that's fraught with issues, number 1 being communication.... So, you know, as opposed to being completely autonomous, we're just not autonomous, we're really dependent on primary care and that's a challenge because we can't fine tune our screening activities.	Pr4, P3
...there's always tension between the group that actually runs it [the program] and the people that says you know, "This is what we want". This is the group that monitors the quality of it and such like. So there is tension between [them].	Pr3, P7
I don't know that I would say there are challenges, I think it's just figuring out- or I guess what I would say is, planning to resume screening is more challenging than stopping screening. And part of the reason for that is a lot of our infrastructure is [location] versus COVID is not hitting the province equally. So you know we can't necessarily target certain things to certain regions just because they might be doing better than others. So some of our considerations- or we might be able to do some changes like that, but there would be a lot of background work that would have to be done in order to make our system function more regionally.	Pr4, P4
It seemed like a long time; it could have been three weeks I'm not sure, to FINALLY get that document approved, and to FINALLY be able to circulate it. And in the end, it was never really broadly circulated, it sounds like, to those you know, to all levels of people involved in cancer care and screening. So it's very unfortunate. And it was, I think by now it got to the appropriate recipients, and it's had its effect but it could have had even more impact if we, if a communication strategy had been ironed out.	Pr4, P3
I mean, the overwhelming one [challenge] is the inability for the health boards to provide colonoscopy. That's, that's it really. The, the actual central laboratory runs really well, we don't have any problems with it. The, the turnover is	Pr2, P12

<p>very fast and the quality control checks have all been very good. So, it's not, it's not an issue with the actual screening centre, it's all-around colonoscopy capacity. And one of the challenges ... is the variability between the different health boards in terms of colonoscopy waiting times. And that is something that, I suspect will be exaggerated in the coming months.</p>	
<p>I think there will be. I think there, there has to be because, you know, I can tell you that with- over this period of time and probably almost as a direct result, you know, this is anecdote but we've had four missed- or four delayed diagnosis, that, you know, so they, they were on the waitlist and we got them actually later. And they were- had a diagnosis of colorectal cancer.</p>	Pr1, P19
<p>... we don't necessarily have that modelling expertise within the organization so, we commissioned the [---] to do that modelling work for us. So, I guess the challenge is our org-, our capacity within the department to do that modelling work but we were able to get it done...</p>	Pr1, P8
<p>The one thing we have noticed with Telehealth though is that the majority of Telehealth consultations in [country] are by telephone, not by video. And there are significant limitations to that, to do with patient health, to do with diagnosis of symptoms and signs that are difficult to see. To do with establishing empathy and trust between doctors and patients, particularly in situations where the patient didn't have a relationship with that doctor beforehand.</p>	Pr1, P15
<p>Our IT system is not so easy to manage in terms of how it creates people that are coming due for screening. And so it's a lot of work for our analytics team.... there are funny things about our IT system that are challenging from an operations standpoint....</p>	Pr5, P5