Roadmap to improve the organized cancer screening programs – The case of colorectal cancer screening in Montenegro

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ARTICLE INFO

ABSTRACT

Background: Implementation of organized cancer screening programs comes with many challenges and barriers, which may inhibit the achievement of the screening activities' desired benefits. In this paper we outline a plan for improving the colorectal cancer (CRC) screening system in Montenegro.

Methods: We formulated a roadmap, which was generally defined as a country-specific strategic plan to improve cancer screening programs. The roadmap development was an iterative, step-by-step process. First, we described the current screening program, then identified and described key barriers, and finally proposed actions to overcome them. Multiple sources of information (e.g., documents, expert opinions) were collected and processed by local and international stakeholders.

Results: The CRC screening program was implemented between 2013–2019 by gradually increasing the invitation of the target population. Key barriers of the implementation were defined: 1) Lack of colonoscopy capacity in the northern part of the country; 2) Inadequate information technology systems; 3) Inadequate public promotion of screening. The defined actions were related to overcoming lack of available resources (e.g., financial, human and technological), to improve the policy environment and the knowledge, and to facilitate information sharing.

Conclusion: The collaboration between local stakeholders of CRC screening and researchers experienced in planning and evaluating screening programs resulted in the first comprehensive description of CRC screening in Montenegro, detailed understanding of key barriers that emerged during implementation and a carefully designed list of actions. The implementation of these actions and the evaluation of whether barriers were solved will be captured in the upcoming period by maintaining this collaboration.

1. Introduction

Screening for cervical, breast and, more recently, colorectal cancer has been among the most prioritized public health interventions in Europe. Organized screening programs are implemented by the countries for specific target populations, which are mostly based on the invitation of specific age groups, with regular intervals [1]. These public health programs should continuously deliver high-quality systematic, uniform, organized screening activities, which require careful planning,

regular evaluation and interventions for improvement [2]. These can ensure the maximization of the health benefits at population level in terms of cancer deaths prevented and healthy life-years gained. However, screening programs come with many challenges even in the wealthiest countries of the EU. Many factors hamper screening activities, which are mostly referred as barriers in the literature.

According to a recent literature review, the conceptual framework of screening barriers relate to three main aspects: *health system barriers* that include availability of resources, affordability and acceptability of

health services; *capability barriers* that relate to knowledge or skills to implement effective screening programmes; and *intention barriers* that is associated with motivations of providers to achieve effective screening [3]. Another paper considered these aspects for the different subsystems of screening 1) generation of knowledge; 2) identification of population at risk; 3) maximization of uptake; 4) operation of the program; 5) maximization of follow-up; and 6) assurance of effective treatment [4]. Taking into account these subsystems, a comprehensive list of screening barriers was formulated in a previous study with 23 items, which could hinder the effectiveness and equity of a screening program [5]. In this paper we apply this framework to specify a roadmap to improve cancer screening.

We focus on colorectal cancer (CRC) screening that can significantly decrease cancer-specific mortality [6], and its implementation is cost-effective compared to no screening [7]. CRC screening usually either involves analyzing stool samples for traces of blood, or colonoscopy/sigmoidoscopy to look for the presence of adenomas or malignant tumors. While colonoscopy has higher specificity than a single fecal test, it is a more invasive screening method and less acceptable by participants [8]. Most programs are now adopting the faecal immunochemical test (FIT) as the primary screening test of choice, and individuals with positive test result are referred for colonoscopy assessment.

Many recommendations are available to maximize the benefits from CRC screening. Testing methods and follow-up examinations must be carefully introduced and explained to the population [9,10]. The invitation process and service delivery should ensure equitable access to the targeted individuals [11,12]. While invitation is usually based on age [13], additional parameters such as prior screening history, lifestyle or genetic information could also be considered to move towards risk-based screening [14]. Quality and performance must be addressed at different levels, including the screening system, providers, and individuals [15].

While these recommendations are useful in general, limited information is available on how screening programs are actually implemented and what difficulties are faced during implementation. In Europe, this is especially true for Central and Eastern European countries. Therefore, as a case study, we selected Montenegro, an upper middle-income country from Southeastern Europe that became independent in 2006 and has a population of little over 600 000 inhabitants. In this paper we outline a plan for improving the colorectal cancer (CRC) screening system in Montenegro by identifying the key barriers, providing their details and context, and then proposing actions to overcome them.

2. Methods

Our approach was centered around developing a roadmap, which was defined as a country-specific strategic plan to improve cancer screening programs. The roadmap development was a step-by-step process based on standardized templates that are publicly available [16]. At each step, an iterative process was ensured between representatives of the country, in this case, employees of the Institute of Public Health of Montenegro (IPHM), and researchers experienced in planning and evaluating screening programs. This included online meetings and continuous correspondence. Multiple sources of information were used including published literature, presentations or other documents and expert opinions. Most of the relevant materials about the screening activities were local documents, as no English studies were published yet on the CRC screening in Montenegro. The roadmap development lasted from October 2021 to May 2022. Steps of the roadmap development process (Table 1) are detailed below. An update of the roadmap was done before the preparation of this manuscript in January 2023.

2.1. Step 1: comprehensive description of screening activities

The comprehensive description aimed to provide a context and

Table 1
Summary of the roadmap development process.

Roadmap development	Aim of the step	Followed approach
Step 1: Comprehensive description of screening activities	To understand the context and the environment of cancer screening activities in the country for which the roadmap is developed	Description of 6 chapters: 1) historical overview 2) patient / individual pathway 3) data collection and IT infrastructure 4) organizational background including stakeholders and legal framework 5) capacities and available resources 6) individual perception and cultural background Main topics of the chapters: 1) generation of knowledge 2) identification of population at risk 3) maximization of uptake 4) operation of the program 5) maximization of follow-up 6) assurance of effective treatment
Step 2: Identification of key barriers	To enable screening organizers, researchers, and policymakers to perform self-assessment of their screening programs to identify the most important barriers	Scoring of a list of potentially relevant barriers of the screening system from two perspectives: impact on effectiveness and impact on equity. Establishment of a priority list with the three most important barriers to overcome.
Step 3: Comprehensive assessment of the barriers	To provide a detailed explanation of each barrier and to reveal the problems that make it difficult to overcome	Description of 4 chapters: 1) historical context of the barriers 2) capabilities and resources that influence the barrier 3) stakeholders' perspectives 4) available knowledge, data, and monitoring of the barrier
Step 4: Outline of the action plans	To define a list of actions to overcome the barriers and to define further details on the stakeholders, costs, outputs, outcomes and timeline of the actions	Domains of actions: 1) non-supportive legislative, political, and economic environment 2) human resource obstacles 3) technological resource obstacles 4) financial resource obstacles 5) knowledge-based obstacles 6) cooperation and information sharing obstacles

Templates for these steps are available from the following link: https://eu-topia-east.org/downloads/.

describe the environment of cancer screening activities in Montenegro. A document with a predefined structure was used for the description that builds on two approaches, which were published earlier for characterizing cancer screening programs [5,17]. The first approach structured the document into six chapters: 1) historical overview; 2) patient / individual pathway; 3) data collection and IT infrastructure; 4)

organizational background including stakeholders and legal framework; 5) capacities and available resources; and 6) individual perception and cultural background. The second approach provided the main themes to describe the chapters. This included the 6 main sub-systems of the screening programs that were introduced above.

2.2. Step 2: identification of key barriers

The second step was the identification of key barriers with the Barrier Assessment Tool. The tool was published recently and relied on a comprehensive review of the literature [3,5]. The objective of this step was to enable representatives of the IPHM to make a self-assessment of their CRC screening program to identify the most important barriers. For this, scoring a list of potentially relevant barriers of the CRC screening was conducted from two perspectives: impact on effectiveness of the screening program and impact on equity. The output of this step was a priority list with the three most important barriers to overcome in Montenegro.

2.3. Step 3: comprehensive assessment of the barriers

The third step was the comprehensive assessment of the prioritized barriers, which aimed to provide a detailed explanation about each barrier and to reveal the problems that make it difficult to overcome them. A structured document was used with questions related to 4 main chapters: 1) historical context of the barrier; 2) capabilities and resources that influence the barrier; 3) stakeholders' perspectives; 4) available knowledge, data, and monitoring of the barrier. Various data sources were used including published literature, presentations or other documents and expert opinions.

2.4. Step 4: outline of the action plan

The fourth step was to outline an action plan with the Action Plan Tool. This step aimed to define a list of actions that are necessary to overcome the barriers. The Action Plan Tool contains six domains where actions can be proposed. These were originated from the comprehensive assessment of the barriers: 1) legislative, political and economic environment; 2) human resource; 3) technological resource; 4) financial resource; 5) knowledge; 6) cooperation and information sharing.

Actions were defined for each barrier and each relevant domain by considering a list of general themes of actions published in the literature. These themes of action were the planning, educating, financing, restructuring, quality management and changing policy context [18]. Actions tailored to the barriers were defined and additional details were provided on the responsibilities to execute the action; stakeholders who need to be involved; costs associated with the action; expected output and outcome; timeline to complete the action. These additional details were defined based on a literature of implementation science [19].

3. Results

Study results are summarized below in two main chapters. The first chapter includes the summary of the CRC screening activities and lists the key barriers in Montenegro. The second chapter provides a description of each barrier and an action plan to overcome the barrier. More detailed results of the action plan development were included in the appendix files. Appendix I provides the comprehensive description of the screening program and Appendix II includes the details of the barriers. Appendix III has the full action plan in a table format, while Appendix IV illustrates the actions on a GANT chart.

3.1. Description of the screening activities and key barriers

The organized CRC screening program was introduced on 1st of June 2013 in Montenegro. At first, individuals aged from 60 to 64 years in 14

of the 18 municipalities were invited. A year later, it became a national program with a coverage of population aged from 59 to 64 years. People were involved to attend the program if they were registered at the Health Insurance Fund of Montenegro and had chosen a GP (general practitioner). The number of persons who were eligible for screening increased annually because of the expanding age range, as well as due to the subsequent screening rounds from the third year for those who had negative test results. On 1st of June 2019, the nationally organized CRC screening program reached its final scope; in accordance with the European guidelines at that time, the target group included the population aged 50–74 years [20]. Individuals with insurance and chosen a GP are invited via calls and contacted by a primary care team, which includes GPs and nurses. The FIT test is used for screening, which is free of charge every 2 years.

The Department of Screening Programme at the IPHM is responsible for the implementation, conduction, evaluation and reporting of CRC screening. The Ministry of Health (MoH) is accountable for providing and procuring the necessary resources from the human, financial and technological point of view. Coordinators of primary health centers, depending on the dynamics of sampling, usually once a week, deliver samples to the central laboratory of the Institute for Public Health of Montenegro according to a pre-defined procedure, where samples are analyzed at the level of the entire country. GPs play a key role as they invite the individuals, inform the participants about the test results, and if necessary, inform their patients about the importance, preparations and possible complications of colonoscopy, and refer the patient to gastroenterologists.

The gradual implementation came with important barriers that the organizers still face. Considering the barriers' impact on the effectiveness and equity of the CRC screening program, the following key barriers were identified: 1) Lack of colonoscopy capacity in the northern part of the country; 2) Inadequate information technology (IT) systems; 3) Inadequate public promotion of screening.

3.2. Assessment of the most important barriers and outline of the action plans

Lack of colonoscopy capacity in the northern part of the country: Colonoscopy capacity is a key limitation in the country, since there are only three centers where examinations could be performed, and there is a lack of trained staff. Importantly, more than 85% of screening-related colonoscopies are performed in the Clinical Center of Montenegro at the capital city, Podgorica. Many hospitals either do not have gastroenterologists or the staff is not trained to perform the colonoscopy procedures. Therefore, new colonoscopy centers are needed to facilitate the availability of colonoscopy for residents of the remote parts of the country who are forced to travel to the capital and more gastroenterologists and staff need to be trained.

Actions to overcome the barrier:

A long list of actions was formulated to overcome the human resource issues. The core action was to conduct a comprehensive capacity planning for gastroenterologists, other medical staff (e.g., anesthesiologists, surgeons, pathologists) and non-medical staff (e.g., technicians, assistants or nurses), to define the optimal number and location of human resources in Montenegro. Another list of actions focused on assessing the available current training and educational programs and to identify gaps in these to meet with the optimal capacity. Actions were formulated to outline short-term solutions (e.g., benefit packages for medical and non-medical staff, employment from another country or from the private sector), propose new educational and training options, and set up a motivational program to ensure long-term optimal capacity. Finally, the need to ensure regular follow-up of human capacities was highlighted.

Regarding the technological resource issues, actions were formulated to define the exact number of missing colonoscopies and related equipment and then provide support for conducting the procurement.

The importance of monitoring the utilization of the colonoscopy capacities was also highlighted. From the perspective of financial resources, actions were defined to estimate the budget for training and educating human resource and for procuring the necessary equipment.

Finally, actions were outlined to identify opportunities and platforms for the promotion of CRC screening towards the medical and non-medical staff. It was proposed that the experience of those who are already engaged in the screening program could be the basis of such activities.

Inadequate IT systems: The information system of the screening program was established within the existing IT system of the Health Insurance Fund of Montenegro, and it includes data on insured individuals. The improvement of the system was a continuous process and changes have been made since the beginning of the program. One of the key problems is the lack of linkage with the central population register that includes more up-to-date contact information as well as information about uninsured individuals. Another problem was that some healthcare providers use a different platform that is not compatible with the information system of the screening program, therefore, the individual level monitoring of follow-up, diagnosis and treatment is not feasible after screening. Organizational issues, in addition to technological barriers related to the interoperability of different systems, emerged as another problem. The management of non-responders at different steps of the pathway emerged as a potential problem to be addressed, introducing changes in the procedures, eventually translated into IT system changes.

Actions to overcome the barrier:

An extensive list of actions was defined to overcome technological issues. First, actions were defined to clarify the structure of data needed to evaluate and monitor screening activities and then develop a standardized reporting process. Second, actions outlined the need to harmonize the process of transforming and transferring data from other platforms that is needed for the monitoring. Third, actions were proposed on managing data access rights and authorizations. These steps would create an opportunity to integrate different platforms. Further actions were formulated to develop incentives for the medical staff to ensure precise and timely data entry and train the staff to use the integrated IT system appropriately.

Actions related to the financial aspect were defined to determine the budget of procuring infrastructure and tools for the integrated IT system and budget of educating medical staff. Another list of actions was outlined to facilitate the necessary legislative changes to effectively operate the IT system.

The IPHM was appointed as the responsible organization to conduct the actions. However, it was proposed that the invitation of international experts to overcome knowledge-related issues could facilitate the improvements in this area.

Inadequate public promotion of screening: The key issue for this barrier is the lack of continuous and carefully planned campaign to promote screening. Although materials for promotion have been developed, these are not shared regularly, only sporadic communication activity exists. There is generally a low awareness about the importance of CRC screening in the general population. In addition, there is also a lack of media and/or communication specialists appointed to deal with CRC awareness campaigns.

Actions to overcome the barrier:

First, it was proposed to set explicit goals of promotion activities, then assign a specific list of activities, methods, and platforms of promotion to achieve the goals with a comprehensive communication strategy. The communication strategy should be tailored to the key stakeholder groups: general population, medical staff, decision makers, media, patient organizations and researchers. Therefore, they should be involved into the development of the strategy through interactive events such as workshops or conferences. The importance of monitoring the activities was highlighted as well.

In terms of financial resources, actions were defined to estimate the

financial requirements of the different types of promotional activities. Finally, actions were proposed to explicitly define the human resource capacities that are required to have an effective promotion of screening.

4. Discussion

Major progress has been made in the last decades regarding the implementation of organized cancer screening programs in Europe. However, there is a significant heterogeneity in the approaches to organize quality assured services, introduce legislations and institutional frameworks, the experience with the implementation process and the evaluation of the impact [21]. There is also a considerable inequality in the use of tests for cancer screening in Europe [11]. Opportunistic screening for breast, cervical and colorectal cancer can be observed in most countries and the implementation of organized screening programs is still in the early phase in some nations in Europe. In this paper we focused on Montenegro, where the full scope of implementing CRC screening was achieved in 2019 and the country had limited prior experience of screening. Our study filled in some important gaps that have not been addressed in the country before. More specifically, the collaboration between local stakeholders of CRC screening and researchers experienced in planning and evaluating screening programs led to the 1) first comprehensive description of CRC screening in Montenegro, 2) a detailed understanding of key barriers that emerged during implementation and 3) a carefully designed action plan.

Our comprehensive approach was necessary as we focused on barriers which are related to multiple areas of governance. For example, in case of the inadequate IT system, organizational problems have been identified together with technological obstacles related to the interoperability of different systems limiting the feasibility of comprehensive individual level monitoring of screening process and outcomes. In the action plan we focused on ensuring data linkage and harmonization of the process of transforming and transferring data from the different platforms, which capture pathway from screening to diagnosis and treatment. Once these fundamental issues are solved, further efforts will be needed to capture other related problems, such as the management of non-respondents. These will require defining new procedures and protocols, which will eventually be translated into additional IT system changes.

In a broader perspective, the timing of the study is important, because it was done after the first shocks that the COVID pandemic caused in the healthcare systems. Many studies have already pointed out that the organized screening programs were also heavily influenced by the pandemic [22,23]. During the first waves of COVID, there were lower participation rates, more delays in attending screening appointments and subsequently there was a lower number of diagnosed cancer cases, particularly in the early stages of the disease [24–26]. On the other hand, the restart of screening programs also provides an opportunity to introduce changes and define actions to ensure more effective and equitable programs. This is especially relevant considering that the restart strategies also have a major impact on the screening capacities [27].

From our network of researchers, screening program coordinators and public health policymakers, similar attempts have been published to overcome barriers. These former studies focused on quantifying the expected impact of different strategies to improve screening and relied on health economic modelling methods. For instance, in Hungary the different scenarios of improving invitation coverage for CRC screening was modelled, while in Slovakia the optimal screening strategy was proposed based on cost-effectiveness analyses [28,29]. Regarding breast cancer in Italy, an evaluation of costs and benefits was performed for increasing adherence for Southern Italy and harmonizing screening intervals in the country [30]. In Slovenia, the selection of the optimal HPV-screening protocol for cervical cancer screening was supported with a cost-effectiveness analysis [31]. These former studies, however, paid less attention on how to implement the potential changes to achieve

the anticipated benefits. This current study illustrates a successful case, where a comprehensive planning of actions to implement changes was carefully constructed. The action plans to overcome the key barriers in Montenegro are not only simple lists of actions but they also include realistic timelines, stakeholders who are responsible or should be involved to overcome the barriers, the expected outputs or outcomes of the actions and the associated costs.

It should be highlighted that our study has important limitations. First, we relied only on qualitative information and our information sources were scarce, especially that most documents about the screening program were available only in local language. Second, we relied primarily on the information provided by the members of IPHM. Although this institution interacts with other relevant stakeholders as well, we had no opportunity to directly approach other stakeholder groups in order to validate our proposals.

5. Policy summary

It is our hope that the developed action plan came at a right time in Montenegro, and it helps to ensure that the CRC screening program will be one of the highly prioritized public health activities. Therefore, we also plan to maintain the current collaboration, and we will dedicate efforts to monitor the implementation of the proposed actions and evaluate whether the barriers were resolved according to the proposed timelines. The implementation of the actions will be regularly discussed, and the roadmaps will be updated and refined if needed. In addition, our case study might provide a good example to other countries facing similar implementation barriers of screening. All tools and templates that we applied in this study are publicly available and they give an opportunity to understand the complexity of screening activities and provide a framework to define plans for improvements.

CRediT authorship contribution statement

Marcell Csanádi: Conceptualization, Data curation, Formal analysis, Methodology, Validation, Writing – original draft, Writing – review & editing. **Ivana Nikčević Kovačević:** Data curation, Formal analysis, Visualization, Writing – review & editing. **György Széles:** Conceptualization, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. **Zoltán Vokó:** Conceptualization, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. **Jovana Vuković-Leković:** Conceptualization, Data curation, Visualization, Writing – review & editing. **Iris Lansdorp-Vogelaar:** Conceptualization, Supervision, Validation, Writing – review & editing. **Adrijana Vujović:** Conceptualization, Data curation, Validation, Writing – review & editing. **Milica Stanišić:** Conceptualization, Data curation, Validation, Writing – review & editing. **Dominika Novak Mlakar:** Supervision, Validation, Writing – review & editing. **Carlo Senore:** Supervision, Validation, Writing – review & editing. **Judit Józwiak-Hagymásy:** Methodology, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

Declarations of interest

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jcpo.2023.100464.

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