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Chapter 5

Colorectal Cancer Prevention and Risk Counseling

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Additional information is available at the end of the chapter

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Abstract

Colorectal cancer (CRC) is one of the leading causes of cancer death in the world. Many risk factors have been identified in the development of colorectal cancer. It is necessary to carry out activities related to risk factors in order to implement effective CRC early diagnosis and screening programs and achieve positive outcomes. International screening guidelines have been created and these are being implemented by individual countries according to their own health policies. Colorectal cancer prevention and early training in terms of disease identification, counseling against negative disease perceptions, and changing false beliefs will reduce the fear of CRC and ensure the development of positive health behaviors and acceptance of screening. Among recent developments in cancer prevention, "cancer risk counseling" has become quite prominent. Individual-specific colorectal cancer risk counseling programs are developed through the assessment of individual risk factors by focusing on a genetic assessment and the development of a risk management plan. This chapter will examine and define colorectal cancer prevention and risk counseling strategies in relation with the relative literature.

Keywords: Colorectal cancer, prevention, cancer risk counseling, screening, clinical guidelines

1. Introduction

Colorectal cancer (CRC) is one of the leading causes of cancer death in the world. Colorectal cancer is a significant public health problem in many countries considering its incidence, mortality rate, and treatment costs [1]. Among all cancer deaths, mortality due to CRC ranks second in the world and accounts for 9–10% of all cancers deaths [2–4]. Colorectal cancer is the second most common cancer worldwide [5]. The incidence of CRC in North America and highly industrialized areas such as northwestern Europe and Australia is high, but is low in less

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developed regions such as Asia, Africa, and South America [2, 5, 6]. Lifetime risk of developing CRC varies between 2.4 and 6%. Risk factors possessed by individuals may increase this rate [2, 3]. It is necessary to carry out activities related to risk factors in order to implement effective CRC early diagnosis and screening programs and achieve positive outcomes. Moreover, implementing cost-effective screening programs decreases costs and increases the effectiveness of CRC screening [7, 8]. Many people do not know the risk factors for CRC; it is reported that those who do know them should be encouraged and supported by professionals to apply safeguard measures and effective interventions. More than half of CRC incidents can be prevented by implementing protection strategies in accordance with risk factors [9, 10]. However, to achieve this, negative behaviors must be changed to positive, and individuals should be directed toward early diagnosis in accordance with their risk conditions and monitored [11, 12]. In the realization of primary and secondary prevention strategies, bespoke colon cancer risk counseling is important for reducing morbidity and mortality [11–13].

2. Colorectal cancer prevention and risk counseling

2.1. Colorectal cancer prevention

2.1.1. Colorectal cancer risk factors

Advancing age, familial and genetic factors, environmental factors, and lifestyle/behavioral factors affect the development of CRC [2, 6–8]. Colorectal cancer risk factors are divided into two groups, those that can be changed and those that cannot [1, 6, 10].

Nonchangeable risk factors: These factors cannot be taken under control by the individual. These include age, sex, genetics (personal or family history of CRC), chronic colon diseases such as ulcerative colitis, inflammatory bowel disease or Crohn's disease, and a history of adenomatous polyps [6, 8, 10, 13].

Changeable risk factors: These are behavioral factors that can be altered or managed to help reduce the risk of CRC. It is reported that more than half of all cancers are linked to risky health behaviors. Changeable factors include but are not limited to smoking, moderate-to-heavy levels of alcohol consumption, being overweight and obesity, unbalanced diet, excessive consumption of red meat and/or processed meat products, physical inactivity, and/or sedentary lifestyle [3, 4, 6, 8–10, 13–19]. Risk factors and their relative risk for CRC are shown in **Table 1**. Colorectal cancer risk with relative risk above 1 indicates high risk, and less than 1 indicates low risk [10].

2.1.2. Colorectal cancer prevention strategies

The aim is to prevent cancer, precancerous lesions, and reduce the incidence of cancer-related morbidity and mortality and cancer spread, or at least diagnose it at earlier stages. Cancer prevention research, and the reduction of cancer morbidity and mortality, requires a three-dimensional approach: primary, secondary, and tertiary prevention [4, 6, 11, 20].

Factors increasing the risk	Relative risk
Family history and genetics	
One first-degree relative	2.2
More than one relative	4.0
Relative diagnosed before 45	3.9
Individual history	
Crohn's disease	2.6
Ulcerative colitis	2.8
Colon	1.9
Rectum	
Diabetes	1.2
Behavioral risk factors	
Excessive alcohol consumption	1.6
Obesity	1,.2
Red meat consumption	1.2
Processed meat consumption	1.2
Smoking cigarette	1.2
Risk reducing factors	
Physical activity (colon)	0.7
Consumption of dairy products	0.8
Fruit consumption	0.9
Vegetable consumption	0.9
Total dietary fiber consumption (10 g/day)	0.9

Table 1. Colorectal cancer risk factors and relative risk.

2.1.2.1. Primary prevention strategies

Primary prevention includes reducing the effects of carcinogens by using chemopreventive agents or removing environmental carcinogens. The goal of primary prevention is to prevent cancer from starting by reducing individual risk. Primary prevention focuses on lifestyle changes and risk factors related to chemoprevention. Primary prevention measures focus on two areas: making lifestyle changes toward changing primary risk factors and chemoprevention (chemical protection) strategies [20, 21].

2.1.2.1.1. Lifestyle changes

Healthy body weight: Being overweight obesity increases the risk of CRC, independent of physical activity. It is noted that abdominal obesity as measured by waist diameter is a more important risk factor than general obesity for both women and men [8, 10]. Patient education about ways to gain and maintain a healthy body weight is an important health professional task. Most people know its importance but there is a need for the encouragement and support of health professionals to implement effective interventions for individuals. Excess body fat can be reduced by reducing caloric intake and increasing physical activity. Reducing daily calorie intake by 50–100 calories can prevent gradual weight gain in adults, 500 calories/day or more weight loss program is the first joint reduction target. Research has shown that up to 60 minutes a day of moderate to vigorous physical activity may be necessary to prevent weight gain. For overweight people, daily physical activity up to 90 minutes of moderate intensity can help in losing weight [21].

Healthy nutrition and diet: Positive dietary factors that reduce the risk of cancer include low-fat diet (less than 24% of dietary fat content), high in fiber, high in omega 3, high fruits and vegetables, citrus fruits, cruciferous vegetables, carotene and lycopene-rich foods, plant-based diet, calcium, selenium, vitamin D, folic acid, omega 3 nutritional factors, and fatty acids. Dietary factors that increase the risk of cancer include animal fat, saturated fat, red meat, burnt/charred meat, trans fatty acids, and excessive alcohol consumption. Animal fats and consumption of excessive red meat and processed meat products increase the risk of high-calorie diet and consumptionless fiber-rich foods [2, 6, 8, 15, 16]. An oil-poor fiber-rich diet, 20–35 g of fiber daily for adults, and reducing total daily calories from fat by about 30%, with limited consumption of red meat is said to help reduce the risk of CRC. Also, regular consumption of fruits, vegetables, and calcium are recommended to reduce the risk for CRC for women and men. Nutritional advice for cancer prevention includes plant-derived diet containing at least five servings of fruits and vegetables every day, choosing whole grains instead of refined carbohydrates, eating saturated fat, and restricting alcohol and excessive calorie intake [11, 17, 19, 21].

Physical activity: Physical inactivity is one of the behavioral risk factors most often associated with CRC. Risk of CRC is lower for physically active people. Risk of CRC for very physically active people is 25% lower than in most physically inactive people [10]. Being physically active during both work and leisure time also reduces the risk. The American Cancer Society recommends a minimum of 150 minutes of moderate intensity every week, and preferably spread over the week, or 75 minutes of vigorous physical activity (or combination thereof) [10].

Avoidance of tobacco and alcohol: Smoking is more related to lung cancer but it also has quite harmful effects on the colon and rectum. Cigarette smoking increases the risk of colorectal adenoma [2, 6, 10, 17] and long-term use is associated with large polyps in the colon/rectum. The numbers of polyps have been reported to increase in patients even after they quit smoking 10 years previously [8, 17]. It is stated that the relative risk of CRC development is 1.64 in current smokers relative to nonsmokers [2], and 12% of all CRC deaths are related to tobacco use [8, 17]. Age of smoking initiation, duration of smoking, and the amount of cigarettes consumed per day increase the risk of CRC [18]. The difference in life risk of developing CRC

in individuals who consume —two to four alcoholic beverages per day is greater than 23% compared with those who consume less than one alcoholic beverage per day. Alcohol consumption as a factor that plays a role in CRC is seen at an earlier age. The relative risk is 1.08 for alcohol intake of 25 g/day. Smoking together with alcohol consumption doubles the risk of CRC [10, 17, 19].

2.1.2.1.2. Chemopreventive measures

The administration of drugs or natural compounds to prevent the development of CRC is called chemoprevention. Colorectal cancer chemoprevention can be considered for advanced adenomas greater than 1 cm with villous histology, and more than two adenomas independent of the size of the adenoma and histology. Also, patients with a family history of cancer or cancer in first-degree relatives benefit from chemoprevention. Some 10% of all CRC groups can benefit from chemoprevention [22]. Research into chemoprevention of CRC is very active and chemical measures are recommended to more people in the high-risk group [6, 18, 21, 22]. Results of studies on chemical measures vary. Nonsteroidal anti-inflammatory drugs (NSAIDs) and aspirin have been determined to inhibit the enzyme cyclo-oxygenase (COX-1 and COX-2), which is involved in development of CRC. Regular aspirin or other NSAID use in humans reduces CRC development by 30–50%. In the recent past, these agents were not recommended for the general population (average risk), but today aspirin and other NSAIDs are recommended for the average-risk group. However, aspirin and other NSAIDs have adverse effects such as gastrointestinal bleeding and stroke, thus the benefit/risk balance of these drugs has restricted their use. In addition, calcium, vitamin D, folic acid, hormone replacement therapy, and the protection provided by statins need to be evaluated in further studies [6, 18, 21, 22].

2.1.2.2. Secondary prevention strategies

Secondary prevention, which enables slow-growing lesions to be diagnosed at early stages, includes early diagnosis and screening methods. Screening achieves better results because it avoids the onset of new cases and enables treatment of tumors at an early stage, which provides a better prognosis. Screening methods such as colonoscopy can identify abnormal cancerous changes so cancer can be prevented from fully developing. Secondary prevention is often associated with the removal of precancerous lesions or intraepithelial neoplasia (e.g., ductal carcinoma in situ, adenoma, or hyperplasia). In this way, disease is caught at an early stage, and the incidence of patients with advanced stage disease and mortality decreases [20, 23]. Polyps, especially adenomatous-type polyps, are known to be the precursor of CRC. The estimated 5-year survival rate of localized tumor (limited to the bowel wall) is 90%, it is 68% when the regional lymph node is involved, and 10% in the presence of distant metastases. CRC screening is recommended for the entire population; some people have a higher risk of developing CRC than others. The most important step is to assess the correct risk of developing CRC, screening is most effective test for individuals [6, 21, 23–27].

Colorectal cancer screening tests are divided into two groups:

- Stool tests: guaiac-based fecal occult blood test (gFOBT), fecal immunochemical test, stool DNA test.
- Structural analysis: flexible sigmoidoscopy (FS), colonoscopy, double barium contrast radiography, computed tomographic (CT) colonography, virtual colonoscopy, capsule endoscopy.

Each test has different advantages and disadvantages and can be used alone or in combination according to the request and the status of the individual [6]. Secondary prevention measures "Who should be screened and how?" The answer to the questions of who and which test brings clarity to the issue of how and how much will be applied at intervals, which is why CRC screening recommendations/guidelines have been established in many countries [6, 11, 21].

2.1.2.3. Clinical guidelines on colorectal cancer prevention

The aim of screening is to detect a precancer condition in the healthy population, as well as very early-stage malignancies that can be treated with a clearly curative intervention. In this context, international clinical guidelines have been created by the following organizations:

- American Cancer Society (ACS), The US Multi-Society Task Force on Colorectal Cancer (USMSTF), and American College of Radiology
- U.S. Preventive Services Task Force (USPSTF)
- National Comprehensive Cancer Network (NCCN)
- European Society for Medical Oncology (ESMO)

Screening tests and follow-up intervals are implemented and updated frequently by these organizations, depending on study results and technical improvements. The recommendations are not applied in the same way for the whole population; there are variations between countries and appropriate tests are recommended based on individual risk situations [6, 11, 16, 21, 24–28]. Although all guidelines recommend starting routine screening for CRC and adenomatous polyps in asymptomatic adults at age 50, there is less agreement as to the screening method, frequency of screening, and at which age screening may be safely discontinued. The recommendations differ for the method, frequency, and age of screening commencement in high-risk patients.

American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and American College of Radiology (ACR) guidelines were published in 2008 [6, 21, 24]. These guidelines recommend starting screening in asymptomatic men and women at age 50 years. Any test that can detect adenomatous polyps can be used for screening adults at average risk. **Table 2** lists the tests and their recommended frequency of use. Individuals with family history of CRC, polyps, or one of the hereditary CRC syndromes, or a personal history of CRC or chronic inflammatory bowel disease are recommended to undergo colonoscopy at younger ages and more frequently than individuals at average risk (**Tables 3** and **4**) [24, 28].

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Test	Interval recommendations	Training issues to facilitate decision-making advantage/disadvantage
Flexible sigmoidoscopy	Every 5 years[1,2] Every 10 years[3] The optimal interval should not be <10 years and may even be extended to 20 years[3]	• Full or partial bowel preparation is required • Sedation is not generally used, so there may be some difficulties during the process • The protective effect is limited to the examined column section • If results are positive, people are generally directed to colonoscopy • Low risk of bleeding, infection, and perforation
Colonoscopy	Every 10 years[1,2,3] The optimal interval should not be <10 years and may even be extended up to 20 years[3]	• Full bowel preparation is required • Awareness under sedation used in most centers • A business day may be needed for resting before the preparation and after the process • Transportation (car cannot be used after sedation) and travel companion is required • Biopsy can be taken during the procedure, polyps can be removed • Rare but potentially serious risk of perforation and hemorrhage; risk increases with polypectomy
Double-contrast colonography	Every 5 years[1,2] Uncertain[3]	• Full bowel preparation is required • The biopsy cannot be done during the procedure • If one or more polyps >6 mm, colonoscopy will be recommended; follow-up colonoscopy will require full bowel preparation • Sedation is generally not used, so there may be some difficulties during the process • Low-risk, rare perforations have been reported
Virtual colonoscopy/ CT colonography	Every 5 years[1] Uncertain[2,3]	• Full bowel preparation is required • If one or more polyps > 6 mm, colonoscopy will be recommended; if colonoscopy is not possible on the same day, full bowel preparation is needed before the colonoscopy • Sedation is not used, so there may be some difficulties during the process

Test	Interval recommendations	Training issues to facilitate decision-making advantage/disadvantage
		• Low-risk, rare perforations have been reported • Extracolonic abnormalities can be identified and require further evaluation

[1]American Cancer Society, USMSTF, American College of Radiology screening guide.
[2]National Comprehensive Cancer Network (NCCN).
[3]ESMO guidelines and European guidelines for quality assurance in colorectal cancer screening and diagnosis [6, 13, 21, 24–27].

Table 2. Average risk for colorectal cancer, tips for individuals in the group, follow-up frequency, and advantages and disadvantages.

Test	Recommendations interval	Training issues to facilitate decision-making advantage/disadvantage
Guiac-based FOBT	Annually[1], [2] Annually[3] The test interval should not exceed 2 years[3]	• Depending on the manufacturer's recommendation, 2–3 stool samples collected at home are required to complete the test; stool sample collected during a single examination at the clinic, touching stool test is not acceptable and should not be used • No risk of perforation of the intestine • Can be done at home, increase the protection of privacy • It is relatively cheap compared with other tests • If results are positive, further evaluation with colonoscopy is needed • Avoid consumption aspirin, NSAIDs, vitamin C, red meat, poultry, fish, and raw vegetables for 48 hours before the test
Fecal immuno-chemical test	Annually[1] Uncertain[2] The test interval should not exceed 3 years[3]	• If results are positive, further evaluation with colonoscopy I needed • Single tests are often ineffective • The transportation of the material to the laboratory requires specific instructions and appropriate protective material • No risk of perforation • Protection of privacy as can be done at home
Stool DNA test	Uncertain[1],[2],[3]	• A test sample should be sufficient and should be packaged in suitable preservative for transportation to the laboratory • More expensive than other stool tests • If the test result is positive, further evaluation with colonoscopy is needed. If the test is negative, it is not clear, the test should be

Test	Recommendations interval	Training issues to facilitate decision-making advantage/disadvantage
		repeated at appropriate intervals • No dietary restrictions • Protection of privacy increased as can be done at home • No risk of perforation

[1]American Cancer Society, USMSTF, American College of Radiology screening guide.
[2]National Comprehensive Cancer Network (NCCN).
[3]ESMO guidelines and European guidelines for quality assurance in colorectal cancer screening and diagnosis [6, 13, 21, 24–27].

Table 2. Moderate risk for colorectal cancer, tips for individuals in the group, follow-up frequency, advantages and disadvantages (continued).

Risk category	Starting year	Recommendations/interval	Comment
CRC or adenomatous polyps in the first 60 years of first-degree relative or two or more first-degree relatives at any age	40 years, or 10 years younger than the age of the CRC diagnosis in the youngest relative CRC diagnosis[1,2] 40 years, or 5 years younger than the age of cancer onset in first-degree relatives[3]	Colonoscopy[1,2] FOBT and colonoscopy[3] Every 5 years[1,2,3]	
Two adenomatous/CRC polyps in first- or second-degree relatives aged over 60 years	40 years[1,2] or 5 years younger than the age of disease onset in first-degree relatives[3]	Screening frequency and recommendations for moderate risk individuals are applied[1,2] Screening/follow-up procedure will be determined by clinical follow-up of patients[3]	Individuals can now scan any screening test but should begin at an early age

[1]American Cancer Society, USMSTF, American College of Radiology screening guide.
[2]National Comprehensive Cancer Network (NCCN).
[3]ESMO guidelines and European guidelines for quality assurance in colorectal cancer screening and diagnosis [6, 13, 21, 24–27].

Table 3. Recommendations and colorectal cancer screening tests for individuals in the increased-risk group.

Risk category	Starting year	Recommendations/interval	Comment
Genetically diagnosed with FAP or without evidence of	10 or 12 years old[1,2] Starting at age 12–14 years and continued lifelong in mutation carriers[3]	Individual genetic anomaly that carries genetic tests to determine the annual FSA and consulting requirements[1,2] Sigmoidoscopy every 2 years[3]	If genetic testing is positive, colectomy should be considered Screening and monitoring procedures following clinical cases will be determined[3]

Risk category	Starting year	Recommendations/interval	Comment
genetic testing and those suspected in FAP			Once adenomas are detected, annual colonoscopy should be carried out until colectomy is planned[3]
For AFAP	Starting at age 18–20 years and continued lifelong in mutation carriers. [3]	Colonoscopy every 2 years[3]	After adenomas are detected, colonoscopy should be carried out annually[3]
Genetically or clinically diagnosed with HNPCC individuals, or high-risk individuals for HNPCC	20–25 years of age or their immediate family members or 10 years younger than the age of the CRC diagnosis in the youngest relative[1],[2] Starting at age 20–25 or 5 years before the youngest case in the family[3]	Colonoscopy every 1–2 years and counseling on whether the genetic testing is necessary[1],[2]Colonoscopy every 1–2 years.[3] Upper limit is not established.[3]	First-degree relatives of people with known hereditary MMR gene mutations should be offered genetic testing for HNPCC. Family mutation as yet unknown, but also those having one of the first three criteria of modified Bethesda should be recommended Screening and monitoring procedures following clinical cases will be determined[3]

[1]American Cancer Society, USMSTF, American College of Radiology screening guide.
[2]National Comprehensive Cancer Network (NCCN).
[3]ESMO guidelines and European guidelines for quality assurance in colorectal cancer screening and diagnosis [6, 13, 21, 24–27].

Table 4. Recommendations and colorectal cancer screening tests for individuals in the high-risk group.

US Preventive Services Task Force (USPSTF):

The US Preventive Services Task Force (USPSTF) recommends using high-sensitivity fecal occult blood testing, sigmoidoscopy, or colonoscopy from the age 50 years and to continue until the age of 75 years [28]. Higher risk individuals should begin screening at a younger age, and likely more frequently. Whether individuals need to be screened beyond the age of 75 years must be decided on an individual basis. Recommended screening tests and intervals are as follows:

- High-sensitivity fecal occult blood test (FOBT)—annual
- Flexible sigmoidoscopy—5 yearly (every 3 years with FOBT)
- Colonoscopy—every 10 years

Colonoscopy can be used for screening or as a follow-up diagnostic tool in symptomatic patients, or when the results of another CRC screening test are unclear or abnormal [28].

The National Comprehensive Cancer Network (NCCN):

The National Comprehensive Cancer Network (NCCN) has released separate guidelines for average- (**Table 2**), increased- (**Table 3**), and high-risk individuals (**Table 4**). For average

individuals, the NNCN's guidance is almost identical to that of the ACS, USMSTF, and ACR. These guidelines make recommendations for each risk factor for individuals at high risk [27, 28].

European Society for Medical Oncology (ESMO):

According to all international guidelines, screening tests are stratified according to the personal risk of disease. The CRC screening guidelines of ESMO are in parallel with the guiding principles of the European guidelines. The ESMO recommendations for average-, increased-, and high-risk individuals are shown in **Tables 2–4**, respectively. Guaiac (g) FOBT reduced CRC mortality in average-risk populations by 15% in different age groups. To date, only FOBT has been recommended for men and women aged 50–74 years. Fecal immunochemical testing appears to be superior to gFOBT with respect to detection rates and positive predictive values for adenomas and cancer. Flexible sigmoidoscopy has been demonstrated to reduce CRC and mortality rates when conducted in organized screening programs. FS screening should be discontinued in patients of average risk aged more than 74 years because of the increased number of comorbidities in this population. There is no current evidence to support adding in a one-off sigmoidoscopy to FOBT screening. There is limited efficacy of colonoscopy in reducing CRC incidence and mortality. The optimal age for a single colonoscopy is circa 55 years but the age range for this test is 50–74 years. Newer screening techniques such as computed tomography colonography, stool DNA testing, and capsule endoscopy are still under evaluation and as such should not yet be relied upon to screen the average-risk population [29, 30].

Colorectal cancer screening remains a subject of debate regarding to whom, with which method, and at what frequency; however, its cost-effectiveness has been demonstrated and this is key in influencing the decision to implement CRC screening programs [7, 31]. Policy-makers and health professionals who decide on which CRC screening strategy to recommend or implement must be well informed. It is vital that resources are used efficiently when planning or implementing nationwide CRC screening programs, and that a cost-effective option for CRC screening is selected. According to the results of recent review studies, there is a complexity which screening test is the most cost-effective and which screening test should be chosen [7, 31].

Individuals are divided into categories according to their risk of CRC, and the type and frequency of screening methods varies depending on the risk category [6, 21, 23–27]. The risk of developing CRC for an individual is classified into three categories: moderate risk, increased risk, and high risk; screening is recommended in accordance with the risk group of individuals [6, 13]. Persons with known gene mutation or those with suspected gene mutations have a very high risk of contracting the disease [6, 13, 21, 24–27].

2.1.2.3.1. Moderate/average-risk group

Everyone is under the lowest risk for CRC [21]. Personal and family history of colorectal polyps or ulcerative colitis without CRC, chronic inflammatory bowel disease such as Crohn's disease without CRC, and all individuals aged 50 years and over are at average risk [6, 21, 24–27].

Individuals at average risk are recommended for screening; the frequency of follow-up is shown in **Table 2**.

2.1.2.3.2. Increased risk group

In this group, risk of CRC is growing twice according to the individuals in average risk. Individuals with a history of adenomatous polyps are at significantly higher risk. A family history of CRC or adenoma increases a person's risk of developing CRC. If there is a family history CRC or adenomas including first-degree relatives (mother, father, sibling, or child) before the age of 60, the risk of developing CRC at any age (—three to four times the average risk) significantly increases. Screening recommendations for high-risk individuals are shown in **Table 3**.

2.1.2.3.3. High-risk group

The risk of CRC in individuals with a known genetic mutation is high. The most common hereditary CRC syndrome, HNPCC, also known as Lynch syndrome, is an autosomal dominant syndrome and accounts for 3–5% of all CRCs. Familial adenomatous polyposis, which is characterized by multiple adenomatous colonic polyps, is an autosomal dominant syndrome comprising 1% of all CRC cases. For the FAP, the average age of cancer diagnosed is 39 years for FAP, but in the individuals with FAP 75% of adenomas occurred in 20 years. Recommended screening and surveillance programs for high-risk individuals are shown in **Table 4** [6, 21, 24, 30].

2.1.2.4. Tertiary prevention strategies

Tertiary prevention is used in the treatment of specified diseases or prevention of complications associated with the disease, is often used to treat one type of cancer and metastasis, or involves treating patients at risk for development of a secondary primary cancer [20]. The target of tertiary prevention in cancer patients is to reduce morbidity and mortality with the optimal treatment. Primary and secondary prevention practices are recommended in developing or less developed countries due to the fact that greater economic burden of tertiary prevention [20].

2.2. Colon cancer risk counseling

Today, although advances in treatment and screening standards established successful tests for CRC, it is not perceived as a curable and preventable disease. Many people do not know that even simple measures can prevent CRC. Cancer can be prevented in some individual cases, and it is very important to develop the perception in the community and belief that cancer can be prevented and is curable. Determining the level of risk and interpretation, encouraging preventive behaviors, and improving the early diagnosis and screening behaviors are important parts of early detection and screening programs. Prevention of colon cancer will be successful with the health efforts of professionals to increase awareness of the disease, risk assessments, counseling programs with appropriate recommendations, and diagnose the

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patients in an early stage [32, 33]. In studies conducted in recent years in the prevention of cancer, "cancer risk counseling" concept stands out [32, 34]. Physicians and nurses who work in primary healthcare services and oncology units have an important role and responsibilities in implementing programs and changing behavior that encourages early screening and diagnosis of cancer. Cancer risk counseling focuses on genetic assessment, assessment of individual risk factors, and the development of a risk management plan [35]. At this point, health professionals trained in CRC counseling can take control of their risk by reaching the individuals at an early stage [11, 12, 32, 36, 37]. Cancer risk counseling should be done in a second step in primary care with asymptomatic individuals at moderate risk and members of the increased-risk and high-risk groups. For example, risk counseling to individuals who have registered in family medicine and family health centers in the moderate-risk group is given by public health nurses. Family of individuals with hereditary CRC and of patients are counseled by doctors and nurses in clinical oncology for as long as treatment continues, or by clinical staff of family cancer clinics/genetic private surveillance programs or outpatient clinics, for those with chronic bowel disease if they are under follow-up [32, 36–38]. To conduct CRC risk counseling, physicians and nurses must have the authority and knowledge on this subject.

This risk counseling process encompasses a comprehensive cancer risk assessment, and determining genetic predisposition, information, guidance training and screening, genetic counseling, and creation of a risk management plan that includes the monitoring and evaluation plan. To achieve effective results in risk counseling, giving individual-specific messages, making an assessment of risk status together with the individual, and supporting the individual in the decision-making process is essential. In addition, it is aimed to follow-up screening participation of the individuals, and guide individuals who receive abnormal test results. Thus, CRC risk counseling aims to reduce morbidity and mortality with an increase in screening rates and to detect disease at an early stage [33, 35, 38].

Risk advisor staff who conduct risk counseling and risk assessments must have certain characteristics. CRC staff have to have adequate current information about hardware, communication techniques, good training, and counseling skills. Also, a counseling room should have adequate ventilation and lighting systems suitable for training and counseling. Colorectal cancer risk counseling identifies risk factors for an individual that can and cannot be changed (hazard identification/risk assessment); screening for risk factors proposition includes monitoring of behavior change initiatives and behavioral changes [38].

2.2.1. Stages of colorectal cancer risk counseling

Colorectal cancer risk counseling includes individual education and counseling and is implemented in three stages [32, 38]:

Stage 1: Application phase

Stage 2: Follow-up phase

Stage 3: Evaluation phase

2.2.1.1. Application phase

The creation of awareness through risk assessment and transfer of disease-specific information/education consist of three parts. Before making giving detailed information, disease awareness should be created for the individual, the individual's attention should be directed toward the subject and they should be allowed to ask questions [38]. At this stage, awareness about factors that increase the risk of disease must be created, and behavioral changes must be implemented in order to ensure appropriate counseling skills and evidence-based interventions [14]. A wide range of communication media have been used in studies aiming to increase awareness of CRC screening ranging from personal letters to TV advertisements. While facilitating effective participation in CRC screening initiatives, such as reminders, mass media and the media, group training, personal training, and assessments, are taken by reducing structural barriers to healthcare professionals and include initiatives such as feedback. The effectiveness of personal reminders, personal training, and counseling in improving CRC screening has been proven [10, 25, 39–44].

Sections	Initiatives/methods	Tools
Application phase		
Creating awareness	**Initiative:** CRC risk factors, prevention, information about early diagnosis **Method:** Face-to-face interviews, telephone interviews, video/slide show, introduce role models, motivational interviewing, send letters	Banners, posters, models, TV and newspaper advertisements, letters, mail/invitation via e-mail, phone messages, calendars, giveaway/inducers such as promotion, promotional stands
Risk assessment	**Initiative:** Determine the risk rating of the individual **Method:** Face-to-face interviews, computer-aided risk assessment models	Risk assessment tables, pedigree charts, graphs, histograms, electronic health records
Disease-specific information	**Initiative:** Provide adequate and appropriate information about the disease **Method:** Face to face interviews	Slides, posters, pamphlets, educational videos, health beliefs scales, written materials
Follow-up phase		
	Initiative: Maintain awareness, support positive behavior, follow-up/surveillance of screening behavior **Method:** Interview	Phone calls, text messages, e-mail, reminders, call center awards
Evaluation phase		
	Initiative: Preventive screening behavior and participation in evaluation, assessment test results **Method:** Face-to-face interviews	Automated phone calls Web-based assessment

Table 5. Colorectal cancer risk counseling can be applied in all stages of evidence-based initiatives.

Creating awareness: Various implications may be used in order to create awareness in the individuals about the importance of their protective behaviors in the prevention of CRC and their health. Evidence-based interventions recommended in the recent relevant studies are

shown in **Table 5** [10, 25, 39–44]. Due to purpose of encouraging individuals take action to protective behaviors, it is important to give positive messages in materials (e.g., posters, banners) that it is possible to protect against CRC [11, 36, 37]. Risk assessment is required for each individual in order to determine the screening interval and proper test [21, 33].

Risk assessment: It is important to be able to receive adequate health history. The scope of individual members in the counseling process assessment includes the following:

- demographic, socioeconomic, cultural characteristics, and medical history (previous/existing diseases, especially chronic bowel disease, polyps),
- a detailed family history (especially first- and second-degree relatives),
- cognitive and psychosocial (cognitive capacity, CRC knowledge, risk perception, CRC-related health beliefs and attitudes, perceptions, motivation, concerns, barriers, CRC relevant experience, anxiety and fears, coping mechanisms and social support status, decision-making and decision support systems),
- lifestyle behaviors (habits that increase the risk of CRC, dietary behaviors, physical activity status, smoking and alcohol use, stress level, given the importance of such a negative attitude and a healthy lifestyle),
- do not collect data on exposure to environmental risk factors and other characteristics.

Risk assessment tools for practical risk assessment (risk calculation tool, pedigram) can be made using electronic health records [10, 25, 33, 35, 39, 45]. According to the data obtained, a risk rating of the risk assessment is performed. The risk rating is how to determine whether an individual is at risk and making orientation relative to the risk. The degree of risk of cancer is important in guiding the individual screening tests [6, 11, 21]. In this regard, national/international guidelines should be considered. Risk assessment, web-based tools, and mathematical models of interpretation of risk may make it easier to use directed individual protection proposals. Graphical presentation of risk status (bar, pie, histogram) makes it easier to explain and to understand the risk [6, 21, 33, 45]. Health behavior models have been developed for people to understand why there are different health behaviors or practices they are going to implement. While counseling individuals, health behavior models act as a "black box" to determine factors that affect preventive behaviors and to change negative behaviors to positive. These models are Health Belief Model, Transtheoretic Model, Health Promotion, and Preventive Health Model [11, 12, 14, 38, 39].

The risk status of the individual is described in a way that can be understood. Words, tone of voice, body images, and facial expressions of health personnel can affect the understanding individual risk information. The level of education of the individual, age, cultural, and linguistic differences should be taken into account. In addition, the cost of diagnosis and treatment, transportation requirements, communication, and cultural characteristics are important for the care of the patient's decision. Particular circumstances of the individual (e.g., affected my social and personal values, and economic and environmental conditions) should be considered. Individuals are given information regarding their assessment and risk diagnostics; when interpreting cancer risks, results that will disrupt the motivation for the indi-

vidual's protection behavior or descriptions that will cause anxiety/fear should be avoided [33, 45].

Sufficient disease-specific information: The aim is to address the lack of knowledge about the disease and the individual CRC screening tests (fecal occult blood test, colonoscopy, double-contrast bowel X-ray, sigmoidoscopy). Patients training sessions should include information on colon and rectal anatomy of the digestive system, CRC generation, CRC signs and symptoms, risk factors, the importance of disease prevention, prevention, healthy lifestyle behaviors, early diagnosis and screening tests, the advantages and disadvantages of each test, and information about CRC protection behavior information [11, 21, 32, 35, 38, 39, 45]. Taking appropriate initiatives to scan an individual's risk rating should be provided and monitored (see **Table 5**). Encouragement of positive behavior aimed at reducing CRC risk and altering health beliefs associated with the disease are very important. Therefore, the individual's health beliefs during counseling, motivation, and barriers to education in this direction may be determined by a variety of scales [11, 21, 38]. Video display and printed materials in the education department, presentations, and motivational interviewing techniques such as active listening are available. There are no studies on the use of individual incentives that promote screening (a small amount of money, coupons, gift certificates); therefore, there is insufficient evidence to support this initiative alone. After the training, short appropriate tests should be conducted in order to evaluate the effectiveness of the training; individuals who then wish to undergo screening should be referred to the relevant departments and clinics [38].

2.2.1.2. Follow-up phase

Maintainance of awareness of the individual is intended to support the CRC protection behavior. It will increase the importance of the disease and practical initiatives to ensure the consistency of behavior covered in the training. The next follow-up face-to-face meeting in the implementation phase can be done through methods such as e-mail or telephone (**Table 5**). During these initiatives, any information that was given during training that was not clear can be questioned. For example, healthy lifestyle behaviors and screening recommendations for prevention of CRC can be repeated/reviewed, and information can be discussed about where to go in the event of receiving negative test results. At this stage, the behavior of individuals regarding disease protection is expected to show increased enthusiasm. All associated individuals (family, friends, healthcare professionals) are encouraged to support positive and protective behavior [11, 12, 21, 25, 35, 38].

2.2.1.3. Evaluation phase

At this stage, CRC protection behavior exhibited by the individual is evaluated. Changing an individual's behavior is not a goal that can be realized in a short time, it requires long-term follow-up. In order to ensure continuity, to maintain positive behaviors and enable behavior changes to occur, regular implementation of risk counseling (e.g., 3, 6, 12, 24 months) should be carried out [34, 35, 39]. The evaluation phase, which allows for obtaining feedback from individuals, is usually advised to be face to face. Reasons for an individual wishing to end the

program should be taken to identify obstacles and need to reschedule procedures overcome these barriers [11, 12, 21, 32, 35, 38, 41, 45].

3. Conclusions

Primary and secondary prevention practices in the management of CRC are to be carried out together. Applying primary measures alone will not be enough, only having screening tests will not prevent the disease occurrence. Primary healthcare physicians and nurses have an important role in the implementation of risk counseling. Colorectal cancer risk counsellers are required to have special knowledge and skills. Therefore, the staff who undertake counseling are required to have received appropriate training. Colorectal cancer risk counseling is a process that applies to all stages of implementation, including monitoring, evaluation stages, and health services. Many initiatives and recommended methods for each stage of the process have been demonstrated in research. Adequate training in CRC risk counseling practice of health professionals, all relevant employees in surgery, oncology, and public health has been estimated to reduce the incidence of CRC.

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