



REVISTA DE GASTROENTEROLOGÍA DE MÉXICO

www.elsevier.es/rgmx



ORIGINAL ARTICLE

Descriptive study on the use of colonoscopy as a screening method for colorectal cancer

F.E. Jabif*, P.N. Cherne, C. Pintos, J.A. Pollán, A. Murujosa

Servicio de Clínica Médica, Hospital Italiano de Buenos Aires, Buenos Aires, Argentina

Received 5 April 2024; accepted 25 November 2024

KEYWORDS

Colorectal tumors;
Colonoscopy;
Screening;
Epidemiology;
Cohort studies

Abstract

Introduction and aims: The aim of this study was to estimate the number of patients diagnosed with colorectal cancer (CRC) that underwent their first screening colonoscopy and to describe the endoscopic and anatomopathologic findings and characteristics of the patients that had a screening colonoscopy for CRC.

Materials and methods: A cross-sectional study was conducted that included patients aged 50 to 79 years, with prepaid healthcare at a tertiary care hospital, that underwent a first colonoscopy within the time frame of 2013 and 2022. The demographic data, endoscopic findings, and biopsy results were collected. Patients with a history of previous colonoscopy or a previous CRC diagnosis were excluded. Descriptive statistics were utilized for the data analysis. **Results:** Of 28,286 colonoscopies performed, 19,222 (68%) were for CRC screening. Mean patient age was 61 years, with a predominance of women (59.5%). The prevalence of CRC diagnosis was 0.6% and the most common findings were polyps (36.7%) and diverticula (35.5%). A total of 118 cases of CRC were diagnosed, as a result of the first colonoscopy. The post-colonoscopy hospitalization rate was 1.14%.

Conclusions: This study provides relevant information on the characteristics of the population undergoing CRC screening at our center. Our data contribute to having a better understanding of the profile of patients that access screening and provides a solid descriptive base through which clinical practices, diagnostic method quality, and screening program results can be evaluated. © 2025 Asociación Mexicana de Gastroenterología. Published by Masson Doyma México S.A. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author at. Gascón 450, Ciudad Autónoma de Buenos Aires, Argentina. Tel.: + 5493814426739.
E-mail address: fernando.jabif@hospitalitaliano.org.ar (F.E. Jabif).

PALABRAS CLAVE

Neoplasias
colorrectales;
Colonoscopia;
Tamizaje;
Epidemiología;
Estudios de cohortes

Uso de la videocolonoscopia para el tamizaje del cáncer colorrectal: estudio descriptivo**Resumen**

Introducción y objetivos: Este estudio buscó estimar el número de pacientes diagnosticados con cáncer colorrectal (CCR) que se realizaron una primera colonoscopia (VCC) de tamizaje y describir los hallazgos endoscópicos, anatomopatológicos y las características de los pacientes sometidos a VCC.

Materiales y métodos: Se realizó un estudio de corte transversal que incluyó a pacientes de 50 a 79 años afiliados a una prepaga hospitalaria, que se sometieron a una primera VCC entre 2013 y 2022. Se recopilieron datos demográficos, hallazgos endoscópicos y resultados de biopsias. Se excluyeron aquellos con antecedentes de VCC previas y diagnóstico previo de CCR. Se utilizó estadística descriptiva para el análisis de datos.

Resultados: Se realizaron 28286 videocolonoscopias, siendo 19222 (68%) para tamizaje de CCR. La edad promedio fue de 61 años, con predominio femenino (59.5%). La prevalencia de diagnóstico de CCR fue del 0.6%. Los hallazgos más comunes fueron pólipos (36.7%) y divertículos (35.5%). Se diagnosticaron 118 casos de CCR como consecuencia de esta VCC. La tasa de hospitalización post colonoscopia fue de 1.14%.

Conclusiones: Este estudio aporta información relevante sobre las características de la población que se somete a tamizaje de CCR en nuestro centro. Nuestros datos contribuyen a una mejor comprensión del perfil de los pacientes que acceden al tamizaje y proporcionan una base descriptiva sólida sobre las que se pueden evaluar prácticas clínicas, calidad de los métodos diagnósticos y resultados de los programas de tamizaje.

© 2025 Asociación Mexicana de Gastroenterología. Publicado por Masson Doyma México S.A. Este es un artículo Open Access bajo la CC BY-NC-ND licencia (<http://creativecommons.org/licencias/by-nc-nd/4.0/>).

Introduction

Colorectal cancer (CRC) is a prevalent disease with a high mortality rate and its incidence is increasing worldwide.¹ It is the third most common type of cancer and the second cause of cancer-related death across the globe.² In 2020 in Argentina, approximately 130,000 new cases of cancer were diagnosed.³ CRC was in second place, accounting for 12.1% of all the diagnoses^{2,3} and 12.4% of cancer-related deaths in the same period.⁴

Pathophysiologically, CRC derives from colorectal polyps originating from normal mucosa that, through genetic and epigenetic changes, progress into malignant tumors, during a process that takes an estimated 10 years.^{5,6} In this context, early detection of CRC precursory lesions or lesions in their initial stages could prevent the subsequent development of the disease.^{6,7} Therefore, colonoscopy has become one of the methods of choice for CRC screening thanks to its diagnostic and therapeutic capacities. In addition, clinical practice guidelines recommend periodic surveillance colonoscopy after the removal of a colonic adenoma, for the purpose of reducing the incidence and mortality of CRC. The risk of developing advanced adenoma and metachronous CRC is related to findings in the baseline colonoscopy.⁸

Different studies, the majority of which are observational, suggest a reduced incidence and mortality in CRC by using colonoscopy as the screening method.^{6,9} A study conducted in a Caribbean country reported CRC detection at earlier stages through screening colonoscopy,

compared with its symptomatic detection.¹⁰ The first randomized clinical trial was recently published, in which there was a reduced risk of CRC in patients who were invited to undergo screening, compared with those who were not.¹¹

From another perspective, national and international studies have shown that CRC screening is a cost-effective intervention, compared with no intervention, in terms of quality-adjusted life years.¹² Since 2010, Argentina has had a CRC early detection and prevention program for persons between 50 and 75 years of age.¹³ However, there is no local information available on the characteristics of patients at standard risk that undergo colonoscopy for CRC screening, nor endoscopic findings of those studies.

Therefore, we decided to conduct an observational, cross-sectional study to estimate the prevalence of malignant lesions consistent with CRC in a first screening endoscopy, as well as to describe the endoscopic and anatomopathologic findings and the characteristics of the patients that underwent a screening colonoscopy for CRC.

Materials and methods

A cross-sectional study was designed. The sample consisted of patients between 50 and 79 years of age, all with a prepaid healthcare plan at the same tertiary care hospital, who underwent their first colonoscopy as screening for CRC, within the time frame of January 2013 and Decem-

ber 2022. The reason for the colonoscopy was identified in the patient report made by the gastroenterologist who performed the examination. Demographic data, colonoscopy findings that included biopsy results, and the later diagnoses of the patients were collected to detect the development of CRC. Patients with a history of previous lower endoscopic studies or with a diagnosis of CRC prior to the first colonoscopy were excluded. The analysis included all the patients that met the inclusion criteria, with no exclusion criterion. CRC diagnosis was considered a consequence of colonoscopy in the patients whose biopsy from the procedure showed a lesion consistent with malignancy, defined in the anatomopathologic report with the terms, "carcinoma" and "colorectal origin". The remaining later diagnoses were considered unrelated to the first endoscopy. The study was carried out at an advanced specialty hospital located in Buenos Aires, Argentina, that also acts as its own private healthcare provider, with approximately 181,000 affiliates in December 2022. Seven operating rooms are available to the Gastroenterology Department and about 100 endoscopic examinations are performed daily.

Ethical considerations

Given that all healthcare information is recorded in an Electronic Health Record (EHR), the variables of interest were provided by the Information Management Department, using high-quality secondary databases, without requiring informed consent.

The protocol of the present study was approved by the institutional ethics committee (#6737). In addition, manual review of the EHR by experts was necessary for identifying complications during the 30 days post-colonoscopy (perforations, infections and/or bleeding), guaranteeing patient privacy and confidentiality.

Statistical analysis

Descriptive statistics were employed in the statistical analysis. The quantitative variables were expressed as median and interquartile range (IQR) and the categorical variables as absolute frequency and relative frequency (percentage). The prevalence of screening adherence was calculated by dividing the number of patients that completed the colonoscopy by the total number of eligible patients. It was represented annually to reflect its evolution throughout the study period. The mean study period's annual prevalence, differentiated by sex, was obtained by adding the yearly prevalence figures and dividing the sum by the number of study years. The prevalence of malignant lesions was calculated as the percentage of patients with a histopathologic diagnosis of a malignant lesion divided by the total number of patients that underwent colonoscopy. The results were expressed as percentages and 95% confidence intervals (95% CIs) and calculated utilizing binomial approximation. The Student's *t* test was utilized to compare the prevalence figures between groups, and statistical significance was set at a $p < 0.05$.

Table 1 Reasons for undergoing colonoscopy (n = 28,286)

Reasons for colonoscopy	
Screening in average-risk patients	68.1% (19,222)
Screening in increased-risk patients	1.5% (426)
Abdominal pain	1.3% (373)
Gastrointestinal bleeding	8.1% (2293)
Altered bowel habit	3.5% (987)
Anemia	3.1% (874)
Suspected functional disorder	3.2% (924)
Other reasons	11.2% (3,187)

The data were entered into an Excel® database with restricted access and processed using RStudio for the statistical analysis.

The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) checklist was employed to guarantee thoroughness and transparency in the data presentation.

Results

During the study period, 28,286 patients underwent colonoscopy as their first endoscopic examination. Of those patients, 19,222 (68%) were referred for colonoscopy as part of the screening process for individuals at an average risk for developing CRC. Table 1 shows the other indications for colonoscopy, outside of screening, of which gastrointestinal bleeding and change in bowel habits were the principal causes.

The mean age of the screened patients was 61 years (55-68 IQR), and 59.5% were women. A total of 999 patients (5.2%) were between 76 and 79 years of age when undergoing the colonoscopy. The mean annual prevalence of screening colonoscopy performed in men in the age group analyzed was 3.06 patients/year (95% CI 2.54-3.59), whereas it was 2.79 patients/year (95% CI 2.24-3.34) in women. There were no significant differences between sexes ($p = 0.428$). Fig. 1 shows the distribution of screening adherence over the years, with no substantial changes, except for 2020. The most commonly reported comorbidities are shown in Table 2, with high blood pressure at 41.2%, overweight at 39.9%, obesity at 25.3%, and smokers or ex-smokers at 24.9%. In the 6 months prior to the colonoscopy, only 3.5% ($n = 668$) of the patients had undergone a fecal occult blood test (FOBT) as a screening exam, of which 49.6% were positive.

Table 3 describes the study's findings. Polyps (36.7%) and diverticula (35.5%) were the most common lesions. Of the polyps identified, 88.2% ($n = 6,239$) were extirpated during the same procedure. There was a 1.04% prevalence of lesions with macroscopic characteristics suggestive of malignancy (e.g., vegetative, ulcerated, or friable lesions) in the colonoscopy (95% CI 0.9-1.19), and this type of lesion was detected in 201 patients. Biopsies were performed on 5,936 patients (30.8%) during the endoscopic procedure.

The prevalence of lesions consistent with CRC in the first colonoscopy was 0.6% ($n = 118$, 95% CI 0.50-0.72), with a predominance of low-grade adenocarcinoma (72.9%), whereas

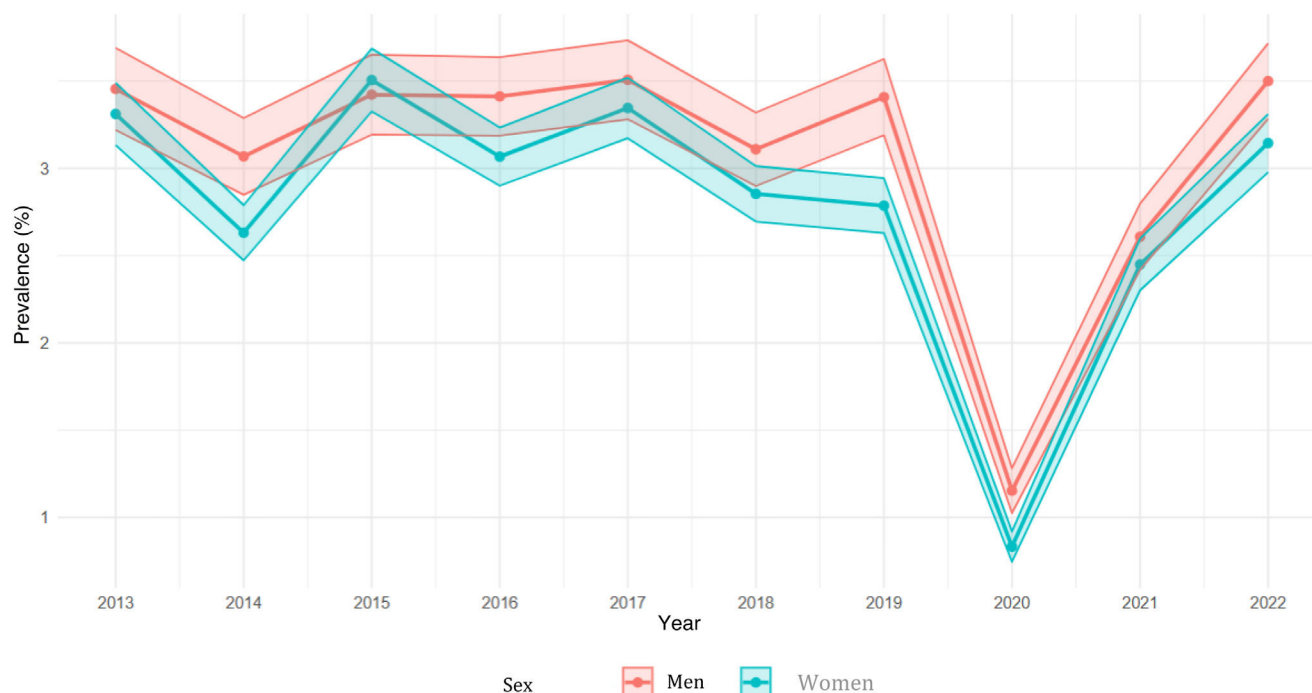


Figure 1 Prevalence of adherence to colonoscopy as a screening method over the years, differentiated by sex.

Table 2 Characteristics of the population undergoing a first colonoscopy as a colorectal cancer screening method (n = 19,222)

Age, in years ^a	61 (55-68)
Female sex, % (n)	59.5% (11,435)
Comorbidities and clinical histories	
High blood pressure, % (n)	41.4% (7,950)
Overweight, % (n)	40% (7,688)
Obesity, % (n)	25.4% (4,878)
Smokers or ex-smokers, % (n)	25% (4,796)
Diabetes, % (n)	5.8% (1,119)
Cancer, % (n)	5.2% (1,001)
Breast cancer	2.5% (485)
Prostate cancer	1% (192)
Thyroid cancer	0.6% (109)
Kidney cancer	0.2% (33)
Lung cancer	0.1% (25)
Pancreatic cancer	0.02% (4)
COPD, % (n)	1.8% (344)
Chronic kidney disease, % (n)	1.1% (215)
Coronary heart disease, % (n)	1.1% (215)
Heart failure, % (n)	0.5% (95)
Cirrhosis, % (n)	0.3% (58)

COPD: chronic obstructive pulmonary disease.

^a Median (interquartile range).

21.2% were described as adenocarcinoma *in situ* or intramucosal adenocarcinoma. The adenoma detection rate (ADR) was 25.3%. The most frequent histologic finding was tubular adenoma, found in 18.8% (n = 3,617) of the endoscopic studies. In addition, 699 patients (3.6%) presented with adenomas with a villous component (villous characteristics in more than 25% of the adenoma) and 2.2% (n = 429) with ser-

Table 3 Endoscopic findings in the colonoscopies performed as average-risk colorectal cancer screening (n = 19,222)

Endoscopic findings	
Polyps	36.7% (7,074)
Diverticula	35.5% (6,844)
Angiodysplasias	1% (189)
External hemorrhoids	0.9% (172)
Internal hemorrhoids	8.6% (1664)
Flat lesions	5.2% (994)
Subepithelial lesions	0.1% (25)
Lesions with a macroscopic tumoral aspect	1.04% (201)
Ulcers	0.2% (44)

rated adenomas. Table 4 shows the rest of the histologic findings.

A total of 220 patients (1.14%) required hospitalization in a 30-day post-procedure window of the immediate follow-up period, and 5 of them were hospitalized more than once during that time interval. Median hospital stay was 2.37 days, with an interhospital mortality rate of 0%. The most common causes of hospitalization were gastrointestinal-related (37.6%), followed by trauma (8.8%) and cardiologic (7.5%) events. Twenty-five of those hospitalizations (11.1%) were considered associated with the endoscopic procedure, identifying 16 cases of gastrointestinal bleeding, 6 endoscopy-associated infections, and 3 perforations.

Discussion and conclusions

In our study population, the prevalence of CRC in the colonoscopies performed was 0.6% (95% CI 0.5-0.72%). The majority

Table 4 Anatomopathologic findings revealed by first colonoscopy performed as screening for colorectal cancer (n = 19,222)

Adenoma detection rate (ADR)	25.3% (4,863)
Hyperplastic polyps	9.1% (1,745)
Tubular adenoma	18.8% (3,617)
Adenoma with villous component	3.6% (699)
Serrated adenoma	2.2% (429)
Adenocarcinoma	0.6% (118)
<i>In situ</i>	21.2% (25)
Low-grade	72.9% (86)
High-grade	0.8% (1)
Others	5.1% (6)

of the tumors were low-grade adenocarcinoma (72.9%) and the remaining 21.2% were carcinoma *in situ* or intramucosal carcinoma. Said prevalence percentage is somewhat lower than the results from a German cohort that included almost 3,000,000 screening colonoscopies, in which carcinoma was detected in 0.9% of cases, and most of them (47%) were in the initial stages.¹⁴ However, our figures are comparable with those of a recent meta-analysis of Latin American studies, which reported an overall CRC detection rate of 0.4% (95% CI 0.1%-0.8%) in patients that were screened.¹⁵ These comparisons point out the geographic and methodological variations in the prevalence of CRC, underlining the importance of specific contexts in interpreting results and planning screening strategies.

Participant age (61 years) was consistent with the recommendations of the majority of guidelines and coincided with that reported in an Austrian cohort.¹⁶ Despite the Argentinian national CRC screening recommendation, patients above 75 years of age have undergone screening colonoscopy. In our study, 5% of the participants included were above 75 years of age. Even though findings in that subgroup are beyond the scope of the present work, a deeper examination of screening benefits in that age group is important to carry out.

CRC screening is the only cancer screening program offered to both men and women,¹⁷ and so adherence to the different CRC detection programs by sex has been evaluated, albeit with disparate results. For example, a study conducted in Hong Kong showed a greater number of females participating in a CRC screening program,¹⁸ whereas an Italian study reported similar participation by men and women, as did a retrospective cohort study conducted in the United States.¹⁸⁻²⁰ In our analysis, screening adherence was similar in the two sexes, but future studies are needed to determine if there is an actual clinical difference between males and females, regarding screening adherence. The prevalence of colonoscopy adherence remained stable over the past 10 years, with the exception of a dramatic decline in 2020, most likely due to the obligatory isolation in place during the COVID-19 pandemic that largely reduced the performance of preventive strategies. The most frequent findings reported were the presence of polyps (36.7%), similar to that described in an Argentinian national retrospective study,²¹

followed by diverticula (35.5%). The polyp detection rate is considered an indicator of adequate inspection in screening or diagnostic colonoscopy and correlates well with the ADR.^{22,23} Local recommendations suggest a polyp detection rate of 40% or higher.²⁴ As we stated before, the ADR is another quality indicator, with values of 25% or higher (20-25% in women and 25-30% in men)²⁵ considered appropriate. It is a surrogate marker for a meticulous inspection of the colonic mucosa and is inversely related to the risk of CRC and death by cancer. Our study found an ADR of 25.3%, meeting the reference standards.

Regarding the complications related to the procedure, 220 participants (1.14%) had to be hospitalized for any cause within 30 days from the colonoscopy, which was very similar to the 1.11% reported in a cohort in the United States. Hospitalization was more frequent in patients that required polypectomy. Of the total number of hospitalizations, 11.1% were directly related to the endoscopic procedure. A low quantity of perforations (0.015%), bleeding (0.08%), and infections (0.03%) was identified and was less frequent than in the aforementioned US cohort. This could be associated with the large volume of procedures carried out at our center and the expertise of the endoscopists performing them.²⁶

One of the strengths of the present study is the large sample size, providing robust results and increasing study population representativeness. Nevertheless, the fact that the study participants belonged to a prepaid medical healthcare system could affect the generalization of the results.

Another study limitation was the use of secondary databases. Participant inclusion was based on codifications taken from electronic clinical histories, which could result in the inclusion of patients that were not at standard risk for developing CRC. At any rate, data extraction through an electronic register improves the accuracy and reliability of the collected information.

Concerning hospitalizations, a manual review of the patient histories was conducted by experts to determine whether they were related to the endoscopic procedure. Nevertheless, only events such as perforations, gastrointestinal bleeds, or intra-abdominal infections were considered complications of the procedure. In contrast, hospitalizations due to cardiac causes that may or may not have been related to the preparation for the procedure were not, which could have been underestimated.

The main strength of our study was its contribution to local information on the characteristics of the population undergoing CRC screening outside of an institutional program and its endoscopic findings, thanks to the large number of patients treated at our center.

In conclusion, the present study provides relevant information on the characteristics of the patient population that undergoes CRC screening at our center, as well as on the endoscopic findings and the detection rates of pre-malignant and malignant lesions. These data contribute to a better understanding of the profile of patients that access CRC screening and the characteristics of the detected lesions, providing a solid descriptive base upon which clini-

cal practices, diagnostic method quality, and results can be evaluated, in the context of screening programs in average-risk populations.

Financial disclosure

No financial support was received in relation to this study/article.

Declaration of competing interest

The authors declare that there is no conflict of interest.

References

- Ladabaum U, Dominitz JA, Kahi C, et al. Strategies for colorectal cancer screening. *Gastroenterology*. 2020;158:418–32, <http://dx.doi.org/10.1053/j.gastro.2019.06.043>.
- Baidoun F, Elshawy K, Elkeraie Y, et al. Colorectal cancer epidemiology: recent trends and impact on outcomes. *Curr Drug Targets*. 2021;22:998–1009, <http://dx.doi.org/10.2174/1389450121999201117115717>.
- Argentina, Ministerio de Salud de la Nación. Instituto Nacional del Cáncer. Estadísticas de Incidencia de Cáncer. 2019 [accessed 15 Aug 2023]. Available from: <https://www.argentina.gob.ar/salud/instituto-nacional-del-cancer/estadisticas/incidencia>.
- Argentina, Ministerio de Salud de la Nación. Instituto Nacional del Cáncer. Estadísticas de Mortalidad por Cáncer. 2019 [accessed 17 Aug 2023]. Available from: <https://www.argentina.gob.ar/salud/instituto-nacional-del-cancer/estadisticas/mortalidad>.
- Gupta S. Screening for colorectal cancer. *Hematol Oncol Clin North Am*. 2022;36:393–414, <http://dx.doi.org/10.1016/j.hoc.2022.02.001>.
- Helsing LM, Kalager M. Colorectal cancer screening – approach, evidence, and future directions. *NEJM Evid*. 2022;1:EVIDra2100035, <http://dx.doi.org/10.1056/EVIDra2100035>.
- Jodal HC, Helsing LM, Anderson JC, et al. Colorectal cancer screening with faecal testing, sigmoidoscopy or colonoscopy: a systematic review and network meta-analysis. *BMJ Open*. 2019;9:e032773, <http://dx.doi.org/10.1136/bmjopen-2019-032773>.
- Laudanno O, Pucci B, Brayer S. Detección y vigilancia pospolipectomía de pólipos colónicos. *Acta Gastroenterol Latinoam*. 2022;52:21–35, <http://dx.doi.org/10.52787/agl.v52i1.157>.
- Nishihara R, Wu K, Lochhead P, et al. Long-term colorectal-cancer incidence and mortality after lower endoscopy. *N Engl J Med*. 2013;369:1095–105, <http://dx.doi.org/10.1056/NEJMoa1301969>.
- Cawich SO, Phillips E, Moore S, et al. Colorectal cancer in an Eastern Caribbean nation: are we missing an opportunity for secondary prevention? *Rev Panam Salud Publica*. 2022;46:e18, <http://dx.doi.org/10.26633/20RPS2022.18>.
- Bretthauer M, Løberg M, Wieszczyn P, et al. Effect of colonoscopy screening on risks of colorectal cancer and related death. *N Engl J Med*. 2022;387:1547–56, <http://dx.doi.org/10.1056/NEJMoa2208375>.
- Espinola N, Maceira D, Palacios A. Costo-efectividad de las pruebas de tamizaje del cáncer colorrectal en Argentina. *Acta Gastroenterol Latinoam*. 2016;46:8–17 [accessed 3 Apr 2024]. Available from: <https://actagastro.org/costo-efectividad-de-las-pruebas-de-tamizaje-del-cancer-colorrectal-en-la-argentina/>.
- Gualdrini UA, Iummato LE, Bidart ML [accessed 17 Aug 2023]. Available from: Guía para equipos de atención primaria de la salud: información para la prevención y detección temprana del cáncer colorrectal. 1.ª ed Ciudad Autónoma de Buenos Aires: Instituto Nacional del Cáncer; 2015 <https://sage.org.ar/wp-content/uploads/2019/05/PDF-guia-INC-CCR.pdf>.
- Pox CP, Altenhofen L, Brenner H, et al. Efficacy of a nationwide screening colonoscopy program for colorectal cancer. *Gastroenterology*. 2012;142:1460–7.e2, <http://dx.doi.org/10.1053/j.gastro.2012.03.022>.
- Montalvan-Sánchez EE, Norwood DA, Dougherty M, et al. Colorectal cancer screening programs in Latin America: a systematic review and meta-analysis. *JAMA Netw Open*. 2024;7:e2354256, <http://dx.doi.org/10.1001/jamanetworkopen.2023.54256>.
- Zessner-Spitzenberg J, Jiricka L, Waldmann E, et al. Polyp characteristics at screening colonoscopy and post-colonoscopy colorectal cancer mortality: a retrospective cohort study. *Gastrointest Endosc*. 2023;97:1109–18.e2, <http://dx.doi.org/10.1016/j.gie.2023.01.021>.
- Patnick J. Why do we see gender differences in bowel cancer screening? [accessed 18 Sep 2023]. Available from: <https://ukhsa.blog.gov.uk/2014/12/05/why-do-we-see-gender-differences-in-bowel-cancer-screening/>.
- Chan DNS, Choi KC, Au DWH, et al. Identifying the factors promoting colorectal cancer screening uptake in Hong Kong using Andersen's behavioural model of health services use. *BMC Public Health*. 2022;22:1–16, <http://dx.doi.org/10.1186/s12889-022-13634-7>.
- Zanobini P, Lorini C, Giusti M, et al. Health literacy and gender differences in colorectal cancer screening. *Eur J Public Health*. 2022;32, <http://dx.doi.org/10.1093/eurpub/ckac130.158>, ckac130.158.
- Valery JR, Applewhite A, Manaois A, et al. A retrospective analysis of gender-based difference in adherence to initial colon cancer screening recommendations. *J Prim Care Community Health*. 2020;11, <http://dx.doi.org/10.1177/2150132720931321>, 2150132720931321.
- Ruiz EF, Hasdeu S. Rastreo de cáncer colorrectal Análisis de resultados en la provincia de Neuquén Argentina, 2015-2019. *Rev Argent Salud Publica*. 2021;1–5 [accessed 25 Mar 2024]. Available from: <https://rasp.msar.gov.ar/index.php/rasp/article/view/655>.
- Almadi MA, Allehibi A, Aljebreen MA, et al. Findings during screening colonoscopies in a Middle Eastern cohort. *Saudi J Gastroenterol*. 2019;25:20–6, http://dx.doi.org/10.4103/sjg.SJG_353_18.
- Abdelbary M, Hamdy S, Shehab H, et al. Técnicas colonoscópicas para la detección de pólipos: un estudio egipcio. *Rev Gastroenterol Méx*. 2021;86:36–43, <http://dx.doi.org/10.1016/j.rgmx.2020.02.004>.
- Kirschbaum A, Yonamine KG [accessed 5 Sep 2023]. Available from: <https://bancos.salud.gob.ar/sites/default/files/2020-09/indicadores-calidad-vcc-tamizaje-ccr.pdf>, 2019.

25. Liem B, Gupta N. Adenoma detection rate: the perfect colonoscopy quality measure or is there more? *Transl Gastroenterol Hepatol.* 2018;3:19, <http://dx.doi.org/10.21037/tgh.2018.03.04>.
26. Rutter CM, Johnson E, Miglioretti DL, et al. Adverse events after screening and follow-up colonoscopy. *Cancer Causes Control.* 2011;23:289–96, <http://dx.doi.org/10.1007/s10552-011-9878-5>.