

Evaluating adherence to post-treatment surveillance of colorectal cancer at a reference center in Mexico: A retrospective analysis.

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Abstract

Purpose: After colorectal cancer (CCR) treatment, adequate follow-up is recommended to improve overall survival. We aimed to assess the adherence to the National Comprehensive Cancer Network clinical practice guidelines on post-treatment surveillance for CRC at the National Institute of Medical Sciences and Nutrition Salvador Zubiran in Mexico City, Mexico.

Methods: We included patients with stage I-III CRC treated between January 2014 and December 2016. We evaluated adherence to surveillance during the first three years after completion of CRC treatment or until recurrence, whichever came first. We defined adequate compliance with guidelines as ≥ 2 physician visits annually for three years, ≥ 2 serum carcinoembryonic antigen blood tests annually for two years, and at least one colonoscopy during the three-year surveillance period.

Results: Overall-three-year adherence to surveillance recommendations was 53.8% (n=49). Colonoscopy was the component with the highest adherence with 91.2% (n=83) of the patients, followed by medical visits with 71.4% (n=65) of the patients. During the three-year period of follow-up, 23% (n=21) of patients lost follow-up. Three-year recurrence rate was 6.6% (n=6). In a bivariate analysis, we did not find any significant association between clinical and demographic factors and adherence to surveillance.

Conclusions: At our institution, compliance to the guidelines on post-treatment surveillance is higher than the reported at similar centers in other world regions, though there is a decreasing trend in adherence during the study period. More evidence is needed to understand the potential barriers to surveillance and implement strategies to improve compliance to surveillance and the survival of patients.

Introduction And Aims

In Mexico, according to the Global Cancer Observatory 2020, colorectal cancer (CRC) is the third most frequent type of cancer with 14,900 new cases per year and the leading cause of cancer mortality with 7,025 deaths per year¹. Despite the prognosis improvement in recent years in patients with CRC, recurrence after treatment with curative intent is high. Approximately 30% of patients with stages I to III develop recurrence after initial treatment (surgery with or without chemotherapy), and 60 to 80% of recurrences occur in the first two years².

The American Society of Clinical Oncology (ASCO), the National Comprehensive Cancer Network (NCCN), and the European Society of Medical Oncology (ESMO) agree on post-treatment follow-up recommendations, and they include them in their clinical practice guidelines to detect recurrences early and improve CRC survivorship (see Table 1 in supplement material)^{3,4,5}. Post-treatment surveillance for colorectal cancer consists of four components: 1) a visit to the physician with a complete clinical history and physical examination; 2) measurement of the carcinoembryonic antigen (CEA) blood levels; 3) imaging with computed tomography (CT); 4) and endoscopic surveillance. The differences between the recommendations of these societies lie in the frequency of the interventions.^{3,4,5} There is controversy

regarding the given survival benefit of the different components used to follow CRC survivors in individual randomized clinical trials^{6,7,8}. Nevertheless, some meta-analyses have shown a significant improvement in overall survival (OS) with more intensive follow-up programs^{2,9}.

In different world regions, adherence to guidelines is variable and goes from 12 to 87%¹⁰. This variability can be explained by differences in patient characteristics, treatment received, access to health care services, and/or health care system factors¹⁰. Patient characteristics that can affect adherence to surveillance are advanced age, socioeconomic status, comorbidities, and distance from home to the center of care^{10,11}. In Mexico, there is no evidence of adherence to post-treatment surveillance recommendations in CRC survivors. The National Institute of Medical Sciences and Nutrition Salvador Zubiran (INCMNSZ-Spanish acronym) in Mexico City, a tertiary-level hospital, is a national reference center for treating patients with CRC in Mexico, where patients also receive post-treatment surveillance. This provides a unique scenario to assess adherence to existing guidelines and characterize the follow-up of INCMNSZ CRC survivors.

The objective of this study was to evaluate the overall adherence to CRC post-treatment surveillance recommendations in patients treated at the INCMNSZ. We also aim to assess the adherence to each of the individual components of surveillance and to identify factors associated with higher adherence to surveillance recommendations.

Materials And Methods

This study was approved by the Institutional Review Board (IRB) of the INCMNSZ (HEM-3662-21-22-1). We built a dataset by retrospectively reviewing the de-identified medical records of patients with a histologic diagnosis of CRC, stage I to III, according to the seventh edition of the American Joint Committee on Cancer staging system (AJCC-7), and treated between January 1, 2014, and December 31, 2016, at INCMNSZ. This dataset included the starting date of surveillance, number, and date of medical visits, CEA blood tests, CT scans and colonoscopies performed in years one to three, other studies requested, date of recurrence, date of the last visit, vital status, and sociodemographic variables: age, sex, socioeconomic status, distance from home to the center of care, and education level. We excluded patients diagnosed but not treated in this center, patients who did not complete adjuvant therapy, patients who progressed during adjuvant therapy, patients who died before starting surveillance, and those with missing information relevant to this analysis. We assessed adherence to surveillance during a three-year follow-up period after completion of oncological treatment or until recurrence or death, whichever occurred first. At the INCMNSZ, post-treatment surveillance is performed by medical oncology fellows with the supervision of attending oncologist physicians who follow the recommendations dictated by the NCCN guidelines³ with some modifications based on up-to-date literature. These guidelines are followed in our institution as they are constantly updated.

Definitions of adherence to surveillance

We used a composite definition previously stated by *Cooper et al*¹² to assess overall adherence for this study. We decided to use this definition as it has been used in other studies allowing comparisons with other populations. Cooper et al, define overall adherence as ≥ 2 medical visits per year for three years, ≥ 2 CEA blood tests per year for two years, and ≥ 1 colonoscopy in the 3-year surveillance period. We created a modified composite definition that includes the previous components and ≥ 1 CT scan during the first 6 to 18 months. CT scan is a component of surveillance recommended by NCCN guidelines and is performed at our institution³. We also evaluated each component of the overall adherence definition separately for the individual adherence assessment.

Factors associated with adherence to surveillance recommendations

We analyzed factors potentially associated with adherence to surveillance in our cohort. Previous studies have found that sociodemographic factors such as age, income, race, and distance from home to the center of care, can impact the surveillance received by survivors of different types of cancer.^{11,13,14,}

In our study, the variables analyzed were sex, clinical stage at diagnosis, primary tumor site, age over 65 years, socioeconomic level (assigned by our social work office with a score from 1 to 7 from lowest to highest income), comorbidity burden using the Charlson index (score obtained from 19 items related to medical conditions and commonly used to assess comorbidity burden) with a cutoff point of ≥ 4 which predicts one-year mortality of 52%¹⁵, the distance from INCMNSZ to home (defined as "close to INCMNSZ" if the patient's city of residence belonged to the metropolitan area of the Valley of Mexico as previously defined by our government¹⁶) and educational level according to the levels proposed by the National Institute of Geography and Statistics (INEGI- Spanish acronym)¹⁷; which are: no education, basic education, high intermediate education, and higher education.

Statistical analysis

Data was analyzed using IBM SPSS version 25. We performed a descriptive analysis of the clinical and sociodemographic variables and conducted a bivariate analysis using chi-square tests to identify factors affecting the overall adherence and the adherence to individual components of surveillance. We calculated overall survival and recurrence-free survival using the Kaplan-Meier method.

Results

Demographics

We reviewed 216 clinical records of patients with a histological diagnosis of CRC and excluded 125 patients that were clinical stage IV, diagnosed but not treated in this center, and with relevant missing information (see Fig. 1). We included 91 patients in this analysis, 46.2% (n = 42) were women and 53.8% (n = 49) men, with a mean age of 62.2 (SD 12.5) years. In 68.1% (n = 62) of patients, the tumor was located in the colon and 31.9% (n = 29) in the rectum. According to AJCC-7, 19.8% (n = 18) of cases were

stage I, 38.5% (n = 35) stage II and 41.28% (n = 38) stage III. The median Charlson comorbidity index score was 4 (IQR 3–6) (see Table 1).

Adherence to colorectal cancer post-treatment surveillance recommendations

Overall-three-year adherence to CRC post-treatment surveillance recommendations at the INNCMSZ, according to the definition of Cooper et al., was 53.8% (n = 49). Using our proposed Modified Composite Definition that included the CT scan, overall-3-year adherence was 40.6% (n = 37). When evaluating adherence to the individual components of surveillance in the three-year period, colonoscopy was the component with the highest adherence with 91.2% (n = 83), followed by medical visits with 71.4% (n = 65), CEA measurement with 58.2% (n = 53), and CT scan with 36.2% (n = 33). Additionally, we observed that 12.08% (n = 11) of the patients had a PET/CT or any other imaging study not indicated for surveillance. There is a decreasing trend in adherence to all the components of surveillance year by year in the 3-year follow-up period (see Table 2).

Factors associated with adherence to surveillance recommendations

We performed a bivariate analysis to identify factors associated with higher overall and individual adherence, and we did not find any statistically significant association with any variable (see Table 3).

Recurrence and overall survival

In this cohort, the three-year recurrence rate was 6.5% (n = 6). However, after a median follow-up of 79.5 (IQR 72.6–89.5) months, the recurrence rate was 10.9% (n = 10), with a 5-year recurrence-free survival of 89%. It is important to point out that, during the 3-year period of follow-up, 23% of patients were lost for surveillance. After three years, 31.8% (n = 29) of the cases in our cohort were lost to follow-up, and it was not possible to contact them.

Regarding cases with recurrence, 70% (n = 7) of patients were stage III at diagnosis, 70% (n = 7) were systemic, and 30% (n = 3) were local. In six (60%) cases, recurrence was detected by the follow-up CT scan in asymptomatic patients, three cases (30%) were detected by a CEA elevation also in asymptomatic patients, and one case (10%) was detected by symptoms with a concomitant CEA elevation. During the first five years of follow-up, we detected 80% of the recurrences (n = 8) (see Supplementary Table 2).

Four deaths were reported during the follow-up period, with a five-year survival rate of 95.6%. Because of the low number of deaths registered in our follow-up period, it was not possible to perform an analysis to evaluate the impact of the individual recommended components of surveillance nor the composite adherence definitions on overall survival.

Discussion And Conclusions

Higher adherence rates to surveillance recommendations in CRC have been associated with better cancer mortality¹⁸. In addition, patient surveillance improves the care of those patients who could potentially benefit from curative treatments².

In this cohort, the overall adherence to surveillance recommendations for CRC survivors was slightly superior to 50%, a number that we considered high compared to other populations^{10,11}. However, 46.2% of patients did not comply with adequate surveillance according to Cooper's definition, and 59.3% of patients did not comply with our proposed modified composite definition, which includes the CT scan. When comparing our overall adherence against other populations, compliance to the guidelines on post-treatment surveillance is higher than the reported at similar centers in other world regions Kupfer et al¹¹ reported an overall adherence of 22.8% at three NCI-designated cancer centers, and Cooper et al¹² reported an overall adherence of 17% in Medicare beneficiaries.

The surveillance component with the highest adherence in other populations was the medical visit, with an overall adherence between 70–92%¹⁰. Similarly, the component with the lowest adherence in other populations was colonoscopies, with an adherence between 18–61%¹⁰. Our results show that colonoscopy was the individual component with the highest adherence rate, even though it is an invasive procedure. This might be because it only requires completing one examination in the three-year surveillance period. Additionally, medical visits had consistently high compliance throughout the three-year period. The medical visit represents the minimum component that some guidelines suggest for follow-up, which is relevant in resource-limited contexts, like many regions in Mexico.¹⁹ The individual component with the lowest adherence rate was the CT scan. The lack of adherence to CT scans could be due to oncologists' preferences based on patients' characteristics and changing evidence. During our study period (2014–2016), a randomized clinical trial conducted by *Primrose et al*⁶ in the UK revealed that surveillance with CEA and CT measurements increased the chance of receiving a curative resection. However, when they compared the intensive and the minimal follow-up groups, there was no significant impact on survival (overall survival of 18.2% vs. 15.9%, $p = \text{NS}$). This study could have impacted the request for CT scans in our institution. More recently, results of the COLOFOL Randomized Clinical Trial³ did not show a significant difference in five-year mortality between those patients who received high-intensity surveillance (CEA and CT scan at 6, 12, 18, 24, 36 months) and those who received low-intensity surveillance (CEA and CT at 12 and 36 months) (13 vs. 14.1%, $p = 0.43$)⁸. Even with this evidence, CT is still part of surveillance recommendations in guidelines, and our work shows it might have a relevant role in detecting recurrences without enough evidence about its impact on survival in this cohort.

Previous studies in other populations have found that some factors may impact adherence to surveillance recommendations^{10,11}. In our study, we did not find statistically significant predictors of adherence to follow-up recommendations, which might be explained by our small sample size. Nevertheless, we recognize that circumstances related to the patient, physician, and the health system influence the adequate surveillance of CRC survivors. Patient education and shared decision-making to offer the best possible care are effective strategies to improve adherence. Several CRC screening studies

have found that narrative communication strategies like sharing stories or testimonials positively influence adherence, mainly due to greater emotional engagement^{20,21,22}. This approach could be implemented using videos, images, or leaflets of patients who have had a positive experience following surveillance regularly^{21,22}. Other suggestions include reminders for appointments generated by the electronic medical records^{23,24}; the inclusion of a medical team member who aids patients in arranging upcoming medical visits and organizing them, and avoiding confusion in the appointments ordered by the medical provider²⁵. Telemedicine could also increase access to surveillance, decentralize care, and reduce patient travel costs. During the COVID-19 pandemic, we implemented a telemedicine system in our institution. This system can help patients adhere to medical visits better by avoiding traveling long distances.

Our study has several limitations. This is a retrospective study conducted in a single tertiary care center in Mexico City with a modest sample size. Therefore, it is not possible to generalize our results to other Mexican populations, as each different center has its particular follow-up system for cancer survivors. Due to the sample size, we do not have the statistical power to expose the effect of the variables analyzed on adherence. The small number of patients and the high rate of loss of follow-up could explain the higher five-year overall survival and five-year recurrence-free survival compared to other populations. Finally, factors associated with physician decisions regarding surveillance recommendations were not evaluated but could also impact adherence.

The main strength of this study is that it is the first assessment of adherence to post-treatment surveillance recommendations of CRC in Mexico. We assessed overall adherence and to individual components of surveillance in the first three years of follow-up, the period where the majority of recurrences in CRC occur (60–80%)². This study provides valuable evidence to improve adherence by focusing on the components of surveillance where we found the lowest adherence rates and taking advantage of the components of surveillance with higher rates. As for medical visits, telemedicine can be implemented for patients from outside the metropolitan area.

In conclusion, in our institution, compliance to the guidelines on post-treatment surveillance is higher than the reported at similar centers in other world regions, though there is a decreasing trend in adherence during the study period. Nevertheless, it is difficult to generalize this knowledge to other Mexican populations as each cancer center has its own method of implementing surveillance systems. Multi-institutional studies with a bigger sample size are needed to have more certainty about our findings. More evidence will help us understand the potential barriers to surveillance in our population and implement strategies to improve compliance to surveillance and the survival of patients.

Declarations

Funding declaration

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Author Contributions

Dr. Jorge H. Hernández-Félix designed the study, collected data, interpreted data, and wrote the manuscript. Dr. Mónica I. Meneses-Medina designed the study, collected data, interpreted data, and wrote the manuscript. Dr. Fidel David Huitzil-Meléndez interpreted data, wrote and critically revised the intellectual content. Dr. Alejandro Noguez-Ramos interpreted data and critically revised the intellectual content. Dr. Lucero Itzel Torres-Valdiviezo collected data and interpreted data. Dr. Mauricio Rivera Aguilar and Dr. Ana K. Valenzuela-Vidales collected data. Dr. Vanessa Rosas-Camargo, Dr. Alberto Cedro-Tanda, Dr. César Rodrigo Arce-Sandoval, Dr. Miriam Heidi Cisneros-Cordero, and Dr. Andrea Luviano revised the intellectual content.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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References

1. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin.* 2021;71(3):209–249. doi:10.3322/caac.21660
2. Pita-Fernández S, Alhayek-Aí M, González-Martín C, López-Calviño B, Seoane-Pillado T, Pérttega-Díaz S. Intensive follow-up strategies improve outcomes in nonmetastatic colorectal cancer patients after curative surgery: a systematic review and meta-analysis. *Ann Oncol Off J Eur Soc Med Oncol.* 2015;26(4):644–656. doi:10.1093/annonc/mdu543
3. Benson AB, Venook AP, Al-Hawary MM, et al. Colon Cancer, Version 2.2021, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Cancer Netw JNCCN.* 2021;19(3):329–359. doi:10.6004/jnccn.2021.0012
4. Labianca R, Nordlinger B, Beretta GD, et al. Early colon cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. *Ann Oncol Off J Eur Soc Med Oncol.* 2013;24 Suppl 6:vi64-72. doi:10.1093/annonc/mdt354
5. Meyerhardt JA, Mangu PB, Flynn PJ, et al. Follow-Up Care, Surveillance Protocol, and Secondary Prevention Measures for Survivors of Colorectal Cancer: American Society of Clinical Oncology Clinical Practice Guideline Endorsement. *J Clin Oncol.* 2013;31(35):4465–4470. doi:10.1200/JCO.2013.50.7442

6. Primrose JN, Perera R, Gray A, et al. Effect of 3 to 5 years of scheduled CEA and CT follow-up to detect recurrence of colorectal cancer: the FACS randomized clinical trial. *JAMA*. 2014;311(3):263–270. doi:10.1001/jama.2013.285718
7. Lepage C, Phelip JM, Cany L, et al. 3980 Effect of 5 years of imaging and CEA follow-up to detect recurrence of colorectal cancer (CRC) - PRODIGE 13 a FFCD phase III trial. *Ann Oncol*. 2020;31:S410. doi:10.1016/j.annonc.2020.08.509
8. Wille-Jørgensen P, Syk I, Smedh K, et al. Effect of More vs Less Frequent Follow-up Testing on Overall and Colorectal Cancer–Specific Mortality in Patients With Stage II or III Colorectal Cancer: The COLOFOL Randomized Clinical Trial. *JAMA*. 2018;319(20):2095–2103. doi:10.1001/jama.2018.5623
9. Mokhles S, Macbeth F, Farewell V, et al. Meta-analysis of colorectal cancer follow-up after potentially curative resection. *Br J Surg*. 2016;103(10):1259–1268. doi:10.1002/bjs.10233
10. Carpentier MY, Vernon SW, Bartholomew LK, Murphy CC, Bluethmann SM. Receipt of recommended surveillance among colorectal cancer survivors: a systematic review. *J Cancer Surviv Res Pract*. 2013;7(3):464–483. doi:10.1007/s11764-013-0290-x
11. Kupfer SS, Lubner S, Coronel E, et al. Adherence to postresection colorectal cancer surveillance at National Cancer Institute-designated Comprehensive Cancer Centers. *Cancer Med*. 2018;7(11):5351–5358. doi:10.1002/cam4.1678
12. Cooper GS, Kou TD, Reynolds HL. Receipt of guideline-recommended follow-up in older colorectal cancer survivors: a population-based analysis. *Cancer*. 2008;113(8):2029–2037. doi:10.1002/cncr.23823
13. Salloum RG, Hornbrook MC, Fishman PA, Ritzwoller DP, O’Keeffe Rossetti MC, Elston Lafata J. Adherence to surveillance care guidelines after breast and colorectal cancer treatment with curative intent. *Cancer*. 2012;118(22):5644–5651. doi:10.1002/cncr.27544
14. Elston Lafata J, Cole Johnson C, Ben-Menachem T, Morlock RJ. Sociodemographic differences in the receipt of colorectal cancer surveillance care following treatment with curative intent. *Med Care*. 2001;39(4):361–372. doi:10.1097/00005650-200104000-00007
15. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987;40(5):373–383. doi:10.1016/0021-9681(87)90171-8
16. OECD. *OECD Territorial Reviews: Valle de México, Mexico*. OECD; 2015. doi:10.1787/9789264245174-en
17. Características educativas de la población. Accessed February 13, 2022. https://www.inegi.org.mx/temas/educacion/#Informacion_general
18. Hines RB, Jiban MJH, Lee E, et al. Characteristics Associated With Nonreceipt of Surveillance Testing and the Relationship With Survival in Stage II and III Colon Cancer. *Am J Epidemiol*. 2021;190(2):239–250. doi:10.1093/aje/kwaa195
19. Costas-Chavarri A, Nandakumar G, Temin S, et al. Treatment of Patients With Early-Stage Colorectal Cancer: ASCO Resource-Stratified Guideline. *J Glob Oncol*. 2019;5:1–19. doi:10.1200/JGO.18.00214

20. Narrative interventions for health screening behaviours: A systematic review - Marie-Josée Perrier, Kathleen A Martin Ginis, 2017. Accessed February 28, 2022.
<https://journals.sagepub.com/doi/10.1177/1359105315603463>
21. McQueen A, Caburnay C, Kreuter M, Sefko J. Improving Adherence to Colorectal Cancer Screening: A Randomized Intervention to Compare Screener vs. Survivor Narratives. *J Health Commun.* 2019;24(2):141–155. doi:10.1080/10810730.2019.1587109
22. McGregor LM, von Wagner C, Vart G, et al. The impact of supplementary narrative-based information on colorectal cancer screening beliefs and intention. *BMC Cancer.* 2015;15(1):162. doi:10.1186/s12885-015-1167-3
23. Stone EG, Morton SC, Hulscher ME, et al. Interventions That Increase Use of Adult Immunization and Cancer Screening Services. *Ann Intern Med.* 2002;136(9):641–651. doi:10.7326/0003-4819-136-9-200205070-00006
24. Sequist TD, Gandhi TK, Karson AS, et al. A Randomized Trial of Electronic Clinical Reminders to Improve Quality of Care for Diabetes and Coronary Artery Disease. *J Am Med Inform Assoc.* 2005;12(4):431–437. doi:10.1197/jamia.M1788
25. Cardella J, Coburn NG, Gagliardi A, et al. Compliance, attitudes and barriers to post-operative colorectal cancer follow-up. *J Eval Clin Pract.* 2008;14(3):407–415. doi:10.1111/j.1365-2753.2007.00880.x

Tables

Table 1. Clinical and demographic characteristics of the total population

Characteristic	N=91
Age at diagnosis (mean ± SD)	62.25 ± 12.5
Sex	n (%)
Women	42 (46.2)
Men	49 (53.8)
Tumor location	n (%)
Colon	62 (68.1)
Rectum	29 (31.9)
Clinical Stage¹	n (%)
I	18 (19.8)
II	35 (38.4)
III	38 (41.8)
Socioeconomic Status (stratified)	n (%)
1-2	39 (42.8)
3	31 (34.2)
4-5	10 (10.9)
6-7	11 (12.0)
Charlson Comorbidity Index Score (median, IQR)	4 (3-6)
Distance from home to center of care	n (%)
Living in Metropolitan area	63 (69.2)
Living outside Metropolitan area	28 (30.8)
Education	n (%)
No education	1 (1.1)
Basic Education	32 (35.2)
High-Intermediate education	32 (35.2)
Higher education	26 (28.5)

¹ According to AJCC-7

Abbreviations: SD, standard deviation. IQR, interquartile range 25-75%.

Table 2. Adherence to the recommended individual components of surveillance and to the composite definition per year and per the 3-year period of follow-up

Component of surveillance	Year One n = 91 (%)	Year Two n = 87 (%)	Year Three n = 85 (%)	3-years Global n = 91 (%)
Medical Visit	83 (91.2)	71 (81.6)	62 (72.9)	65 (71.4)
CEA Measurement	78 (85.7)	67 (77.0)	53 (62.3)	53 (58.2)
Colonoscopy	79 (86.8)	3 (3.4)	1 (1.1)	83 (91.2)
CT scan	63 (69.2)	55 (63.2)	49 (57.6)	33 (36.2)
Composite Adherence <i>Cooper et al</i> ¹¹	NA	NA	NA	49 (53.8)
Proposed Modified Composite Adherence Definition*	NA	NA	NA	37 (40.6)

* Proposed modified definition which includes at least one CT scan in the first 12 +- 6 months.

Abbreviations: CT, computed tomography; NA, not applicable; CEA, Carcynoembrionic Antigen.

Table 3. Bivariate Analysis to identify factors associated to adherence of surveillance recommendations

Variable	Composite adherence (<i>p</i> value)	Modified composite adherence (<i>p</i> value)	Medical Visit Adherence (<i>p</i> value)	CEA measurements adherence (<i>p</i> value)	CT scan adherence (<i>p</i> value)
Sex	0.51	0.67	0.61	0.80	1.00
Clinical Stage	0.59	0.44	0.97	0.76	0.94
Socioeconomic Status	0.99	0.89	0.24	0.44	0.17
Age > 65 years	0.52	0.38	0.78	0.60	0.43
Charlson Index \geq 4	0.36	0.36	1.00	0.88	0.65
Primary Tumor Site	0.50	0.17	0.21	0.14	0.47
Distance from home	0.48	0.35	0.60	0.72	0.35
Education	0.64	0.87	0.13	0.07	0.11

Abbreviations: CEA, carcinogenembryonic antigen. CT, computed tomography.

Figures

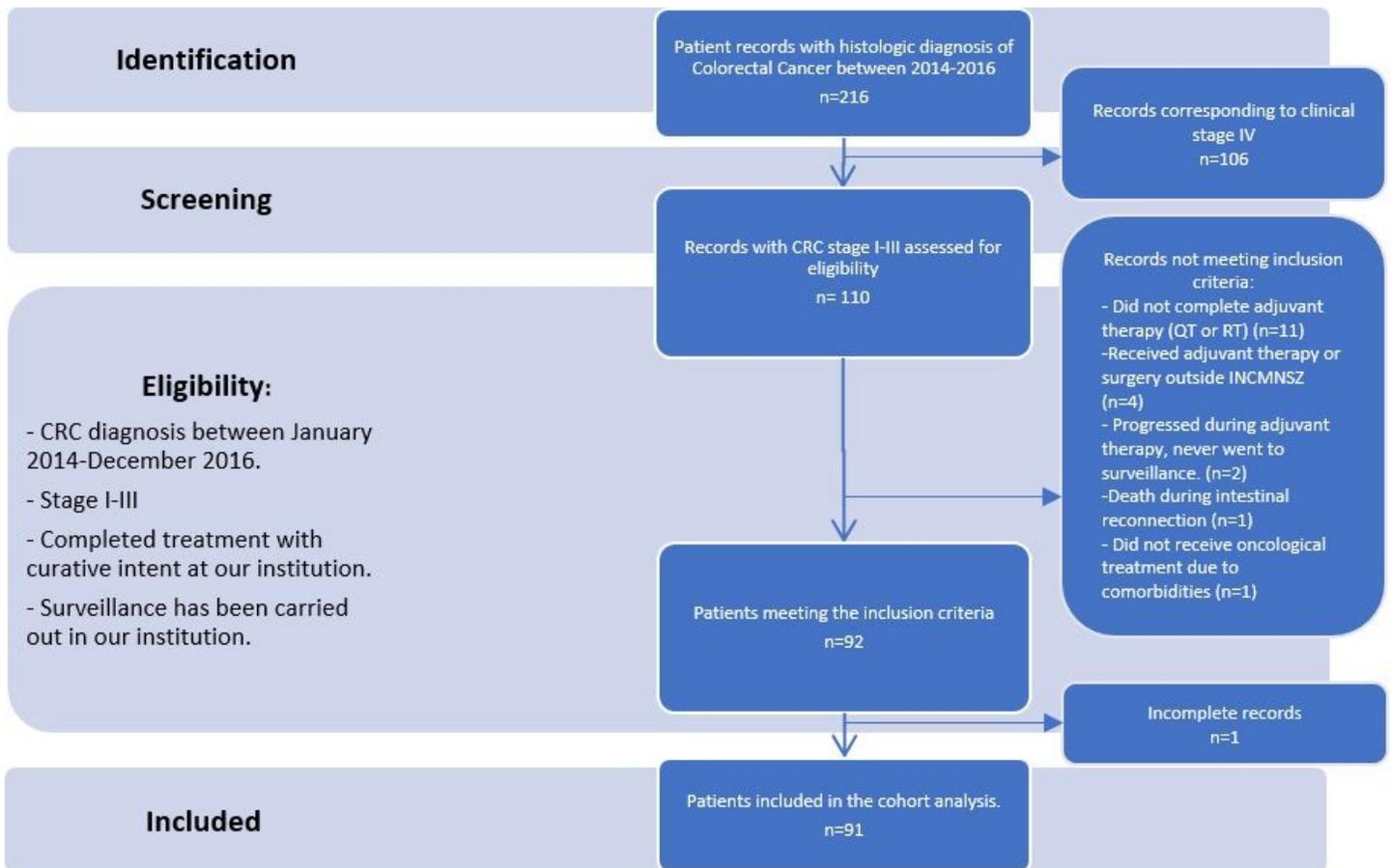


Figure 1

CONSORT Diagram of the Cohort

Abbreviations: CRC, colorectal cancer.

Supplementary Files

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