

# Interventions to Improve Care Related to Colorectal Cancer Among Racial and Ethnic Minorities: A Systematic Review

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**OBJECTIVE:** To systematically review the literature to identify interventions that improve minority health related to colorectal cancer care.

**DATA SOURCES:** MEDLINE, PsycINFO, CINAHL, and Cochrane databases, from 1950 to 2010.

**STUDY ELIGIBILITY CRITERIA, PARTICIPANTS, AND INTERVENTIONS:** Interventions in US populations eligible for colorectal cancer screening, and composed of ≥50 % racial/ethnic minorities (or that included a specific sub-analysis by race/ethnicity). All included studies were linked to an identifiable healthcare source. The three authors independently reviewed the abstracts of all the articles and a final list was determined by consensus. All papers were independently reviewed and quality scores were calculated and assigned using the Downs and Black checklist.

**RESULTS:** Thirty-three studies were included in our final analysis. Patient education involving phone or in-person contact combined with navigation can lead to modest improvements, on the order of 15 percentage points, in colorectal cancer screening rates in minority populations. Provider-directed multi-modal interventions composed of education sessions and reminders, as well as pure educational interventions were found to be effective in raising colorectal cancer screening rates, also on the order of 10 to 15 percentage points. No relevant interventions focusing on post-screening follow up, treatment adherence and survivorship were identified.

**LIMITATIONS:** This review excluded any intervention studies that were not tied to an identifiable healthcare source. The minority populations in most studies reviewed were predominantly Hispanic and African American, limiting generalizability to other ethnic and minority populations.

**CONCLUSIONS AND IMPLICATIONS OF KEY FINDINGS:** Tailored patient education combined with patient navigation services, and physician training in communicating with patients of low health literacy, can modestly improve adherence to CRC screening. The onus is now on researchers to continue to evaluate and refine these

interventions and begin to expand them to the entire colon cancer care continuum.

**KEY WORDS:** colorectal cancer; race; ethnicity; interventions; outcomes.  
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## INTRODUCTION

Colorectal cancer (CRC), although a preventable disease, causes the death of more than 50,000 Americans per year.<sup>1</sup> Given the ability to detect and intervene on pre-cancerous lesions, colorectal cancer screening is associated with decreased CRC mortality.<sup>2</sup> Because of advances in screening and treatment, the incidence of and mortality from colorectal cancer have been declining over the last 25 years.<sup>1</sup> Unfortunately, this decline has not been shared equally by all groups, resulting in a growing racial and ethnic survival gap over that same 25-year period.<sup>1,3,4</sup>

Racial and ethnic minority patients, as well as those with lower incomes and inadequate insurance, are less likely to receive adequate screening.<sup>5–7</sup> Once screened positive, they are less likely to be treated, and once treated, less likely to have guideline recommended follow up.<sup>8–10</sup>

A variety of physician, patient, and health systems barriers have played their role in these disparities.<sup>11</sup> Emerging in the last 10 to 15 years is a body of literature that focuses on investigating interventions to address these barriers. The goals of this paper are: to systematically review the medical literature for interventions conducted within health care systems that have the potential to decrease racial and ethnic disparities in the care of colorectal cancer; to evaluate the strength of their evidence; and to recommend both public health and research strategies going forward based on this evidence.

## METHODS

In consultation with a biomedical librarian, an electronic search was conducted using the MEDLINE database for articles reporting on interventions that have the potential to reduce disparities in health outcomes or health care processes in

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*K. Naylor and J. Ward contributed equally to the manuscript*

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colorectal cancer screening, treatment, survivorship, and end-of-life care published from 1950 to September, 2010. For the topic of colorectal cancer screening, an additional parallel search was conducted using the PsycINFO, CINAHL, and Cochrane Register of Controlled Trials databases. In addition, a manual search was conducted that included topic relevant review articles;<sup>12–15</sup> reference lists obtained from the studies meeting pre-specified inclusion criteria; and unpublished abstracts presented in 2009 and 2010 from selected national meetings of professional societies including Digestive Diseases Week (DDW) and the American Society of Clinical Oncology (ASCO). This review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards.<sup>16</sup> A summary of the review protocol may be found in the introductory article by Chin et. al.

## Search Strategy

The MEDLINE database was searched using pre-specified Medical Subject Headings (MeSH) terms and keywords to identify studies evaluating interventions in colorectal cancer screening, treatment, survivorship, and end-of-life care among racial and ethnic minority patients. Please see Text Box 1 for the colorectal cancer screening MEDLINE database search strategy. A full listing of the MeSH terms and Keywords used in the MEDLINE database search may be found in Appendix 1 (available online). A full listing of the search terms used in the PsycINFO and CINAHL database searches may be found in Appendix 2 (available online).

### Text Box 1. Medline Colorectal Cancer Screening Intervention Search Strategy

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[(exp. Colorectal Neoplasms or colonic polyps) or (Colon combined with Cancer or colorectal* or colon or colonic or bowel* or rectal or rectum or sigmoid or anal or anus combined with cancer* or neoplas* or tumor* or carcinoma* or sarcoma* or adenocarcinoma* or adenom* or lesion* or CRC or Polyp)] AND [(Colonoscopy (Sigmoidoscopy) or Colonography) or (colonoscopy or endoscop* or proctoscop* or colonoscop* or sigmoidoscop* or rectosigmoidoscop* or proctosigmoidoscop* or COL or SIG or FSIG or faecal or fecal or stool near occult or FOBT or FOB or haemoccult or hemoccult or sense or coloscreen or seracult or ez-detect or colocare or flexsure or hemmoquant or hemeselect or immudia or monohaem or insure or !nsure or hemodia or instant-view or immocare or magstream or guaiac near1 smear* or stool test or DNA stool or Colon near1 radiography or barium near1 enema or DCBE or CT near1 colonography)] AND [(Mass screening or Population surveillance or exp. Preventive health services (Diagnostic Services, Early Intervention, Health Education)) or ( screen* or test or tests or testing or tested or population* near 1surveillance or early near 3 detect* or early near 3 prevent*)] AND [(Minority Groups or exp. Population groups)]
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representation (defined as >50 % racial/ethnic minority patients) or, if less than 50 %, the study must include subgroup analysis by race or ethnicity with documentation of sufficient statistical power. Articles must report on an experimental intervention (purely descriptive studies were excluded). Articles were *not* excluded based solely on the type of experimental study design or measured outcome. Study interventions were required to take place within the context of a consistent source of health care (community interventions must directly integrate a system of ongoing medical care). Lastly, studies were required to be conducted in the United States and to be published in English.

## Data Collection Process

The titles and abstracts of articles obtained from the electronic search were screened by two reviewers (KN and JW) independently to eliminate duplicates and articles unrelated to colorectal cancer. A full text review was performed on the remaining articles to assess inclusion and exclusion criteria, discrepancies were resolved by consensus among all three reviewers. A manual reference review was performed on all articles meeting inclusion criteria and on topic relevant reviews<sup>12–15</sup> in order to include articles not identified in the electronic database search. All articles not meeting inclusion criteria were excluded. Articles were then manually extracted for data including reference citation, type of intervention, study design, study population, setting, outcomes assessed, results, and quality assessment measures.

## Inclusion and Exclusion Criteria

Articles and abstracts were assessed for inclusion based on pre-specified criteria. Study populations were required to be composed of patient groups with greater than 50 % minority

## Quality Assessment

To assess study quality, each article was abstracted by two authors and assigned a quality score using a modified Downs and Black scoring algorithm. Inter-

rater reliability was assessed using four randomly selected articles resulting in a weighted kappa statistic of 81.25 %. The Downs and Black checklist is a validated instrument used to assess the methodological quality of studies across a variety of domains including: reporting, external validity, bias, confounding, and power.<sup>17</sup> For this review, we utilized a modified Downs and Black scoring checklist with a maximum achievable score of 29. To aid in the comparison of study quality across articles, a qualitative categorization grouping articles by Downs and Black score ( $\geq 20$ : very good; 15-19: good; 11-14: fair;  $\leq 10$ : poor) was used.<sup>18</sup>

**RESULTS**

**Article Selection (Figure 1)**

The combined electronic database search resulted in 489 articles. A manual title and abstract review was performed, identifying 53 articles for independent full text review. Fourteen articles, representing studies of community interventions, were excluded from the review due to lack of a consistent source of healthcare (Appendix 3); 22 other studies also did not meet the pre-specified inclusion criteria. The combined electronic database search resulted in 17 articles for data collection. A manual reference review of included studies and relevant topic review articles resulted in an additional 16 articles. Overall, the search process resulted in a total of 33 articles that were included in the final systematic review. Downs and Black (DB) scores ranged from 5 to 27, with a median score of 20. The manual review of unpublished abstracts presented at selected national meetings resulted in the identification of three abstracts. There was insufficient data presented in the abstracts to perform quality assessment (Appendix 4-available online).

**Demographics (Figure 2)**

Figure 2 provides a breakdown of the studies by the predominant racial or ethnic population that was analyzed. Thirteen of the 33 studies included a majority of African-Americans, eight of the 33 included a majority of Hispanics, and two of the 33 included a majority of Asians. In seven of the 33 included studies the majority of the subjects were composed of a mix of racial/ethnic minorities and in three of the 33 studies a majority of the subjects was listed as “non-white”.

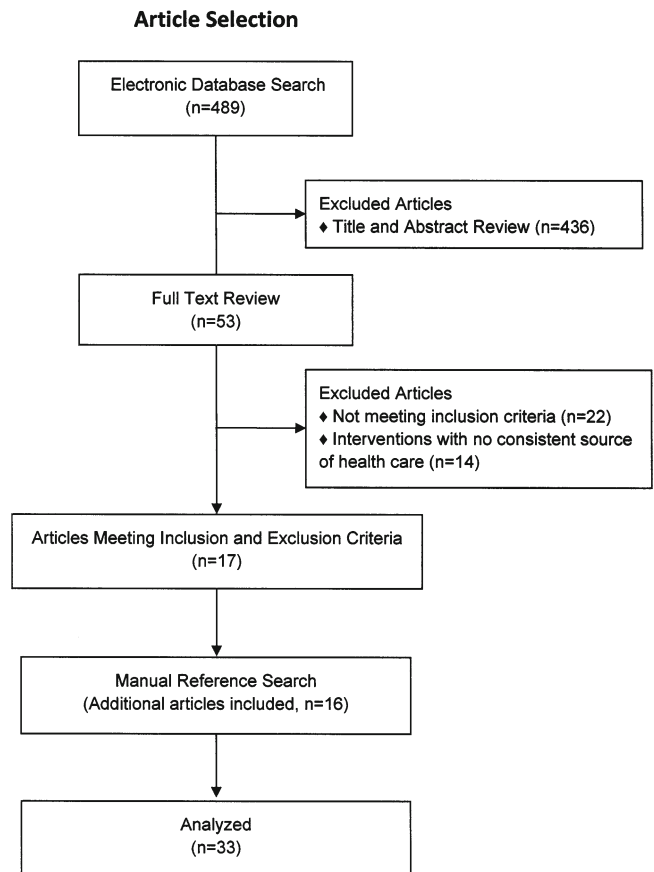


Figure 1. Colorectal cancer screening interventions search results.

**Intervention Type (Table 1, Figure 3)**

Displayed in Table 1, are the 33 studies we included in the final analysis, as well as information related to study design, measured outcome(s), intervention details, setting, sample size and ethnicity, length of follow up, major findings, and

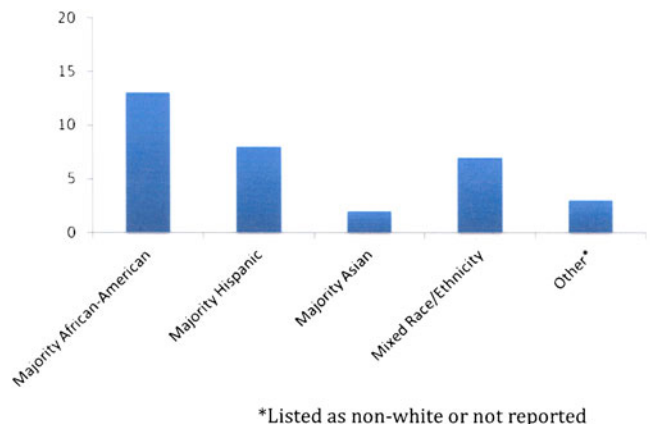


Figure 2. Breakdown of studies by race/ethnicity (# of total studies, n=33).

Table 1. Summary of Studies

Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
Miller et al. 2005 <sup>21</sup>	RT	Screening-Completion of FOBT FOBT Knowledge assessed by 6 item post-intervention questionnaire	PL-E	A multimedia computer program vs. nurse counseling on FOBT use and collection (usual care).	Outpt	N=204 Black: 72 % White: 28 %	30 d	No difference in FOBT completion intervention 62 % (58/93) vs. usual care group 63 % (64/101); $p=0.89$ . Knowledge mastery ( $>5$ correct responses) was similar between groups ( $p=0.09$ ). FOBT completion higher in the intervention group 65.9 % vs. standard education 51.3 % ( $p<0.001$ ). No difference in FOBT completion by race/ethnicity ( $p=0.655$ )	26
Stokamer et al. 2005 <sup>22</sup>	RT	Screening-Completion of FOBT	PL-E	One-on-one education sessions plus FOBT and brochure vs. standard education group with FOBT and brochure.	VA Outpt	N=788 Black: 35 % Hisp/Lat: 15.9 % White: 45.6 %	6mo	Screening documented in 27.0 % of intervention group vs. 6.1 % in control; OR 4.4 (95 % CI 2.6, 7.7). Participants in brochure/counseling group were more likely to report FOBT screening vs. usual care. OR=1.89 (95 % CI 1.34, 2.66), compared to OR=1.18 (95 % CI 0.84, 1.66) in brochure alone group; in the Vietnamese population, the addition of counseling further increased FOBT rates OR 3.02 (95 % CI 1.77, 5.14) compared to brochure only OR 1.33 (95 % CI 0.80, 2.20).	25
Basch et al. 2006 <sup>30</sup>	RT	Screening-Completion of FOBT, Sigmoidoscopy, Colonoscopy, or Barium Enema	PL-E	Tailored telephone education based on behavioral and educational theory vs. mailed brochure.	Comm	N=456 Black: 63.2 % White: 16.2 % Other: 19.7 %	6 mo	Index appointment FOBT completion was 35.6 % intervention group vs. 3.3 % usual care group, OR=16.0 (95 % CI 3.5, 71.4). One year, FOBT completion intervention vs. usual care OR=13.0 (95 % CI 3.6, 45.5).	24
Walsh et al. 2010 <sup>29</sup>	RT	Self-reported up-to-date screening with FOBT Or Any CRC Screening (FOBT, Sigmoidoscopy, and/or Colonoscopy)	PL-E	(1) Bilingual culturally tailored brochure with FOBT or (2) Bilingual culturally tailored brochure with FOBT plus telephone counseling by a community health advisor vs. (3) usual care.	Outpt	N=1789 Hisp/Lat: 52.9 % Asian: 47.1 %	1 yr	No difference in positive vs. negative introduction for viewer rating, knowledge, willingness, or intention ( $p$ value not reported). Composite willingness to consider FOBT, sigmoidoscopy, and colonoscopy increased pretest vs. posttest ( $p<0.001$ for each). Composite mean knowledge scores increased from 3.8 pretest to 6.3 posttest ( $p<0.001$ ).	24
Goldberg et al. 2004 <sup>25</sup>	RT	Screening-Completion of FOBT	PL-O	Mailed FOBT with appointment reminder letter 2 weeks prior to scheduled clinic appointment vs. usual care.	Outpt	N=119 Black: 82 % Hisp/Lat: 3 %	1 yr	Index appointment FOBT completion was 35.6 % intervention group vs. 3.3 % usual care group, OR=16.0 (95 % CI 3.5, 71.4). One year, FOBT completion intervention vs. usual care OR=13.0 (95 % CI 3.6, 45.5).	23
Makoul et al. 2009 <sup>22</sup>	PP	Viewer rating and intention to discuss screening assessed by posttest structured interview. Willingness to consider FOBT, sigmoidoscopy, or colonoscopy; and screening knowledge assessed pretest and posttest by structured interview	PL-E	Culturally tailored CRC screening educational video with positive introductory appeal vs. negative introductory appeal.	Outpt	N=270 Hisp/Lat: 100 %	NA	Index appointment FOBT completion was 35.6 % intervention group vs. 3.3 % usual care group, OR=16.0 (95 % CI 3.5, 71.4). One year, FOBT completion intervention vs. usual care OR=13.0 (95 % CI 3.6, 45.5).	22

Table 1. (continued)

Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
Potter et al. 2009 <sup>26</sup>	RT	Screening-Completion of FOBT; or up-to-date screening with Sigmoidoscopy, Barium Enema, or Colonoscopy	PL-O	FOBT distribution and education at time of annual flu shot clinic visit with reminder phone calls at 3 and 6 weeks vs. flu shot alone with usual care.	Outpt	N=514 Asian: 56.1 % Hispanic/Lat: 25.2 % Black: 6.1 %	6 mo	Intervention group FOBT completion increased from 54.5 % at baseline to 84.3 % at follow-up (p<0.001) vs. 52.9 % to 57.3 % (p=0.071) in the usual care group. 68.0 % of intervention group became up-to-date with screening vs. 20.7 % for usual care group (p<0.001), OR=11.3 (95 % CI 5.8, 22.0)	22
Myers et al. 2007 <sup>31</sup>	RT	Screening-Completion of FOBT; or self-reported/ documented Sigmoidoscopy, or Barium Colonoscopy, or Barium Enema	PL-E	Participants assigned to 1 of 4 interventions: Usual care; Standard Intervention (SI) with letter, information booklet, and FOBT; Tailored Intervention (TI), or Tailored Intervention plus reminder phone call (TIP).	Outpt	N=1546 Black: 58 % White: 38 %	24 mo	CRC screening use intent-to-treat analyses: control group 33 %; SI group 46 % (OR=1.68, 95 % CI 1.25, 2.53); TI group 44 % (OR=1.58, 95 % CI 1.18, 2.12) TIP group 48 % (OR=1.91, 95 % CI 1.42, 2.56). Screening did not differ across intervention groups (p>0.1 for all).	21
Jacobs et al. 2001 <sup>28</sup>	Cohort	Screening-Completion of annual FOBT	PL-O	Professional interpreter services provided at 4 of 14 clinics serving limited-English-speaking patients vs. comparison group of randomly selected adults representing 10 % of the eligible population.	Outpt	N=327 Spanish speaking: 79 % Portuguese speaking: 21 %	NA	FOBT completion intervention vs. comparison group OR=0.66 (95 % CI 0.44, 0.99; p<0.5) year one; OR=0.86 (95 % CI 0.57, 1.28) year two. No change in FOBT completion year one vs. year two in intervention (p=0.28) or comparison group (p=0.35).	20
Tu et al. 2006 <sup>27</sup>	RT	Screening-Completion of FOBT	PL-E	Trilingual health educator plus culturally tailored video and print materials vs. usual care.	Outpt	N=210 Asian: 100 %	6 mo	FOBT completion greater in intervention group 69.5 % vs. usual care 27.6 %; Age adjusted OR=5.91 (95 % CI=3.25, 10.75)	20
Fitzgibbon et al. 2007 <sup>19</sup>	RT	Screening-Completion of FOBT, Flexible Sigmoidoscopy, or Colonoscopy Provider recommendation assessed by chart abstraction	PL-E; PSL	Physician education/feedback sessions plus patient education with tailored video, pamphlet, and FOBT distribution with simplified instructions vs. usual care.	VA Outpt	N=986 Black: 50 % White: 45 %	6-18 mo	Providers who attended intervention sessions recommended CRC screening more (64 % vs. 54 %, p=0.004) and their patients completed CRC screening more (42.3 % vs. 29.5 %, p=0.02) vs. providers that attended no sessions. Patients in the intervention group were more likely to have screening recommended (83.7 % vs. 74.6 %, p=0.003) vs. usual care. No difference in screening completion (39.5 % vs. 41.6 %, p=0.61).	19

Table 1. (continued)

Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
Friedman et al. <sup>2,4</sup> 2001	RT	Screening-Completion of FOBT CRC knowledge assessed by 16-item measure Self efficacy and intent assessed by single item measure	PL-E	Culturally tailored video featuring peer educators and health professionals vs. standard print education.	Outpt	N=160 Black: 87.5 % Hispanic/Lat: 5 %	3 mo	FOBT completion did not differ between the video 43.6 % vs. standard education 36 % (p=0.847). Knowledge, self efficacy, and intent scores were higher in the video vs. standard education (F-statistics, p<0.001 for each).	19
Hoffman et al. <sup>2,5</sup> 1991	Cohort	Stage of CRC at time of diagnosis	PL-E, PSL	Educational pamphlet; distribution of free FOBT kits; nurse FOBT demonstration; and multidisciplinary protocol for diagnostic evaluation and treatment of FOBT positive patients vs. usual care	Outpt	N=8192 Black: 95 %	65 mo	There were 0 % modified Duke's stage D and 35 % (6/16) stage A in the intervention group compared to 33 % (114/346) Duke's stage D and 0 % stage A for usual care. Intervention cohort were diagnosed at an earlier Duke's stage vs. usual care (p=0.003). 24 % in intervention group vs. 11 % in control group were screened; a 13 % difference (95 % CI: 0.07-0.19), p<0.001.	10
Dietrich et al. <sup>34</sup> 2006	RT	Screening adherence according to USPSTF guidelines	PL-N	Frequent (mean 4) phone call follow up from a prevention care manager versus usual care.	Outpt	N=1,413 Race/Ethnicity not provided; however, 64 % of patients listed Spanish as primary language	18mo	27.4 % of intervention vs. 11.9 % of control group were screened within the follow-up interval (p<0.001).	24
Percac-Lima et al. <sup>36</sup> 2008	RT	Screening with colonoscopy, sigmoidoscopy, barium enema, or FOBT during study period	PL-N	Culturally tailored patient navigator program	Outpt Comm	N=1,223 Hispanic/Lat: 40.1 % Black: 6.4 % Asian: 1.5 %	9 mo	23.7 % of PN group vs. 5.0 % of control group received screening endoscopy in the follow-up interval (p=0.019). Flexible sigmoidoscopy was completed by 68.9 % of low-income patients in the intervention group and 51.3 % in the control group (p=0.10). In the moderate-to-high income group, 53.8 % of patients in the intervention arm vs. 62.5 % of patients in the control arm completed flexible sigmoidoscopy (p=0.22).	23
Jandorf et al. <sup>38</sup> 2005	RT	Screening with flexible sigmoidoscopy, or colonoscopy	PL-N	Patient navigator (PN) intervention (including written reminders, telephone calls, and scheduling assistance) Case management intervention with outreach (at least monthly), service planning, service linkage, monitoring, and advocacy vs. usual care.	Outpt	N=78 Hispanic/Lat: 82.1 %	6 mo		22
Ford et al. <sup>35</sup> 2006	RT	Screening with sigmoidoscopy at 3 years after baseline screening	PL-N		Outpt	N=703 Black men: 100 % Prostate, Lung, Ovarian (PLCO) cancer screening trial	3 yr		

Table 1. (continued)

Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
Nash et. al. 2006 <sup>39</sup>	PP	Screening-Receipt of colonoscopy per month in pre versus post intervention period. Provider/System-Broken appointment rate pre and post intervention	PL-N PSL	Direct Endoscopic Referral System and patient navigator system at an urban public hospital. .	Outpt	N=1,060 Hisp/Lat: 69 %-79 % Black: 6 %-17 %	11 mo	The average number of Medicaid patients undergoing screening colonoscopy per month increased from 17.0 pre to 48.4 post-intervention (p<0.001). Broken appointment rates for colonoscopy decreased from 67 % pre to 5 % post-intervention. The authors noted a RR of 2.6 (95 % CI 2.2-3.0) of keeping a colonoscopy appointment in the post-intervention compared to the pre-intervention setting. 353 (66 %) of navigated patients completed colonoscopy (Compared to 43 % in East Harlem Area). Hispanics more likely to complete than AA (OR 1.67;95 %CI 1.1-2.5) No show rate dropped from 40 % to 9.8 %.	20
Chen et. al. 2008 <sup>33</sup>	Cohort	Screening-Completion of colonoscopy over 30 month review period. Provider/System-No Show Rate	PL-N PSL	open-access endoscopy scheduling and patient navigator services (providing education, reminder phone calls, transportation assistance, and face to face meetings)	Outpt	N=532 Hisp/Lat: 55 % Black: 30 % at East Harlem Hospital	NA	53.8 % of the navigated patients completed colonoscopy versus 13 % of non-navigated patients (p=0.085). 63 % of patients in the non-navigated group refused colonoscopy compared to 23 % in the navigated group. There were no statistically significant differences (p>0.05) between the intervention and control clinics in terms of FOBT or sigmoidoscopy use from baseline to 24 month follow up.	16
Christie et. al. 2008 <sup>47</sup>	RT	Screening-Completion of Colonoscopy	PL-N	patient navigator intervention vs. usual care. screening colonoscopy rates during follow-up interval.	Outpt	N=21 patients Hisp/Lat: 71 % White: 22 %	3 mo	Physicians in the intervention group were more likely to recommend screening, as measured by chart audit within 6-18 months of the first visit (76 % vs. 69.4 %, p=0.02), and their patients were more likely to complete screening (41.3 % vs. 32.4 %, p=0.003). Results were most impressive for a pre-planned subset of analysis of patients with low literacy skills (55.7 % vs. 39.0 %, p=0.002).	16
Dietrich et al 1998 <sup>47</sup>	RT	Screening-Completion of FOBT or sigmoidoscopy	PSL	Multi-modal intervention (workshops, reminders, clinic flow sheets) designed to increase recommendations and scheduling of CRC screening tests.	Outpt	N=2648 Black: 30 % Hisp/Lat: 22 % White: 22 % Unknown: 20 %	24 mo	Physicians in the intervention group were more likely to recommend screening, as measured by chart audit within 6-18 months of the first visit (76 % vs. 69.4 %, p=0.02), and their patients were more likely to complete screening (41.3 % vs. 32.4 %, p=0.003). Results were most impressive for a pre-planned subset of analysis of patients with low literacy skills (55.7 % vs. 39.0 %, p=0.002).	25
Ferreira et al. 2005 <sup>48</sup>	RT	Screening-Completion of FOBT, sigmoidoscopy, or Process-Physician recommendation of CRC screening Pre-planned subset analysis among low health literacy patients	PSL	Multi-modal intervention including educational sessions on communicating with patients with low literacy skills as well as feedback sessions at which individual and group level colon cancer screening data were presented.	Outpt	N=1,978 Black: 50 %	18 mo	Physicians in the intervention group were more likely to recommend screening, as measured by chart audit within 6-18 months of the first visit (76 % vs. 69.4 %, p=0.02), and their patients were more likely to complete screening (41.3 % vs. 32.4 %, p=0.003). Results were most impressive for a pre-planned subset of analysis of patients with low literacy skills (55.7 % vs. 39.0 %, p=0.002).	23

Table 1. (continued)

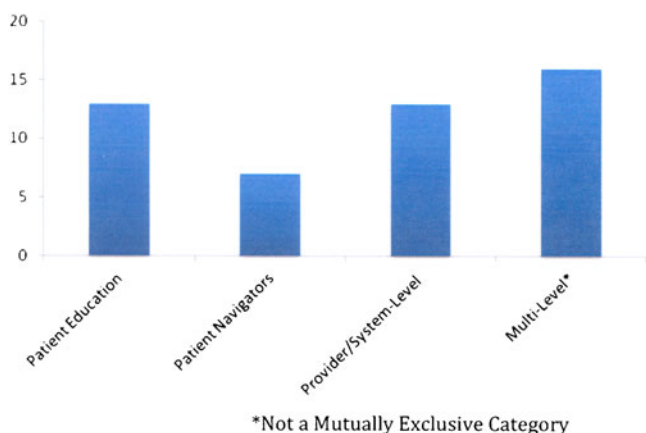
Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
Khankari et al. 2007 <sup>46</sup>	PP	Screening-Completion of FOBT, sigmoidoscopy, or colonoscopy Process-Physician recommendation of CRC screening	PSL PL-O	Manual tracking of patients; physician and patient education; and establishment of a monitoring "feedback loop". The outcomes of interest were rates of physician CRC screening recommendation (measured by provider chart audit at 12 months post-intervention) and patient completion of CRC screening.	Outpt	N=174 Black: 51.7 % Hisp/Lat: 44.8 %	12 mo	Physician recommendation of CRC screening increased from 31.6 pre- to 92.9 % (p<0.001) post-intervention. Completion of CRC screening at 12 months increased from 11.5 % pre- to 27.9 % (p<0.001) post-intervention.	21
Sheinfeld-Gorin et al. 2000 <sup>45</sup>	PP	Knowledge-survey questionnaires of CRC barriers, prevention and screening knowledge	PSL	Primary care physicians received individualized information on current cancer prevention and screening recommendations vs. a control group with no intervention.	Outpt	N=122 Black: 32 % Hisp/Lat: 24 %	18 mo	No significant difference between groups in self-reported cancer prevention and screening practices (survey score 9.82 vs. 9.63, p=0.42). Intervention group physicians identified significantly fewer barriers to practice post-intervention compared to control physicians (survey scores 4.73 vs. 5.35, p<0.05). 16 % increase in CRC screening amongst patients seen by physicians in the intervention group (post-intervention) compared to 4 % increase in CRC screening in the control group (measured by chart audit in the 1 year period before and after intervention), OR 2.25 (95 % CI: 1.67, 3.04).	20
Lane et al. 2008 <sup>44</sup>	RT	Screening-Completion of FOBT, sigmoidoscopy, or colonoscopy Process-Physician recommendation of or referral for CRC screening	PSL	CME approved didactic sessions.	Outpt	N=2,224 Non-White*:78 %	12 mo	There was a 14 % absolute improvement in FOBT completion (OR 2.56, 95 % CI [1.65-4.01], p<0.001) for the intervention clinics versus control clinics, as measured by chart audit at 1, 2, and 3 months post-intervention.	19
Roetzheim et al. 2004 <sup>49</sup>	RT	Screening-completion of FOBT	PSL	Multi-modal intervention consisting of checklists, chart reminders, and feedback of screening rates to clinic staff. Rates of completion of FOBT at baseline and follow-up were assessed in 150 charts randomly selected from each clinic.	Outpt	N=1,196 Black: 29 % White: 48 % Hisp/Lat: 23 %	12 mo	No change in rectal exam or sigmoidoscopy was seen in any group at six weeks post-intervention. The proportion of patients compliant with three-day FOBT increased from 1.3 % pre to 56.8 % post-intervention (p<0.001)	19
Struewing et al. 1991 <sup>43</sup>	PP	Screening-completion of rectal exam, FOBT, or sigmoidoscopy	PSL	A multi-level intervention that included: systematic distribution of FOBT kits, housestaff and nursing education, and physician screening reminder cards.	Outpt	N=365 Black: 51.2 % White: 48.8 %	6 wks		



Table 1. (continued)

Reference	Design	Outcome Type	Intervention Type	Intervention(s)	Setting	Sample Size Race/Ethnicity	Follow up	Results	DB Score
McPhee et al. 1989 <sup>50</sup>	RT	Screening-completion of rectal exam, FOBT, or sigmoidoscopy	PSL	Provider reminders, chart audit with feedback, or no intervention.	Outpt	N=3,905 Black: 25 % Hisp/Lat: 17 % Asian: 14 %	9 mo	Compared to controls, a cancer screening reminder system aimed at internal medicine residents increased FOBT rates by 19 % (P=0.002), increased rectal exam rates by 23 % (p<0.001), and increased sigmoidoscopy rates by 31 % (p=0.002).	17
Armour et al. 2004 <sup>40</sup>	Cohort	Screening-completion of FOBT, sigmoidoscopy, colonoscopy, or double-contrast barium enema	PSL	Financial bonuses as incentives to improve CRC screening rates.	Outpt HP	N=6,749 Black: 28 %	NA	CRC screening use increased from 23 % to 26 % of eligible patients (p<0.01) in the year after financial incentives were added.	16
Parikh et al. 2001 <sup>41</sup>	Cohort	Other-comparison of endoscopy results following 3-day at home FOBT vs. 1-day in-office FOBT	PSL PL-O	One-time, in-office FOBT was compared to 3-day home FOBT as a screening mechanism for CRC.	Outpt	N=350 Black: 52 % Hisp/Lat: 19 %	NA	There was good correlation between in-office FOBT and the 3-day FOBT test results (k=0.6316).	15
Friedman et al. 2007 <sup>20</sup>	PP	Screening-completion of FOBT, rectal exam, sigmoidoscopy, or colonoscopy	PSL	Educational intervention with pre and post-intervention monitoring of cancer screening documentation in the medical record.	Outpt	N=166 Black: 100 %	6 mo	The proportion of orders for endoscopic CRC screening increased from 26.7 % pre to 59.1 % post-intervention (p<0.0001). Performance of FOBT did not significantly change following the intervention.	14
Zubarik et al. 2000 <sup>42</sup>	PP	Screening-completion of flexible sigmoidoscopy	PSL	Provider-directed educational materials stressing the importance of CRC screening and the availability of flexible sigmoidoscopy.	Outpt Inpt Comm	N=121 Black: 97 %	5 mo	use of flexible sigmoidoscopy increased by 42 % (from x pre to y post-intervention, p=xxx).	12
Lloyd et al. 2007 <sup>31</sup>	PP	Screening-completion of colonoscopy	PSL	Training primary care physician to perform screening colonoscopy.	Outpt Comm	N=50 No patient race/ethnicity data reported.	NA	The proportion of primary care patients screened by colonoscopy increased from 20 % pre- to 80 % post-intervention (p-value not provided).	5

List of abbreviations for Table 1  
 CRC, Colorectal Cancer; FOBT, Fecal Occult Blood Test; Outpt, Outpatient; Inpt, Inpatient/Hospital; Comm, Community; HP, Health Plan/Health Insurance; RT, Randomized Trial; PP, Pre/Post; Hisp/Lat, Hispanic/Latino; CI, Confidence Interval; PL-E, Patient-level Education; PL-N, Patient-level Navigation; PL-O, Patient-level Other; PSL, Provider/system level.



**Figure 3. Breakdown of studies by intervention type (# of total studies, n=33).**

DB score. For the purpose of further discussion and data analysis, the articles were grouped into one of three major intervention types: patient-level interventions (including education and other interventions), patient-level navigation, and provider/system-level interventions based on the predominant intervention evaluated in the study. Sixteen of 33 (48.5 %) articles included interventions that targeted CRC disparities across multiple levels (patient, provider, and/or system). Figure 3 provides a graphic description of this information, including a breakdown of the studies by the predominant intervention type, as well as the number of multi-level intervention studies.

### Patient-Level Interventions (Table 1), n=13 (39.4 %)

**Intervention.** Of the thirteen articles evaluating non-navigation related patient-level interventions, ten studies assessed educational interventions; Five evaluated education administered by trained professionals (telephone, one-on-one, and/or group presentation),<sup>19–23</sup> and five assessed self-administered media interventions (computer, brochure, and/or video).<sup>19,21–24</sup> Two studies evaluated FOBT distribution interventions, one through the mailing of FOBT kits<sup>25</sup> and the other through a point of care intervention at the time of influenza vaccination.<sup>26</sup> Three studies<sup>27–29</sup> evaluated multilingual interventions consisting of community health advisors, tailored bilingual educational materials, or interpreter services.

**Quality.** Ten of the 13 patient-level intervention articles were randomized controlled trials,<sup>19,21,24–27,29–32</sup> two were cohort studies,<sup>23,28</sup> and one was a pre-test/post-test design.<sup>22</sup> DB scores ranged from 10–26 with a median score of 22.

**Screening Completion Outcomes.** Eleven of the patient-level intervention articles measured completion of CRC

screening as a primary outcome. Six of the studies assessed CRC screening through fecal occult blood test (FOBT) exclusively.<sup>20,21,25,27,28,32</sup> The five remaining studies assessed completion of any CRC screening test modality.<sup>19,26,29–31</sup>

Three RCT studies<sup>19,21,24</sup> assessing educational media interventions did not achieve significant increases in their CRC screening outcomes. Conversely, all five<sup>27,29–32</sup> articles assessing educational interventions administered through direct contact by trained professionals achieved significant improvements in CRC screening completion, with an absolute improvement ranging from 11 % to 41.9 % (median improvement of 15 %).

Two articles examined interventions related to FOBT distribution. Goldberg et al.<sup>25</sup> found that in a sample of predominately African American patients, mailing FOBT kits along with a standard clinic appointment reminder letter two weeks prior to the scheduled appointment, resulted in 16-fold (95 % CI 3.5, 71.4) greater odds of FOBT return at the index appointment and 13-fold (95 % CI 3.6, 45.5) greater odds of FOBT return by one year compared to usual care. Potter et al. found that in a sample of predominately Asian and Hispanic/Latino patients, providing FOBT kits and education during annual influenza vaccination appointments increased FOBT completion rates by 29.8 % ( $p < 0.001$ ) compared to a 4.4 % ( $p = 0.07$ ) increase in the usual care group.<sup>26</sup>

Two of the three articles evaluating multilingual interventions reported increases in CRC screening outcomes. In the study by Jacobs et al., providing professional interpreter services to selected outpatient clinics in a Spanish and Portuguese speaking population did not significantly increase the rates of FOBT completion over a two year interval,  $p = 0.28$ .<sup>28</sup> Conversely, Tu et al. found that the odds of FOBT completion were 5.9 (95 % CI 3.25, 10.75) fold greater in Chinese Americans who received an educational intervention provided by a trilingual health educator.<sup>27</sup> While, Walsh et al. reported that addition of a bilingual brochure with counseling by community health advisors increased the odds of self-reported FOBT screening by 3.02 (95 % CI 1.77, 5.14) compared to usual care in a predominately Hispanic/Latino and Asian patient sample.

### Patient Navigator Interventions (Table 1) n=7 (21.2 %)

**Intervention.** All of the navigator models included, at the minimum: repeat phone calls to patients to aid with scheduling, bowel preparation instructions, and appointment reminders. Four of the studies included more expansive services such as assistance with transportation, translation services, and referral to other social services if needed,<sup>33–36</sup> and two included face-to-face meetings with participants, including accompanying to endoscopy visits if needed.<sup>33,36</sup> One trial provided assistance to facilitate patient-physician communication<sup>34</sup> through the use of patient activation cards.

**Quality.** Five of the seven studies were randomized controlled trials (RCT),<sup>34–38</sup> one was a pre-test/post-test design<sup>39</sup> and one was an observational cohort study.<sup>33</sup> The DB scores ranged from 16–27 with a median of 22. Five had DB scores in the very good range and the remaining two had scores in the good range.

**Screening Completion Outcomes.** Excluding the observational cohort study, four studies achieved significant screening completion results with the intervention,<sup>34,36,38,39</sup> and two did not.<sup>35,37</sup> In those studies with a comparator arm,<sup>34,36,38</sup> absolute improvement in endoscopy screening completion among the navigated group ranged from 7 % to 40 % with a median improvement of 16 %.

One study provided pre-planned subgroup analyses.<sup>33</sup> In the cohort study by Chen, et al., Hispanic patients were more likely to complete screening compared to African American patients (HR 1.67;95 %CI:1.1–2.5).

**Process Outcomes.** Four studies specifically reported patient willingness to participate in a navigator intervention and in these studies, 44 % to 74 % agreed to navigation services with a median of 72 % agreeing to participate.<sup>33,34,36,38</sup> Patient navigation also reduced the rates of broken appointments anywhere from 12 % to 62 %.<sup>33,37,39</sup> In terms of types of services provided by navigators, in the study by Percac-Lima and colleagues, logistical barriers were identified for 60 % of patients (scheduling, bowel preparation, transportation, etc) and an intervention was performed for 65 % of these barriers.<sup>36</sup>

**Other Outcomes.** In the study by Chen et al., 66 % of patients reported they definitely or probably would not have completed their colonoscopy without the navigator.<sup>33</sup> In the randomized trial by Christie and colleagues, 63 % of non-navigated patients refused colonoscopy compared to 23 % in navigated group and 77 % of navigated patients reported they would refer family or friends for colonoscopy.

### Provider/ System Level Interventions (Table 1), n=13 (39.4 %)

**Intervention.** The interventions tested in these studies were predominantly multi-modal, however, all but two included an educational component.<sup>40,41</sup> Seven of the studies included an educational component that focused on didactic sessions stressing standard national guidelines for CRC screening and the importance of screening.<sup>20,42–47</sup> The sessions varied widely in style, number and length. Two studies focused on training providers in communication skills targeting low-income/low-literacy patients.<sup>46,48</sup> Three studies utilized individual and/or group feedback sessions.<sup>48–50</sup> Four studies used a provider reminder intervention.<sup>43,47,49,50</sup> Two studies evaluated interventions that aimed to improve clinic flow.<sup>47,49</sup>

**Quality.** Of these 13 studies, six utilized a pre-test/post-test design,<sup>20,42,43,45,46,50,51</sup> five were randomized controlled trials,<sup>47,48</sup> and two were cohort studies.<sup>40,41</sup> The DB scores ranged from 5–25 with a median of 19. Ten of the studies had DB scores within the good or very good range,<sup>40,41,43–50</sup> two were fair,<sup>20,42</sup> and one was poor.<sup>51</sup>

**Screening Completion Outcomes Measures.** The primary endpoint for 11 of the 13 included studies was completion of CRC screening. Six of the studies with DB scores in the “very good” or “good” range achieved a significant increase in screening completion results with the intervention<sup>43,44,46,48–50</sup> and two did not.<sup>40,47</sup> In those studies with a comparator arm (n=4), absolute improvement in CRC screening completion among the intervention group ranged from 4.2 % to 16 % (median 8.9 %).<sup>44,48,49</sup> In those studies with a pre-test/post-test design (n=6), the absolute improvement in CRC screening completion in the post-intervention setting ranged from 12.3 % to 55.8 % (median 17.7 %).<sup>20,42,43,46,50,51</sup> In the randomized study by Ferreira and colleagues<sup>48</sup> which measured the effect of didactic educational sessions (aimed at communicating with patients with low literacy) on CRC screening completion, the effect was particularly pronounced in patients with health literacy skills less than the ninth grade level (55.7 % FOBT completion in the intervention arm vs. 30 % of the controls, p<0.01). Similarly in the pre-test/post-test study by Khankari et al.,<sup>46</sup> which focused on communication strategies for physicians of patients with lower health literacy as well as physician feedback and reminder systems, the CRC screening rate increased from 11.5 % to 27.9 % (p<0.001).

**Process Outcomes Measures.** Two studies included process outcomes: physician recommendation of CRC screening.<sup>46,48</sup> Ferreira reports that the recommendation rate was 76 % in the intervention arm compared to 69.4 % in the control arm (p=0.02)<sup>48</sup> and Khankari reports that physician recommendation increased from 31.6 % in the pre-intervention setting to 92.9 % in the post-intervention setting (p<0.001).<sup>46</sup>

**Knowledge Outcomes Measures.** The study by Sheinfeld–Gorin<sup>45</sup> measured the effect of repeated one on one physician education didactic sessions. Following the educational sessions, the physicians in the intervention arm completed a questionnaire and were able to correctly identify more barriers to CRC screening (5.35 vs. 4.73, p<0.05) and an increased knowledge of cancer screening guidelines (2.26 vs. 5.9, p<0.0001) compared to the pre-test setting.

## DISCUSSION

Our systematic review resulted in the identification of 33 articles that reported on interventions to improve CRC screening in minority populations. We were unable to identify

any articles that tested interventions to reduce disparities in post-screening follow-up, CRC treatment, survivorship, or end-of-life care. Therefore, a significant portion of the cancer care continuum remains neglected in the published literature on how to improve colorectal cancer care for racial and ethnic minorities. The absence of studies aimed at increasing initiation and adherence to treatment or follow up after treatment is unfortunate given that prior work has shown that there are clear racial and ethnic differences in stage-specific colorectal cancer survival and in treatment and follow up after treatment.<sup>3,4,8,9</sup> Moreover, there is evidence from both clinical trials and equal access systems such as the Department of Defense that when treatment and follow up are equal, racial and ethnic disparities in survival disappear.<sup>52,53</sup>

The dominant CRC screening promotion interventions tested to date are patient education and navigation. The heterogeneity across the targeted population, intervention, and measured outcome makes the identification of essential intervention characteristics difficult. However, a common theme related to the intensity of patient contact did emerge. Patient education interventions that did not successfully increase screening rates included an 8-minute video and pamphlet, computer-assisted instruction, and a video instrument that due to “poor video quality” and “technical difficulties” was rendered ineffectual in its objective. Comparatively, in a study that used telephone outreach and education, CRC screening increased by more than four-fold.<sup>30</sup> In patient education studies without direct patient contact, the use of culturally tailored printed materials appeared superior to standard materials.<sup>31</sup> For patient navigation services, even the most basic model appeared to be successful in improving completion of colorectal cancer screening rates on the order of 15 %.

In short, the data suggests that patient education involving phone or in-person contact combined with navigation through at least the basic steps of the colon cancer screening process (appointment set up, bowel preparation, appointment reminder) can lead to modest improvements in colorectal cancer screening rates among the minority populations tested. The more difficult question is how to implement these intensive interventions on a system-wide scale. In two studies which reported the time resources involved, approximately 3–5 phone calls were required for each patient and initial phone calls lasted roughly 20 minutes with subsequent calls lasting about 15 minutes; thus, roughly 1-1.5 hours of staff time were spent per patient.<sup>30,34</sup> In another study involving 352 patients, two case managers made 14,978 calls over 3 years of the trial and responded to 780 requests for services.<sup>35</sup> Hiring the personnel to do this in every clinical setting will likely be cost-prohibitive and some type of centralization of services will be needed to achieve economies of scale. In addition, it is imperative that this type of service be reimbursed if it is ever going to take hold. We believe the next generation of studies should focus on implementation logistics of such an approach in a system-wide setting.

The results of studies targeting providers or clinic systems suggest that provider-directed educational interventions are effective in increasing CRC screening rates on the order of 10-15 percentage points. The strongest evidence from these studies involved the training of physicians to communicate with patients of low health literacy.<sup>46,48</sup> System process improvements such as physician reminder systems and check lists were also successful; however, an important caveat is that most of these studies were performed in a single institution or clinic. The use of these systems in a large community health center network was less successful.<sup>47</sup> The next generation of studies need to focus on both the implementation logistics of this type of approach in large health care systems rather than in the controlled setting of small clinics and must include long-term follow to determine the durability and sustainability of this type of approach.

There are several limitations inherent in this type of systematic review of the literature. Certainly publication bias of positive results remains foremost. Because our review and search terms were limited to interventions targeting underserved racial and ethnic minority patients, we found that many articles, (subsequently discovered during reference reviews), included these populations but were not so classified in the MESH headings or key word searches. We have taken all efforts to ensure that all relevant articles are included in this review, but cannot exclude the possibility of missing articles. Since many of the studies focused only on minority patients rather than on comparisons with white patients, we cannot conclude that these interventions would truly reduce the growing disparity gap in colon cancer care. The minority populations in these studies were predominantly Hispanic and African American, thereby limiting generalizing findings across other minorities, such as Asian and Pacific Islander populations. Finally, the specified criteria for this review excluded purely public health campaigns such as targeted advertising to at-risk populations and community-based interventions, such as education provided in churches or at health fairs, if there was no documented link to a specific health care clinic or system (see [Appendix 3](#) for a listing of these studies-available online).

The field of cancer health disparities has matured over the last decade, and we can now point to well designed and implemented studies that are not satisfied with simply pointing out disparities, but rather have focused on ways to eliminate them. The studies included in this systematic review provide a good foundation of evidence that tailored patient education ideally involving personal contact combined with patient navigation services to overcome logistical barriers to screening, and physician training in more effectively communicating with patients of low health literacy, can modestly improve adherence to CRC screening. The onus is now on researchers to continue to evaluate and refine these interventions and begin to expand them to the entire colon cancer care continuum.

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