Published in final edited form as:

Qual Manag Health Care. 2012 ; 21(4): 252–261. doi:10.1097/QMH.0b013e31826d1f28.

Post-Referral Colonoscopy Delays in Diagnosis of Colorectal Cancer: A Mixed-Methods Analysis

Hardeep Singh, MD, MPH¹, Rashid Khan, MD², Traber Davis Giardina, MA, MSW¹, Lindsey Wilson Paul, MA³, Kuang Daci, MD⁴, Milena Gould, MD^{4,5}, and Hashem El-Serag, MD, MPH^{1,5}

¹Houston VA HSR&D Center of Excellence, Michael E. DeBakey Veterans Affairs Medical Center and the Section of Health Services Research, Department of Medicine, Baylor College of Medicine, Houston, Texas USA

²Division of Gastroenterology and Hepatology, Department of Internal Medicine, The University of Texas Medical Branch at Galveston, Galveston, Texas, USA

³School of Social Work, University of Texas at Austin, University of Texas at Austin, Austin, Texas, USA

⁴Department of Medicine, Baylor College of Medicine, Houston, Texas USA

⁵Section of Gastroenterology and Hepatology, Baylor College of Medicine, Houston, Texas USA

Abstract

Background—Delays in colorectal cancer (CRC) diagnosis are one of the most common reasons for malpractice claims and lead to poor outcomes. However, they are not well studied.

Aims—We used a mixed quantitative-qualitative approach to analyze post-referral colonoscopy delays in CRC patients and explored referring physician's perception of processes surrounding these delays.

Methods—Two physician-raters conducted independent electronic health record reviews of new CRC cases in a large integrated safety-net system to determine post-referral colonoscopy delays, which we defined as failures to perform colonoscopy within 60 days of referral for an established indication(s). To explore perceptions of colonoscopy processes, we conducted semi-structured interviews with a sample of primary care physicians (PCPs) and used a content analysis approach.

Results—Of 104 CRC cases that met inclusion criteria, reviewers agreed on the presence of post-referral colonoscopy delays in 35 (33.7%) cases; $\kappa = 0.99$ (95% CI, 0.83–0.99). The median time between first referral and completion of colonoscopy was 123.0 days (range 62.0–938.0; IQR=90.0 days). In about two-thirds of instances (64.8%), the reason for delay was a delayed future appointment with the gastroenterology service. On interviews, PCPs attributed long delays in scheduling to reduced endoscopic capacity and inefficient processes related to colonoscopy referral and scheduling, including considerable ambiguity regarding referral guidelines. Many suggested that navigation models be applied to streamline CRC diagnosis.

Address for Correspondence and Reprints: Hardeep Singh, MD, MPH, VA Medical Center (152), 2002 Holcombe Blvd, Houston, TX 77030, Phone (713) 794-8515, hardeeps@bcm.edu, Fax: 713-748-7359.

The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

Conflict of Interest Notification

The authors declare no potential conflicts of interests.

Conclusion—Post-referral delays in CRC diagnosis are potentially preventable. A comprehensive mixed-methods methodology might be useful for others to identify the steps in the diagnostic process that are in most need for improvement.

Keywords

Diagnostic delays; colorectal cancer; primary care; referrals; practice patterns

Introduction

Early detection of colorectal cancer (CRC) is of high priority for secondary cancer prevention.^{1–3} Delayed CRC diagnosis remains one of the most common reasons for malpractice claims in general practice.^{4,5} While the effects of care delays on prognosis are mixed,^{6–12} longer time to adjuvant chemotherapy was associated with worse survival among patients with resected colorectal cancer in a recent meta-analysis.¹³ Timeliness is an essential element of patient-centered care¹⁴ and delays in cancer diagnosis are now an international priority.¹⁵ There are no widely accepted definitions of “delayed” CRC diagnosis and few studies have explored reasons why these delays occur and to determine if they are preventable. This knowledge can inform the design of strategies to improve early CRC detection and lay the groundwork to develop solutions to reduce delays.^{16,17}

We previously studied diagnostic delays in CRC that occurred due to missed opportunities in initiating endoscopic referrals for alarm features of CRC^{18–21} such as positive fecal occult blood test (FOBT) and iron deficiency anemia. However, the characteristics of post-referral colonoscopy delays are less well described.²⁰ Limitations to improvement strategies include a lack of clear definition on what time period constitutes delay and absence of an established and rigorous methodology to identify them.

In order to explore the preventability of these delays as a first step to initiate interventions, we used a mixed quantitative-qualitative approach to identify and analyze post-referral colonoscopy delays in CRC patients in a safety net system. Because primary care physicians’ (PCP) involvement is central in ensuring timely diagnosis for their patients, we also explored their perceptions of factors surrounding these delays.

Methods

Design and Setting

The present study is part of a larger multi-institution study using mixed methods (i.e., detailed chart review followed by physician interviews to expand upon and explain chart review findings) to better understand missed and delayed cancer diagnosis.²¹ We prospectively identified all newly diagnosed cases of primary CRC from February 2008 to January 2009 using data reported to the tumor registry at a large integrated safety net system consisting of two urban tertiary care county hospitals and their 11 satellite clinics. Patients were mostly uninsured and underinsured; and about 90% belonged to a racial/ethnic minority group. Most PCPs had academic appointments and some supervised resident trainees. PCPs made referrals to subspecialists through the electronic health record (EHR).

All colonoscopy referrals were electronically transmitted to a centralized referral center for processing. The request is reviewed by an RN at the referral center who used established criteria to approve or “deny” the referral. If the reason was unclear, it was sent to a gastroenterologist for review. If the referral center denied the request, the referring physicians were given a specific reason and asked to perform additional diagnostic testing or

provide other information. All events were updated and recorded as referral status changes in the EHR, facilitating easy record review about referral processing.

Our mixed-methods approach consisted of quantitative EHR reviews of CRC-related diagnostic care processes for all cases, followed by semi-structured qualitative interviews with selected clinicians. The study was approved by the local institutional review board.

Exclusion Criteria

We excluded patients if their CRC was the recurrence of a tumor within the previous 5 years. We also excluded patients whose pathologic diagnoses were made outside the study site.

Data Collection

Chart reviews—We developed a data collection instrument for chart abstraction based on our previous work on missed and delayed CRC diagnosis.²² Two internist physicians (RK and KD) were trained to review each case independently to identify post-referral colonoscopy delays, defined as failure to perform colonoscopy within 60 days of referral date in the presence of established indication(s). The review entailed gathering details from EHR including progress notes, test results, and referrals menus. Because definitions of appropriate follow-up vary greatly for cancer screening tests such as FOBT,^{23,24} we used recommendations from a 2007 U.S. Department of Veterans Affairs (VA) Directive that provides policy on CRC screening and follow-up timelines for VA facilities.²⁵ This policy defines timely colonoscopy performance as within 60 days from FOBT-positive report when a colonoscopy was indicated. Established indications included positive FOBT, hematochezia, iron deficiency anemia, change in bowel habit, abnormal barium enema, abnormal CAT scan of abdomen and bowel obstruction, suspected rectal or abdominal mass on physical exam, screen positive for flexible-sigmoidoscopy, and being due for endoscopic surveillance based on previous history of high risk polyps. We included clues that are specific for CRC, and thus excluded other general clues such as weight loss and abdominal pain. After pilot testing to ensure reliable and consistent data collection, both reviewers evaluated data regarding the date when colonoscopy was first initiated by the referring physician for an established indication and the date it was performed. Reviewers also collected baseline characteristics of patients.

Both reviewers performed an initial review of all cases to identify post-referral colonoscopy delays. In cases of disagreement, reviewers discussed the cases in detail to resolve differences and reach consensus. One reviewer performed detailed review to collect additional information to better define colonoscopy performance delays.^{4,22,26} For instance, the reviewer collected information on the reasons for delays in performance such as delay in scheduling by the gastroenterology service, patient no-shows, access issues etc. To reduce hindsight bias,²⁷ we did not ask reviewers to collect data on stage of tumor at diagnosis and patient outcomes, or to make any subjective judgment on impact of delays.

Interviews—A social scientist (TDG) with experience in qualitative research conducted semi-structured, open-ended provider interviews between June 2008 and June 2009. A convenience sample of PCPs from the same healthcare system as the patients with CRC were recruited through an email invitation followed (if required) by a reminder email and phone call after 4 weeks. PCPs were offered a \$50 gift card as an incentive to participate. Of the 31 PCPs contacted, 11 agreed to participate, 6 declined, 4 left the institution before contact, and 10 did not respond to multiple requests.

Eleven interviews discussing 13 delayed CRC cases (1 PCP discussed 3 cases) were included for this study. PCPs were asked to discuss the selected case(s) from the patient's initial presentation to diagnosis and the interview guide specifically solicited system factors affecting the CRC diagnostic process. Interviews were conducted in the PCPs' offices and lasted between 15 and 50 minutes (variability due to provider time constraints). All providers had access to the EHR during the interview. Content was audio-recorded, transcribed, and de-identified by the research team.

Data Analysis

Chart Reviews—We evaluated agreement between the two reviewers on the presence of diagnostic delay before attempting consensus. We calculated descriptive statistics for delay time periods, including the median times between colonoscopy referral initiation and completion (performance time lag). We compared characteristics of patients with and without delays in colonoscopy performance. Data were analyzed using SAS software (SAS Institute Inc., Cary, NC, version 9.1.3).

Interviews—We applied a content analysis approach²⁸ to identify and describe salient themes across respondents. Two investigators identified emergent themes from review of all transcripts and presented them to the research team for discussion. Based on this discussion, the team created and refined a coding scheme that was applied to half the interview transcripts. The coding scheme was then revised based on further discussions and applied to each interview transcript by two independent coders. Coders resolved disagreements about coding decisions through consensus. We used Atlas.ti 5.0²⁹ to manage and code the data, assist in detecting patterns in the data, and compile relevant quotations.

Results

Quantitative

Of 126 cases identified, 104 met our selection criteria. The two chart reviewers independently agreed on the presence of post-referral colonoscopy delays in 32 patients and their absence in 69 patients; $\kappa = 0.99$ (95% CI, 0.83–0.99). In the remaining 3 patients they initially did not agree upon, reviewers were able to reach consensus after discussion, thus leading to 35 (33.7%) patients with delays attributable to post-referral colonoscopy delays. The median time between first referral and completion of the diagnostic colonoscopy for CRC was 123.0 days (range 62.0–938.0; IQR=90.0 days).

Table 1 shows the characteristics of patients with delayed colonoscopy performance compared to those with no delay in colonoscopy performance. No statistically significant differences in baseline characteristics were found.

The most common identifiable reason for the delays in colonoscopy performance was delayed future colonoscopy appointment date given by the gastroenterology service (n=24; 64.8%), followed by denial of consult (n=6; 16.2%), patient behavior such as not calling for appointment or no-show (n=4; 10.8%) and patient access issues related to eligibility of services (n=3; 8.1%). Some cases had more than one identifiable factor responsible for delay.

Qualitative

Analysis of qualitative data revealed the following main themes regarding provider perceptions about post-referral colonoscopy delays: 1) inefficient processes related to colonoscopy referral and scheduling, 2) gastroenterology workload and reduced endoscopic

capacity, 3) patient factors in CRC delays, and 4) areas of improvement. We now discuss these in more detail.

1) Inefficient processes related to colonoscopy referral and scheduling

Ambiguous policies regarding referral processes: There was considerable ambiguity about the criteria for colonoscopy, and providers learned about them mostly through referral denials. Rather than explicit criteria, providers used a simple trial and error method to obtain colonoscopies. One provider had a colonoscopy referral accepted for a positive FOBT, while other providers were told to first obtain a barium enema. These factors caused considerable frustration for the providers:

It is [sic] very frustrating now even to get a colonoscopy...This is a male with rectal bleed and anemia and we have to call and argue. (Provider 3)

The way I figure out what the criteria is, is when they deny a referral. (Provider 9)

But for colon [cancer], I don't think I ever get anybody who's ever higher than a Duke's stage C. It just doesn't happen and it's because of the, it's the [expletive] screening we have. Colon cancer is completely curable. It just needs to be diagnosed early. This meets no standard of care. (Provider 1)

Use of Workarounds By providers to "Bypass" System Challenges: PCP experiences with inefficient colonoscopy referral and scheduling were quite variable, and they used many types of workarounds to bypass the barriers created by the system (Table 2). Some providers attempt to challenge the colonoscopy denial by resubmitting the same referral. A number of providers mentioned they would go so far as to admit a patient:

These are patients that come in they are losing weight, they're guaiac positive I'm looking at them melting before my eyes while I'm waiting. They come in a week later, they've lost another five pounds and I'm like we really don't have time to waste...I admit them straight in and that's not appropriate. That's an inappropriate use of resources. (Provider 1)

Providers also attempted to contact gastroenterologists directly. Not all found this practice useful. Some providers suggested that having a personal acquaintance in gastroenterology might be a means to expedite a colonoscopy referral:

I did finally get my patient who has weight loss and guaiac positive stools...I finally got her a set [appointment] for a colonoscopy. I had to ask my friend, the main person that schedules. (Provider 5)

Lastly, referral-related communication had a significant influence on the way providers practiced:

It would be nice if I could pick up a phone and say I need, this patient [needs] an appointment and the appointment was made. But that's not how it works. So I think that does factor into when I'm deciding what to do. (Provider 4)

2) Gastroenterology Workload and Endoscopic Capacity—PCPs consistently mentioned gastroenterology workload and lengthy wait times for colonoscopies, often associating them with patient harm (Table 3). Generally, providers attributed longer wait times to limited endoscopic capacity in terms of gastroenterology staff and/or equipment. At the same time, many PCPs sympathized with their gastroenterology colleagues about these issues.

3) Patient Factors in CRC Delays—Although not as prominent in quantitative findings, over half the providers discussed patient factors including their failure to show for appointments and lack of patient engagement in their own care.

They don't understand the consequences of things happening. If I tell you "Your hemoglobin is very low you have to do this, this, and this," you would do it faster. They don't do it sometimes. And some people say, "Oh I have to work. I can't miss work, so I can't come here." (Provider 6)

I would say...the patient population that we take care of, most of these patients do not have, do not take an active role in their own self care. And that puts a huge burden on us because they will not come back and say "I need this and I didn't get this." They just leave it to the doctors. (Provider 7)

4) Areas of Improvement—Six providers mentioned the success of the breast cancer program at their institution, which they attributed to a program created to facilitate communication and access to diagnostic testing. Patients with symptoms could be quickly scheduled for a mammogram by contacting a case worker (social worker/patient navigator) assigned to the program, who also managed some of the subsequent patient care and ensured that patients were not lost to follow-up.

The one department that we pride in and this has nothing to do with colon cancer is the breast pathology. We have a person over there; all the docs love her to death. We send a referral, before the end of the day; she will have things for us. She's already made a decision. "You do this, this, and this and I want the patient within a week," is how she schedules the patients. It is awesome. You had a lot, a lot, a lot of patients benefit from her. It's just, the process is there if we could just duplicate it for the other departments. That would work really great. And maybe the person in charge is really conscious of her work but at the same time you have to have a process that you follow that works (Provider 7).

Overall, the qualitative data suggested that the combination of inefficient referral and scheduling processes, patient factors, and inadequate endoscopic capacity laid fertile ground for delays in colonoscopy performance. All the providers interviewed expressed concern about their ability to provide timely care for patients with suspected CRC and many believed that the breast cancer diagnostic program was exemplary and a model that CRC diagnosis should follow.

Discussion

We used a mixed quantitative-qualitative approach to analyze post-referral colonoscopy delays in CRC patients at a safety-net health system and explored referring physician's perceptions of colonoscopy processes surrounding these delays. We found post-referral colonoscopy delays to occur in 33.7% of CRC patients. Delays were related to inefficient referral and scheduling processes, endoscopic capacity-related issues as well as patient factors. In-person interviews with referring providers revealed considerable ambiguity regarding referral processes and long delays in scheduling that they attributed to reduced endoscopic capacity. In addition, interviews validated patient behavior related delays. Overall, providers believed the post-referral period to be vulnerable to preventable delays and many suggested that navigation models similar to those used to improve diagnosis of breast cancer should be applied to CRC diagnosis.

There has been little previous work on the role of referral and scheduling processes in CRC diagnosis delays.³⁰ Our work and that of others suggest that preventable reasons for delays in CRC diagnosis include several system as well as patient factors, many of which

contribute to scheduling delays.^{19,20,22} For instance, in one Australian study, 34 of 100 patients presenting with CRC during a year had a delay in diagnosis, and in many of these cases, delays could be attributed to patients.³¹ In our previous work within the VA healthcare setting, we found that in cases of positive FOBT, significant predictors of absence of the performance of an indicated colonoscopy included patient non-adherence (OR = 33.9; 95 % CI, 17.3 – 66.6) and gastroenterology service not rescheduling colonoscopies after an initial cancellation (OR = 11.0; 95 % CI, 5.1 – 23.7).¹⁹ In a system with limited endoscopic capacity and multiple procedural “bottlenecks,” long wait times can be the norm, and inefficiencies can magnify the impact of diagnostic delays. Thus, improving the efficiency of colonoscopy performance is imperative to reduce delays in colonoscopy scheduling and CRC diagnosis.

While breakdowns are inevitable in paper-based systems, integrated EHRs allow practitioners to document and transmit the reasons for referral and other relevant clinical information and also to track scheduling of appointments electronically. However, effective processes and standards to guide communication and coordination of electronic referrals need to be better defined.²⁰ For instance, streamlining policies and procedures for scheduling high-risk referrals might reduce diagnostic delays in health systems where subspecialty resources are limited. Although the study site used a clinical decision-support tool to prioritize referrals, the criteria were not readily available or properly disseminated to frontline clinicians until the preliminary results of our study became available.

Our mixed-methods approach offers several advantages over retrospective chart reviews used in previous studies.^{20,22} Chart reviews themselves are unlikely to reveal the details on referral practices, perceived system obstacles, or deviations from standards of care related to CRC delays. For instance, we found nearly two-thirds of delays in colonoscopy performance were due to delayed future colonoscopy appointment date given by the gastroenterology service, but the real insights were obtained only through qualitative work. Details of colonoscopy performance processes and related barriers would be nearly impossible to obtain from chart review itself. Based on our findings, we gathered additional data on endoscopic capacity and wait times from the gastroenterology service. The source of the current “bottleneck” in colonoscopy capacity appeared to be a relative shortage of dedicated gastroenterologists to perform colonoscopies, and suboptimal operational efficiency related to performing a certain number of colonoscopies in a given time period (i.e., endoscopy throughput). In addition to uncovering these root causes for delays, other strengths of our study include the improved definitions of diagnostic delays in the data collection instrument used for chart abstraction; these definitions led to far better reviewer agreement than in previous similar studies.^{32,33}

Although patient non-adherence was documented in chart reviews only about 10% of instances with delays, over half of providers interviewed clearly attributed preventable delays to patient related factors. One particular factor was missed appointments, which poses a significant and frequent challenge to timely diagnostic care but has not been adequately addressed in the realm of diagnostic colonoscopy, where patients are symptomatic or have abnormal cancer screens. These are likely prevalent in all systems. Adams et al. showed a 12.2% nonattendance rate over 12 months in a hospital endoscopy unit in Australia.³⁴ In a study of 150 CRC patients at a rural VA system in the upper Midwestern US, 38% of cases had some patient factor that resulted in diagnostic delay.³¹ Our findings reinforce the need for newer models of primary care delivery to reduce both system and patient related delays in CRC diagnosis, and it likely applies to institutions other than safety-net systems.

A local breast cancer navigation program was cited by the providers as an exemplar to follow. Studies on navigation for CRC are now emerging.^{36,37} Furthermore, models for improving primary care, such as the patient centered medical home that emphasizes integrated, continuous, coordinated and team-based care,^{38,39} may be particularly apt to improve timeliness of CRC diagnosis. These programs should also address some of the patient factors that led to delays in colonoscopy performance, including strategies to “activate” patients in their own care.

We propose three interventions to reduce CRC diagnosis related time lag. First, we recommend a comprehensive assessment of endoscopic capacity to estimate its ability to meet demand. This also includes an assessment of colonoscopy efficiency or procedure throughput (number of patients successfully completing colonoscopy in a given time period) to see if expansion is needed. Second, post-colonoscopy triage and follow-up of high-risk patients should be improved with effective use of information technology-facilitated tracking. For instance, EHR repositories could be queried to extract information on patients with positive FOBTs that have not completed a colonoscopy in 60 or 90 days. We are now in the process of implementing such tracking for CRC. Lastly, “best practice” policies and procedures for EHR-based communication and coordination of test results and referrals must be written and implemented in order to affect front line care.

The study has several limitations. We had a relatively small sample size. Additionally, we could not collect reasons why providers did not choose to participate despite multiple invitations. Nevertheless, the sample size was comparable to other studies of delays in CRC.^{18,31} Also, by virtue of the detailed chart review and the provider interview, we were able to increase reliability and validity of collected data. Although we limited our qualitative analysis to a purely descriptive content approach and included only PCPs, the interview data were fairly rich and the interview process was completed only after we determined no new concepts emerged. Because this study was conducted in a safety-net system, some results may not be generalizable to other patients or other practices. However, given that delays in CRC diagnosis have been documented in few private or non-safety net health care systems, we believe our findings and methods might be useful for others.

In summary, post-referral colonoscopy delays in CRC diagnosis are largely preventable. Given the increasing emphasis of improving timeliness of care and the potential association of delays with poor outcomes, we encourage other systems to examine their CRC-related diagnostic process. A comprehensive mixed-method methodology such as the one employed in this study might be useful for others to identify areas in most need for improvement.

Acknowledgments

Funding Source

The study was supported by an NIH K23 career development award (K23CA125585) to Dr. Singh, and in part by the Houston VA HSR&D Center of Excellence (HFP90-020). These sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; and preparation, review, or approval of the manuscript.

Reference List

1. Davila RE, Rajan E, Baron TH, et al. ASGE guideline: colorectal cancer screening and surveillance. *Gastrointest Endosc.* 2006; 63:546–557. [PubMed: 16564851]
2. Levin B, Lieberman DA, McFarland B, et al. Screening and Surveillance for the Early Detection of Colorectal Cancer and Adenomatous Polyps, 2008: A Joint Guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *CA Cancer J Clin.* 2008; 58:130–160. [PubMed: 18322143]

3. Rex DK, Johnson DA, Anderson JC, Schoenfeld PS, Burke CA, Inadomi JM. American College of Gastroenterology guidelines for colorectal cancer screening 2009 [corrected]. *Am J Gastroenterol*. 2009; 104:739–750. [PubMed: 19240699]
4. Gandhi TK, Kachalia A, Thomas EJ, et al. Missed and delayed diagnoses in the ambulatory setting: A study of closed malpractice claims. *Ann Intern Med*. 2006; 145:488–496. [PubMed: 17015866]
5. Phillips R Jr, Bartholomew LA, Dovey SM, Fryer GE Jr, Miyoshi TJ, Green LA. Learning from malpractice claims about negligent, adverse events in primary care in the United States. *Qual Saf Health Care*. 2004; 13:121–126. [PubMed: 15069219]
6. Gomez-Dominguez E, Trapero-Marugan M, del Pozo AJ, Cantero J, Gisbert JP, Mate J. The colorectal carcinoma prognosis factors. Significance of diagnosis delay. *Rev Esp Enferm Dig*. 2006; 98:322–329. [PubMed: 16944992]
7. Khattak I, Eardley NJ, Rooney PS. Colorectal cancer--a prospective evaluation of symptom duration and GP referral patterns in an inner city teaching hospital. *Colorectal Dis*. 2006; 8:518–521. [PubMed: 16784474]
8. Korsgaard M, Pedersen L, Sorensen HT, Laurberg S. Delay of treatment is associated with advanced stage of rectal cancer but not of colon cancer. *Cancer Detect Prev*. 2006; 30:341–346. [PubMed: 16965875]
9. Ramos M, Esteva M, Cabeza E, Campillo C, Llobera J, Aguilo A. Relationship of diagnostic and therapeutic delay with survival in colorectal cancer: a review. *Eur J Cancer*. 2007; 43:2467–2478. [PubMed: 17931854]
10. Ramos M, Esteva M, Cabeza E, Llobera J, Ruiz A. Lack of association between diagnostic and therapeutic delay and stage of colorectal cancer. *Eur J Cancer*. 2008; 44:510–521. [PubMed: 18272362]
11. Rupassara KS, Ponnusamy S, Withanage N, Milewski PJ. A paradox explained? Patients with delayed diagnosis of symptomatic colorectal cancer have good prognosis. *Colorectal Dis*. 2006; 8:423–429. [PubMed: 16684087]
12. Neal RD. Do diagnostic delays in cancer matter? *Br J Cancer*. 2009; 101 (Suppl 2):S9–S12. [PubMed: 19956171]
13. Biagi JJ, Raphael MJ, Mackillop WJ, Kong W, King WD, Booth CM. Association between time to initiation of adjuvant chemotherapy and survival in colorectal cancer: a systematic review and meta-analysis. *JAMA*. 2011; 305:2335–2342. [PubMed: 21642686]
14. Committee on Quality of Health Care in America and Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. 3-1-2001. Washington, D.C: National Academies Press; Jan 25. 2008
15. Richards MA. The size of the prize for earlier diagnosis of cancer in England. *Br J Cancer*. 2009; 101 (Suppl 2):S125–S129. [PubMed: 19956156]
16. Singh H, Sethi S, Raber M, Petersen LA. Errors in cancer diagnosis: current understanding and future directions. *J Clin Oncol*. 2007; 25:5009–5018. [PubMed: 17971601]
17. Singh H, Hirani K, Kadiyala H, et al. Characteristics and predictors of missed opportunities in lung cancer diagnosis: an electronic health record-based study. *J Clin Oncol*. 2010; 28:3307–3315. [PubMed: 20530272]
18. Young CJ, Sweeney JL, Hunter A. Implications of delayed diagnosis in colorectal cancer. *Aust N Z J Surg*. 2000; 70:635–638. [PubMed: 10976891]
19. Singh H, Kadiyala H, Bhagwath G, et al. Using a multifaceted approach to improve the follow-up of positive fecal occult blood test results. *Am J Gastroenterol*. 2009; 104:942–952. [PubMed: 19293786]
20. Singh H, Petersen LA, Daci K, Collins C, Khan M, El-Serag HB. Reducing referral delays in colorectal cancer diagnosis: is it about how you ask? *Qual Saf Health Care*. 2010; 19:e27. [PubMed: 20584706]
21. Singh, H.; Davis Giardina, T.; Petersen, LA.; Smith, M.; Wilson, LA.; Dismukes, K.; Bhagwath, G.; Thomas, EJ. *An Exploratory Human Factors Framework to Analyze Diagnostic Errors in Primary Care*. 2011. Under Review
22. Singh H, Daci K, Petersen L, et al. Missed opportunities to initiate endoscopic evaluation for colorectal cancer diagnosis. *Am J Gastroenterol*. 2009; 104:2543–2554. [PubMed: 19550418]

23. Yabroff K, Washington KS, Leader A, Neilson E, Mandelblatt J. Is the Promise of Cancer-Screening Programs Being Compromised? Quality of Follow-Up Care after Abnormal Screening Results. *Med Care Res Rev.* 2003; 60:294–331. [PubMed: 12971231]
24. Bastani R, Yabroff KR, Myers RE, Glenn B. Interventions to improve follow-up of abnormal findings in cancer screening. *Cancer.* 2004; 101:1188–1200. [PubMed: 15316914]
25. Department of Veterans Affairs and Veterans Health Administration. VHA Directive 2007–004 Colorectal Cancer Screening. Jan 12. 2007
26. Graber ML, Franklin N, Gordon R. Diagnostic error in internal medicine. *Arch Intern Med.* 2005; 165:1493–1499. [PubMed: 16009864]
27. Fischhoff B. Hindsight does not equal foresight: the effect of outcome knowledge on judgment under uncertainty. *Journal of Experimental Psychology: Human Perception and Performance.* 1975; 1:288–299.
28. Green, J.; Thorogood, N. *Qualitative Methods for Health Research.* 2. Thousand Oaks, CA: Sage Publications; 2009.
29. Muhr, T. *User's Manual for ATLAS.ti 5.0 [computer program].* Version 5. Berlin: Scientific Software Development GmbH; 2004.
30. Mitchell E, Macdonald S, Campbell NC, Weller D, Macleod U. Influences on pre-hospital delay in the diagnosis of colorectal cancer: a systematic review. *Br J Cancer.* 2008; 98:60–70. [PubMed: 18059401]
31. Wahls TL, Peleg I. Patient- and system-related barriers for the earlier diagnosis of colorectal cancer. *BMC Fam Pract.* 2009; 10:65. [PubMed: 19754964]
32. Singh H, Thomas E, Khan M, Petersen L. Identifying diagnostic errors in primary care using an electronic screening algorithm. *Arch Intern Med.* 2007; 167:302–308. [PubMed: 17296888]
33. Thomas EJ, Lipsitz SR, Studdert DM, Brennan TA. The reliability of medical record review for estimating adverse event rates. *Ann Intern Med.* 2002; 136:812–816. [PubMed: 12044129]
34. Adams LA, Pawlik J, Forbes GM. Nonattendance at outpatient endoscopy. *Endoscopy.* 2004; 36:402–404. [PubMed: 15100947]
35. Clark J. Appointment cancellation options-a new system to help decrease no-show appointments. *IACH Informer.* 2006:9.
36. Chen LA, Santos S, Jandorf L, et al. A program to enhance completion of screening colonoscopy among urban minorities. *Clin Gastroenterol Hepatol.* 2008; 6:443–450. [PubMed: 18304882]
37. Jandorf L, Gutierrez Y, Lopez J, Christie J, Itzkowitz SH. Use of a patient navigator to increase colorectal cancer screening in an urban neighborhood health clinic. *J Urban Health.* 2005; 82:216–224. [PubMed: 15888638]
38. Davis K, Schoenbaum SC, Audet AM. A 2020 vision of patient-centered primary care. *J Gen Intern Med.* 2005; 20:953–957. [PubMed: 16191145]
39. McMillen M, Stewart E. The patient-centered medical home: 12 tips to help you lead the way. *Fam Pract Manag.* 2009; 16:15–18. [PubMed: 19621867]

Table 1

Characteristics of Patients With and Without Colonoscopy Delays *

	Delay cases	Cases without delays	P value
Age	57.7	54.6	0.19
Gender			
Male	20	37	
Female	15	32	0.73
Race/ethnicity			
African American	15	28	
Asian	2	2	
Hispanic	9	27	
White	9	12	0.44
Comorbidities			
CHF	4	4	0.44
CAD	0	3	0.55
HTN	8	22	0.34
DM	5	6	0.50
COPD	1	1	0.99
HIV	0	3	0.55
Mental disease			
Depression	2	2	0.60
Anxiety	1	1	0.99
Dementia	0	1	0.99
Alcoholism	0	2	0.55

* Defined as failure to complete colonoscopy within 60 days of referral

Abbreviations: CHF, Congested heart failure; CAD, coronary artery disease; COPD, Chronic obstructive pulmonary disease; DM, diabetes mellitus; HIV, human immunodeficiency virus; HTN, hypertension.

Table 2**Quotes Representative of Inefficiencies in Colonoscopy Referral and Scheduling**

Before you can [sic] email back and forth but I guess because so many [people] email back and forth, I guess now your mechanism is removed. So either you call in and try to get whoever to answer you back or you put in a new consult. And I call and put in a new consult and challenge it and hopefully someone will read it and see he [the patient] needs a colonoscopy. So the mechanism to reply or to challenge it is removed so you can't even do it anyway so you have to put in a new consult. It's tough. (Provider 3)

I remember one time a colonoscopy got turned down and then they gave me a reason so then, and I didn't agree with it...So I kind of reworded it in a way that put them more on the spot. I quoted from some national standards...I felt like before someone would turn it down they would be a little more hesitant than just kind of flippantly turn it down. And that one got approved. (Provider 2)

They saw a colon mass on the CT that looked to them like it was cancer and so the next step probably in most situations would probably be to do a colonoscopy. That is impossible. There's no way I could have gotten her a colonoscopy. There's just no way I would have ever got her a colonoscopy. I felt like if I put her in [the hospital] then they could pull the strings; do whatever needed to be done to get it done. And actually they did. She had the colonoscopy right away... (Provider 5)

They [Gastroenterology department] are pretty good if you call them, they try to accommodate the patient. (Provider 6).

Well we can call. We can appeal. And I've done that with some patients and sometimes I get somewhere and sometimes I don't. But the last time I tried to do that I was told that there is a process. (Provider 4)

And sometimes the doctor [participant's acquaintance] will say "well if you just call." Well ok if you're on service then I'll call. But if he's not on service, if it's one of the other guys I may or may not get my scope. (Provider 1)

Abbreviation: CT, computerized tomography.

Table 3**Quotes Representative of the Effect of Workload and Reduced Endoscopic Capacity**Patient harm

So what annoyed me so much about this is because, I mean, his cancer is just invading the stocks so if he would have had the colonoscopy quicker it would have prevented the cancer. (Provider 9)

Cause [sic] what if you wait 6 months for a barium enema and in six months it turns out something's positive and then you wait for one month or two months to get a colonoscopy? It's bad for the patient. (Provider 8)

Sympathy for the GI Department

And I understand from the GI clinicians' standpoint that they are overwhelmed by the number of GI bleeds and just overwhelmed by the number of cases they have to do. I understand that completely. (Provider 1)

We know GI takes a little longer because they have so many patients and the doctors are a little busy. (Provider 6)

I mean, I'm not blaming anybody. We understand the burden that they're in. (Provider 7)

I just think the system is over impacted and that's the problem. (Provider 10)

Lack of Resources

It's just the resources...I mean if you don't have anything there...you just can't. (Provider 4)

It's resources. I mean they put the guidelines, they look very nice but in reality you cannot apply it. In real life everybody should have a colonoscopy when you reach fifty. But we don't have it here. Even if you [have a] rectal bleed, hem [sic] positive stool [you get a] barium enema. Then you would take it from there. We cannot implement because there's no resources. (Provider 3)

You know, to be honest with you, we all kind of know what needs to be done it's just a matter of whether we have the availability. (Provider 10)