

Personal Navigation Increases Colorectal Cancer Screening Uptake

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Abstract

Background: Prior randomized, controlled trials (RCTs) indicate that patient navigation can boost colorectal cancer screening rates in primary care. The sparse literature on pragmatic trials of interventions designed to increase colorectal cancer screening adherence motivated this trial on the impact of a patient navigation intervention that included support for performance of the participants' preferred screening test (colonoscopy or stool blood testing).

Materials and Methods: Primary care patients ($n = 5,240$), 50 to 74 years of age, with no prior diagnosis of bowel cancer and no record of a recent colorectal cancer screening test, were identified at the Group Health Centre in northern Ontario. These patients were randomly assigned to an intervention group ($n = 2,629$) or a usual care control group ($n = 2,611$). Intervention group participants were contacted by a trained nurse navigator by telephone to discuss colorectal cancer screening. Interested patients met with

the navigator, who helped them identify and arrange for performance of the preferred screening test. Control group participants received usual care. Multivariate analyses were conducted using medical records data to assess intervention impact on screening adherence within 12 months after randomization.

Results: Mean patient age was 59 years, and 50% of participants were women. Colorectal cancer screening adherence was higher in the intervention group (35%) than in the control group (20%), a difference that was statistically significant (OR, 2.11; confidence interval, 1.87–2.39).

Conclusion: Preference-based patient navigation increased screening uptake in a pragmatic RCT.

Impact: Patient navigation increased colorectal cancer screening rates in a pragmatic RCT in proportions similar to those observed in explanatory RCTs. *Cancer Epidemiol Biomarkers Prev*; 24(3); 506–11. ©2014 AACR.

Introduction

To increase colorectal cancer screening uptake, and the uptake of other prevention and screening behaviors, multiple strategies have been adapted, trialed, and adopted. In colorectal cancer screening projects, mailed contacts (with or without included screening kits), office contacts, and combined telephone–office contacts have increased uptake (1–4), with liter-

ature reviews indicating increased colorectal cancer screening rates (5–8) via mailings [e.g., printed materials, mailed stool blood tests (SBTs), reminder mailings], whereas recently reported randomized controlled trials (RCTs) show that personal contacts and mailings significantly increase rates in different patients (1–4). Accordingly, personalized patient contacts (i.e., navigation) appear a promising strategy. While navigators have traditionally assisted patients with complex diagnostic–treatment processes (9–13), health educators now navigate patients through preventive health behaviors (14). In colorectal cancer screening in the United States, when a patient navigator has telephoned patients and encouraged screening, increases of 27% to 41% in screening rates have been observed (15–18), with higher rates also reported with the navigation of patients recruited during primary care office visits (1).

In this pragmatic RCT, using minimal inclusion–exclusion criteria, we used primary care outreach to arrange nurse navigation to increase colorectal cancer screening uptake, in direct comparison with opportunistic screening supplemented by a provincially organized screening program (ColonCancerCheck). Existing provincial data that reflected an approximately 30% colorectal cancer mean screening prevalence (19) motivated the key study question: How much of an increase in screening rates could be accomplished with a personal navigation intervention? We hypothesized that navigation would be similarly effective in a pragmatic RCT in Canada, as it had been in explanatory RCTs in the United States, significantly boosting rates above those achieved by the provincially based, organized screening program (usual care).

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Materials and Methods

Study design and participants

The study was an RCT that included primary care providers (PCPs) in 21 practices affiliated with the Group Health Centre (GHC), who share a common electronic medical record (EMR) system in Sault Ste. Marie, Ontario. Following protocol approval by the GHC institutional review board, the research team identified potential study participants (through EMR searches) who were 50 to 74 years, had no prior or current diagnosis of bowel cancer, and were unscreened (no prior colorectal cancer screening), or underscreened [no fecal occult blood test (FOBT) within the preceding 2 years and no colonoscopy or barium enema or flexible sigmoidoscopy within the preceding 5 years].

Potentially eligible patients were randomized using a random number generator applied to each participating primary care practice (following exclusions), either to an intervention group or to a usual care control group, within each participating PCP practice. Eligible intervention subjects were mailed an introductory screening letter signed by their PCP, inviting them to book an appointment with a staff nurse navigator to discuss colorectal cancer screening. Invitation letters were based on focus group findings (19) indicating patient interests in brief correspondence, fact sheets, and brochures (developed by the ColonCancerCheck Program) in identifiable (GHC logo) envelopes. Eligible intervention subjects were also telephoned by a research assistant, up to three times to make contact, verify eligibility, and obtain study (verbal) consent. Patients who consented were immediately scheduled by the research assistant for in-person or telephone appointments to talk about colorectal cancer screening with a staff nurse navigator. Patients who attended the in-person navigator session provided written consent at the appointment, whereas patients who opted for telephone navigation were consented via return mail. All participating patients were permanent residents of the province and eligible for the Ontario Health Insurance Plan (OHIP), which, through the Ministry of Health and Long-Term Care, pays for necessary medical services (20) that include colorectal cancer screening (for average-risk adults 50 years and older) using the FOBT every 2 years. Those assessed at increased risk (i.e., with a first-degree family member with colorectal cancer) can access colonoscopy beginning at age 50, or, alternatively, 10 years earlier than the affected relative's age of diagnosis, whichever comes first (21). Key demographics for the Algoma district, where all participants lived, included median age of 45 years, median income of \$60,494, 34% possessing a college/university certificate/diploma, and 66% with a trades or high school graduation certificate or less (22).

Tailored navigation intervention

Each tailored navigation intervention (TNI) session involved (i) provision of general information regarding colorectal cancer screening, (ii) review of SBT and colonoscopy screening that included neoplasia detection rates and associated procedure risks, and (iii) elicitation of the participant's preferred screening test. Test preference elicitation followed methods developed by Myers and colleagues (2) based on the precaution adoption process model, operationalized in items assessing perceived susceptibility, screening salience-coherence, screening response efficacy, screening worries-concerns and screening social support-influence. In our study, the patient subject and navigator exercised options to deploy items verbally (at navigation sessions) or to

review previously completed surveys. The staging per modality (SBT, colonoscopy) was fed back to the patient who reflected on how much results reflected self-observed preferences. Exchanges thus combined the benefits of item-by-item survey completion and person-to-person discussion. An SBT kit was given directly to patients who opted for this test (during an in-person navigation appointment, or when a phone navigation appointment was undertaken, via mail). If colonoscopy was preferred, the navigator placed a referral for colonoscopy screening in the EMR under the patient's PCP name and provider number. Coordination between affiliated endoscopists and the patient's PCP permitted scheduling of consults during the patient's navigation appointment. As the patient's PCP was responsible for tracking colonoscopy procedure performance via the EMR, the navigator did not follow up on patient compliance with the appointment, nor did the navigator facilitate rescheduling, if it was necessary. To summarize, the nurse navigator in this study (i) elicited participant screening test preference (colonoscopy or SBT), (ii) provided an SBT when preferred, and (iii) directly scheduled a colonoscopist consultation, when colonoscopy was the preference.

Data collection

A GHC Clinical Research Informatics Specialist (J. McColeman) managed data collection, with participant information collected from the EMR and compiled in the GHC study data system, a long-standing, comprehensive electronic system that registers and stores all medical transactions from GHC-affiliated PCPs and specialist physicians. The data system contained information on both intervention and control participants and allowed EMR access to patient data.

Study endpoints and analyses

The study's primary endpoint was colorectal cancer screening uptake within 12 months (48 weeks) after the initial mailing of the invitation letter. Screening uptake was defined as performance of either SBT or colonoscopy during this interval. Both intention-to-treat and per protocol analyses were undertaken (the latter solely with patients who scheduled nurse-navigator contacts by phone or in-person). Subjects were analyzed in the group to which they were randomized, regardless of contacts with health care providers. Control subjects were analyzed for colorectal cancer screening activity during the equivalent 48 weeks, based on the initial mailing date of the invitation letters sent to experimental subjects.

Data analyses

Prospective analyses of screening uptake were based on a logistic random-effects model, with a categorical explanatory variable for the intervention group and the subject's gender, and a nonparametric term for subject age. A random-effects term at the practice level was included to allow for the possibility that baseline screening rates were higher in some primary care practices. The model was fit using Bayesian inference with uninformative prior distributions. Secondary analyses included an as-treated (per protocol) analysis of comparisons of screening and modality (SBT vs. colonoscopy), and additional analyses focusing on screening rates per age- and sex-related subgroups. Original power estimate for a predicted difference of 15% or greater between experimental and control groups was 99.8% with experimental and control groups consisting of 400 subjects or more; however, the pragmatic emphasis in this trial resulted in sample

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sizes that were >6 times those samples, resulting in power estimates approaching 99%.

Results

Participant enrollment and randomization

There were 18,434 GHC patients identified as potentially study eligible. Of this number, 13,194 were excluded because they were up-to-date with screening ($n = 10,058$) or were found to be associated with a PCP who had not volunteered to participate in the study ($n = 3,136$; see Fig. 1).

Altogether, 5,240 patients were randomized such that 2,629 were sent invitation letters and were called by the study research assistant, while 2,611 were randomly assigned to a control group and received no letter or call. During the course of the study, the control group was not aware of participation, and participating primary care physicians were not informed as to which patients were randomized to intervention versus control groups. EMR data show that among eligible subjects, the mean age was 59.4 years, and 50% of subjects were women. No additional demographic data, other than gender and age, were available in the EMR; there were no statistically significant differences in age and gender between the two study groups (see Table 1).

Of the 2,629 intervention-group subjects, 1,109 could not be reached (42.2%), while 1,520 were screened by the research assistant (57.8%). Of the 1,520 patients reached, 821 were consented (821/1,520 or 54%) and scheduled an appointment, but 699 (699/1,520 or 46%) did not participate because, on further scrutiny, they were deemed ineligible ($n = 317$ of 1,520 or 21%), or indicated inability to undergo screening due to poor health ($n = 56$ of 1,520 or 4%), or they declined screening participation altogether ($n = 326$ of 1,520 or 22%). Of those subjects who scheduled a nurse navigator appointment (821), 738 attended the

appointment (89.9%), while 83 did not present for the appointment in person or at the time of the appointed call (10.1%). Among those who spoke with the nurse navigator, 735 (99.6%) subjects had an in-person encounter and 3 (0.4%) subjects had a telephone encounter.

Screening uptake

In the intervention group, 923 individuals were screened within 12 months (35% of all intervention subjects) compared with 533 control subjects (20% of all control subjects; see Table 2). The odds ratio for uptake of screening in the intervention group, when compared with the control group, was 2.11 (95% CI, 1.87–2.39; $P < 0.001$). Among subjects in the intervention group who underwent screening, 17.4% underwent colonoscopy and 17.7% completed an SBT; however, among screenees in the control group, 8.2% underwent colonoscopy and 12.2% completed an SBT.

When patients met with the personal navigator (per protocol), 67% completed screening (see Table 3). The odds ratio for screening uptake in the per protocol arm, when compared with the control arm, was 7.80 (95% CI, 6.56–9.28; $P < 0.0001$). In contrast, only 21% of the patients randomized to the intervention who did not meet with the navigator completed screening.

As seen in Table 4, a greater percentage of male intervention subjects were newly screened than females (52.1% of new screeners were males vs. 47.9% females), and there were 6.4% more newly screened males than females screened with colonoscopy (28.0% males vs. 21.6% females), while 2.2% more newly screened females obtained FOBT than males (26.3% females vs. 24.1% males). In terms of age, a greater proportion of subjects between 50 and 60 years were newly screened (59.9%) than between 61 and 74 years (40.1%), and among the newly screened 50- to 60-year-old group, more received colonoscopy screening

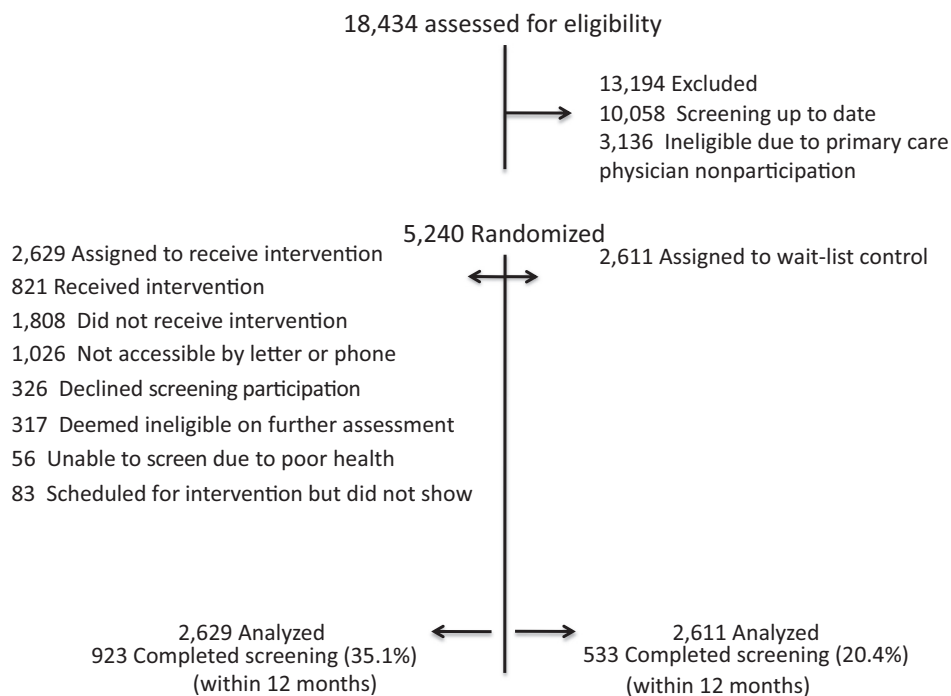


Figure 1.
Intervention trial schema.

Table 1. Demographic data on sample

	<i>N</i>	Age, y	Males	Females
Randomized to intervention	2,629	58.7	1,311	1,318
Randomized to control	2,611	58.6	1,328	1,283

(31.8%) than FOBT (28.1%). This pattern was reversed in subjects 61 to 74 years, where more newly screened subjects had FOBT than colonoscopy (22.4% vs. 17.7%).

Discussion

In this pragmatic RCT, a research assistant contacted and consented primary care attending patients and scheduled consenting participants for in-person or telephone appointments with a staff nurse navigator. The navigation method was associated with substantive, statistically significant increases in colorectal cancer screening uptake over usual care, and reflected in intention-to-treat and per protocol analyses. The intervention impact was comparable with reports from other RCTs (in the United States) designed as explanatory trials (1–4), while it tested a navigation intervention with unique features within a pragmatic trial. Participants in the other RCTs (1–4) satisfied multiple eligibility criteria, whereas our sole criteria were purposefully minimized: age, colorectal cancer screening history, and bowel cancer diagnosis. Furthermore, the control participants and intervention participants who did not accept the navigation intervention were still assessed without direct consent. Thus, intervention impact findings are based on the inclusion of participants who represent the general population of primary care patients eligible for colorectal cancer screening, and reflected methods applicable in the routine practice implemented at the research site.

In contrast, in trials that were more explanatory in orientation (considering the pragmatic-to-explanatory continuum; ref. 23), Green and colleagues (3) excluded patients in active treatment for any cancer illness, inflammatory bowel disease, or serious chronic or life-threatening disease, while Myers and colleagues (2) excluded for inflammatory bowel disease and required at least 1 family practice visit in the prior 2 years. Inadomi and colleagues (1) excluded for inflammatory bowel disease and Gupta and colleagues (4) excluded for inflammatory bowel disease and absence of a health care visit within the 8-month period preceding randomization.

Navigation interventions have variously used telephone contact with the patient population or referral of patients by primary care physicians to meet with navigators at the time of routine office visits (1–4). While the current study is aligned with RCTs where a navigator attempted to contact primary care patients (outside routine visits), our navigation approach accommodated face-to-face or telephone contacts. During the intervention encounter, the navigator helped participants clarify and implement their colorectal cancer screening test preference. For patients preferring colonoscopy screening, the navigator acted on behalf of

Table 2. Screening rates within 12 months: intention-to-treat analysis

	Total	Percentage	Colonoscopy or SBT	OR (95% CI)
Randomized to intervention	2,629	35.1	923	2.11 (1.87–2.39)
Randomized to control	2,611	20.4	533	

Table 3. Screening rates within 12 months: per protocol analysis

	Total	Percentage	Colonoscopy or SBT	OR (95% CI)
Randomized to and received intervention (per protocol)	821	67	547	7.80 (6.56–9.28)
Randomized to control	2,611	20.4	533	

the primary care physician and endoscopist, uniting these relationships in scheduling screening appointments.

In noting specific comparison studies (1–4) in current colorectal cancer screening literature, our study largely follows strategic deployments of contacts with patients outside of physician visits (2–4). Myers and colleagues (2), Green and colleagues (3), and Gupta and colleagues (4) all used such contacts, although they were coordinated differently with mailings and/or automated phone messages. Myers and colleagues (2) provided personal phone-based navigation to establish screening preference (SBT/colonoscopy) and then mailed SBT kits or endoscopy instructions (depending on preference), while Green and colleagues (3) combined mailed endoscopy instructions and SBT kit provision, with and without direct phone navigation. Gupta and colleagues (4) combined mailed invitations with automated phone messages in two comparison arms, one promoting a mailed fecal immunochemical test (FIT-SBT arm) and the other colonoscopy. Live, personally navigated telephone reminders were additionally used by Gupta and colleagues (4) for patients who failed to complete screening within 3 weeks of invitation, at which time a phone-navigated triage assessed whether patients (in the colonoscopy arm) could follow through (with navigation assistance) or required a pre-colonoscopy clinic visit (with provision of bowel preparation materials) followed by reminders and instruction reviews before scheduled appointments.

While direct comparison of the screening rates achieved with varying approaches is unwise (given significant differences in the assessed samples), the highest screening rates attained (above usual care control rates) are notable (e.g., 35.4% for Green and colleagues, 25% for Myers and colleagues, and 28.6% for SBT screening for Gupta and colleagues) and comparable with those obtained in our per protocol sample (47% above usual care control rates). It is noteworthy that larger screening rate increases were found with SBT compared with colonoscopy screening in each of these comparison trials: Myers and colleagues (2) found greater intervention effects in participants who preferred SBT screening and weaker effects in those preferring colonoscopy ($P = 0.099$) for the interaction between group and screening test preference and in the respective screening rates after 6 months, (42% for SBT and 22% for colonoscopy). Green and colleagues (3) attributed generic increases in screening primarily to increased uptake of SBT (71%) versus colonoscopy (26%) after 24 months. Gupta and colleagues (4), in trial arms that were equivalent and defined by the promoted test (after 12 months), found an increase of 41% for SBT (fecal immunochemical test) and 25% for colonoscopy. In contrast with the above, the proportions of intervention subjects screened with SBT or colonoscopy in our study were nearly equal (Table 4). Perhaps the apparent success in promoting colonoscopy was related to scheduling the colonoscopy appointment while the patient was being navigated, enabling the patient to leave the navigation session with a decisive screening step accomplished.

While our study largely resembled other extra-office navigation trials (2–4), there were similarities to the in-office navigations

Table 4. Screening rates within 12 months: per screening modality, gender, and age

	All	All males	All females	50–60 years	61 and above	Males 50–60 years	Females 50–60 years	Males 61 and above	Females 61 and above
Either method	923	481 (52.1%)	442 (47.9%)	553 (59.9%)	370 (40.1%)	271 (29.3%)	282 (30.6%)	210 (22.8%)	160 (17.3%)
Both FOBT and colonoscopy	52	28	24	29	23	15	14	13	10
FOBT	466 (50.5%)	223 (24.1%)	243 (26.3%)	259 (28.1%)	207 (22.4%)	110 (11.9%)	149 (16.1%)	113 (12.2%)	94 (10.2%)
Colonoscopy	457 (49.5%)	258 (28.0%)	199 (21.6%)	294 (31.8%)	163 (17.7%)	161 (17.4%)	133 (14.4%)	97 (10.5%)	66 (7.3%)

(undertaken by primary care physicians) trialed by Inadomi and colleagues (1). Whereas subjects solely interacted with a physician in the Inadomi study, our subjects preferred clinic-based interactions with the navigator (only 0.5% of navigated subjects scheduled telephone-based appointments) who acted on behalf of the primary care physician in scheduling colonoscopy appointments and immediately distributing SBT kits. As in the other studies reviewed, Inadomi and colleagues found higher screening rates in their SBT arm (67%) against the colonoscopy arm (38%), whereas our rates were about equal in both modalities (1).

Ontario has a province-wide organized colorectal cancer screening program, ColonCancerCheck, which preexposed subjects to screening promotions (invitation mailing and television promotion). Thus, our subjects were part of a population sector who remained unscreened per provincial guidelines. In this regard, our study resembles the Green and colleagues study (3), where all subjects were preexposed to system-wide mailed screening invitations. Whether preexposures in both studies had priming effects, or oppositely de-sensitized subjects to additional screening promotions, remains unclear.

Despite the apparent effectiveness of our combined approach, important questions remain about the uptake achieved with direct navigation when compared with mailed interventions introducing multiple screening options. When Myers and colleagues compared a preference-based intervention with a mailed intervention, where subjects solely received multiple options and no navigation toward preference, the subjects randomized to the preference-based TNI had higher rates than no-intervention controls (TNI, 38%; control, 12%) but the multiple-options group demonstrated a screening rate only 5% lower (38% vs. 33%) (2). Subsequent analyses evaluated the independent effects of the multiple-option mailing versus the telephone navigation for SBT, with the multiple-option mailing associated with increased screening (OR = 2.6, $P = 0.001$) due to a 29-fold increase in SBT, while telephone navigation was associated with increased screening (OR = 2.1, $P = 0.005$) due to a 3-fold increase in colonoscopy. It may be that a multiple-option mailing is most effective with SBT promotion, and telephone navigation may be especially useful with colonoscopy (24). In our study, with nearly equal populations of males–females in the sample, we again contrasted the proportions of newly screened subjects who were SBT-screened females against SBT-screened males and colonoscopy-screened females against colonoscopy-screened males (Table 4). A greater percentage of male intervention subjects were newly screened than females; there were 6.4% more newly screened males than females who screened with colonoscopy and 2.2% more newly screened females who obtained FOBT than males. In terms of age, a greater proportion of subjects between 50 and 60 years were newly screened than between 61 and 74 years, and among the newly screened 50- to 60-year-old group, more were screened with colonoscopy than FOBT. This pattern was reversed in subjects 61 to 74 years, where more newly screened subjects had FOBT than colonoscopy. Altogether, results suggest

the intervention was more effective with males than females and that more males than females opted for colonoscopy. Since when our patients met with the nurse navigator, a high percentage (67%) completed screening, future studies should focus on efforts to increase the number of patients who attend phone-based navigator appointments and in-office appointments. As individuals become more internet-accessible, attempts to persuade attendance at phone-based or in-person navigations could feature videos describing and approximating navigation sessions. These videos could be programmed interactively, permitting individuals to formulate questions that trigger video-based or personally navigated information. These preparations could prepare more subjects for "live" sessions, whether phone based or in person. It would also be possible to combine in-person or phone-based navigation with opportunistic efforts to promote screening by primary care physicians. This would entail more cooperation from participating physicians than what was required in the current study but might strategically incorporate their persuasion efforts.

In conclusion, it appears direct personal navigation, immediately linked to referral for colonoscopy or SBT kit provision in a pragmatic RCT, had a significant effect on increasing screening uptake when compared with usual care. Immediate action on options (e.g., colonoscopy consultation) derived during direct navigation may warrant further investigation in efforts to increase colorectal cancer screening rates and the adoptions of other prevention behaviors.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

Authors' Contributions

Conception and design: P.G. Ritvo, R.E. Myers, L.F. Paszat, L. Rabeneck
Development of methodology: P.G. Ritvo, R.E. Myers, L.F. Paszat, J.M. Tinmouth, L. Rabeneck
Acquisition of data (provided animals, acquired and managed patients, provided facilities, etc.): P.G. Ritvo, R.E. Myers, B. Mitchell, L. Rabeneck
Analysis and interpretation of data (e.g., statistical analysis, biostatistics, computational analysis): P.G. Ritvo, R.E. Myers, L.F. Paszat, J.M. Tinmouth, J. McColeman, L. Rabeneck
Writing, review, and/or revision of the manuscript: P.G. Ritvo, R.E. Myers, L.F. Paszat, J.M. Tinmouth, M. Serenity, L. Rabeneck
Administrative, technical, or material support (i.e., reporting or organizing data, constructing databases): P.G. Ritvo, R.E. Myers, J. McColeman, B. Mitchell, L. Rabeneck
Study supervision: P.G. Ritvo, R.E. Myers, L.F. Paszat, B. Mitchell, L. Rabeneck

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