Colorectal Cancer
A collaborative approach to improve education and screening in a rural population

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BACKGROUND: Colorectal cancer (CRC) is the third most commonly diagnosed cancer and second leading cause of cancer death for men and women in the United States. Although early detection and diagnosis greatly affect survival rates, only about half of the U.S. population participates in screening.

OBJECTIVES: The purpose of this project was to implement community-based CRC education and screening. Outcomes included CRC knowledge, CRC screening kit return rate, and rate of positive screening results.

METHODS: Partnering with a community hospital, CRC educational sessions and free screening opportunities were provided for 195 local city government employees. CRC knowledge was assessed before and after education with the Knowledge Assessment Survey. A paired t test indicated significant improvement in mean CRC knowledge.

FINDINGS: More than half of the participants elected to take home fecal immunochemical test kits. Of the 29 participants who submitted their screening kits for evaluation, eight had positive results and received referral recommendations. All participants were notified of their screening results. The community-based CRC project was effective in improving CRC knowledge and screening participation.

COLORECTAL CANCER (CRC) INCLUDES ANY CANCER THAT starts in the colon or rectum. Most begin as an adenomatous polyp and grow into the wall of the colon or rectum before metastasizing by invading tissues or structures, the bloodstream, or the lymphatic system. About 95% of CRCs are adenocarcinomas (American Cancer Society [ACS], 2017b). The ACS (2017a) projected that 135,430 people would be diagnosed with CRC in the United States in 2017. Although the CRC death rate has been dropping for the past 20 years, the ACS still estimated 50,260 CRC-related deaths during 2017 (ACS, 2017a).

The Centers for Disease Control and Prevention ([CDC], 2017) recommends screening for precancerous polyps for anyone aged 50 years or older. Although early detection and diagnosis greatly affect survival rates, only about half of the U.S. population participates in screening (ACS, 2017a). A fecal immunochemical test (FIT) is a noninvasive test used to detect blood in the stool that cannot be seen with the human eye (Tresca, 2017). People at home use the FIT kit by obtaining a sample of the stool with one of the FIT kit sticks and inserting the sample back in the vial. The FIT kits are then either mailed or hand-delivered to a laboratory for blood detection, most specifically from the lower gastrointestinal tract (Tresca, 2017).

The State Cancer Profiles report by the National Cancer Institute (NCI) and CDC (2014) ranked Kentucky seventh for mortality, with a death rate of 17.6 per 100,000 compared to a national rate of 15.1. At the time of this project, the CRC death rate in Hopkins County, Kentucky, was 14.1 per 100,000, one of the highest in the state. The death rate in Kentucky has been trending downward over time from 25.8 in 1982 to 17.6 in 2013 (NCI and CDC, 2014). Incidence and death rates are depicted in Figure 1.

In 2008, the Kentucky Colon Cancer Screening Program (KCCSP) was formed with the passage of Kentucky Regulatory Statute 214.540 to increase CRC screening, reduce morbidity and mortality from CRC, and reduce costs for CRC treatment. The goal of the KCCSP is to increase the number of CRC screenings in Kentucky, using 75% FIT kits and 25% colonoscopies (Justia, 2011).

About 39% of CRCs are diagnosed at the local stage or confined to the primary site, but 56% have already spread to regional lymph nodes or have metastasized. If diagnosed at the localized stage, there is a 90% five-year relative survival rate, but this decreases to 14% when the cancer is in distant sites. The survival rate for regional sites is 71% and 35% for unstaged. NCI (2017a) projects that early detection of CRC could improve survival rates by about 60%.

KEYWORDS
colorectal cancer screening; human caring theory; evidence-based practice

DIGITAL OBJECT IDENTIFIER
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**Literature Review**

Multiple investigators reported improved CRC screening when various targeted strategies were used for CRC education (Dignan et al., 2014; Feltner, Ely, Whitler, Gross, & Dignan, 2012; Smith et al., 2012; Westfall et al., 2013). In addition, Green et al. (2013) and Menon et al. (2011) reported higher rates of screening follow-through when follow-up strategies, such as telephone contact and reminder mailings, were implemented. Population-specific improvements were reported by investigators who implemented targeted educational strategies in medically underserved areas, such as rural Appalachian Kentucky (Dignan et al., 2014; Feltner et al., 2012) and rural Colorado (Westfall et al., 2013).

In their systematic reviews, Morrow, Dallow, and Julka (2010) and Wortley, Wong, Kieu, and Howard (2014) reported the benefits of follow-up strategies that allowed patients to make informed, individual choices regarding participation in their preferred CRC screening method. Although the ability to offer choices for screening methods was not feasible in this project, there was ample evidence in the literature to support implementing a community-based CRC screening program using targeted education and FIT kits.

**Objective and Purpose**

Each March, the KCCSP engages in CRC awareness activities as a public health initiative, distributing FIT kits for CRC

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“Targeted community education successfully increased colorectal cancer knowledge and screening rates.”
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**FIGURE 1.** NATIONAL, STATE, AND LOCAL COLORECTAL CANCER INCIDENCE AND DEATH RATES AND THE TRENDING COLORECTAL CANCER DEATH RATE IN KENTUCKY

Note. Based on information from National Cancer Institute and Centers for Disease Control and Prevention, 2014.
screening. The objective of this project was to implement community-based CRC education and screening for a targeted population.

**Theoretical Framework**
Incorporating theory, philosophy, and ethics while integrating technology and practicality outlines the human caring theory (Watson & Smith, 2002). Watson’s (2009) human caring theory focuses on a caring science for clinical decision making. This theory guided the literature review on strategies to ensure caring and connect with individuals in the community to improve public health while decreasing costs to the healthcare system. This ultimately led to a focus on targeted education and follow-up as improvement strategies for the project.

Prochaska, DiClemente, Velicer, and Rossi’s (1992) transteoretical model (TTM) assists individuals intentionally changing behaviors or intending to change behaviors with interventions to help them change by focusing on decision making. One of the KCCSP’s goals is to increase CRC screening by removing barriers and increasing awareness (National Colorectal Cancer Roundtable, 2017). The TTM guided the project focus to provide education, improve awareness, and offer on-site screening opportunities promoting individuals’ CRC screening decisions.

**Methods**
In Hopkins County, Kentucky, where this project was conducted, 2015 data demonstrated the benefit of community-based CRC screening. The project was a joint venture between local city government and a community hospital, Baptist Health Hospital in Madisonville, Kentucky. Using a pre-/post-test design, 16 CRC educational sessions were delivered at 12 departmental meetings with employees. CRC knowledge was measured before and after the education using the Knowledge Assessment Survey (KAS) (Sanchez, Palacios, Thompson, Martinez, & O’Connell, 2013). On-site FIT kit distribution was conducted by the community hospital oncology nurse navigator (ONN).

**Sample and Setting**
The educational sessions were conducted at various times of day and night in various locations to accommodate the working patterns of the 193 city employees who participated. All employees present at the departmental meetings were eligible to participate in the educational session, knowledge assessment, and FIT kit distribution. All employees who attended the educational sessions participated in the completion of the pre- and post-intervention KAS.

The city employees represented a diverse population with heterogeneity in gender, race, educational background, socioeconomic status, and age. Many of the employees were in the CRC high-risk age group.

**Evidence-Based Intervention**
Institutional review board approval was obtained through Eastern Kentucky University Division of Sponsored Programs. No participant-identifying information was included on the knowledge assessments. The ONN obtained name and contact information of participants who elected to accept a FIT kit. All identifying information was protected using the hospital’s community screening policy and procedure and Health Insurance Portability and Accountability Act (HIPAA) guidelines.

CRC screening educational flyers were posted in the city government departments prior to project implementation. The evidence-based intervention was a 10-minute CRC educational session followed by the opportunity to participate in free CRC screening by accepting a FIT kit.

**Instrument**
The KAS was administered pre- and postintervention. Permission for use was obtained from the instrument author. The KAS is a 14-item survey based on CRC risk information from NCI. Responses to the KAS are assigned a value of 1 for each “yes” and a 0 for each “no,” with a possible total score from 0–14 for each survey. Higher scores indicate greater knowledge. The survey has a 7.9 readability grade level and assesses CRC knowledge, CRC screening history, behavioral intentions to participate in screening, and physician–patient interactions. The knowledge questions are categorized into the following three categories, each with previously documented acceptable reliability coefficients:

| TABLE 1. ITEMS AND SCALE INTERNAL RELIABILITIES COMPARED TO PROJECT RELIABILITIES FOR KAS |
|-----------------------------------------------|------------------|------------------|------------------|
| SUBSCALE                                      | OVERALL           | PRE-EDUCATION    | POSTEDUCATION    |
|                                               | CRONBACH ALPHA    | CRONBACH ALPHA   | CRONBACH ALPHA   |
| Total knowledge (14 items)                    | 0.94              | 0.64             | 0.78             |
| General knowledge of CRC (2 items)            | 0.74              | 0.57             | 0.8              |
| Knowledge of CRC risk factors (5 items)       | 0.88              | 0.27             | 0.22             |
| Knowledge of CRC screening (7 items)          | 0.89              | 0.76             | 0.72             |
| Physician interactions (2 items)              | 0.92              | 0.81             | 0.81             |

CRC—colorectal cancer; KAS—Knowledge Assessment Survey
- General CRC knowledge (Cronbach alpha = 0.74)
- CRC screening knowledge (Cronbach alpha = 0.89)
- CRC risk factor knowledge (Cronbach alpha = 0.88)

Sanchez et al. (2013) reported acceptable internal reliability on the KAS scales and subscales with Cronbach alphas ranging from 0.74–0.94. Sanchez et al. (2013) did not report instrument construct validity in the literature; however, this instrument was selected because the face validity was acceptable to the nurse experts involved in this project. For this project sample, pre-/post-test reliability assessments were conducted for each of the three subscales and total KAS. Coefficient alphas ranged from 0.22–0.8 on the subscales and 0.64–0.94 on total KAS (see Table 1).

The inability to demonstrate adequate subscale reliability in this sample was most likely related to the limited number of items in each subscale and the vast difference in samples. Although Sanchez et al. (2013) tested the scale in predominantly Hispanic women, the current sample was predominantly White men. Face validity of the KAS was confirmed with the oncology and wellness nurses in the city government and community hospital.

Implementation
A cover letter noting the nature of the project was provided and read aloud to each participant prior to the session. Following completion of the KAS before education occurred, a scripted CRC teaching message was delivered while the participants were viewing CDC’s (2017) Screen for Life: National Colorectal Cancer Action Campaign materials and handout. Education included CRC definition, risk factors, screening methods and options, and benefits of screening. The ONN explained that CRC screening was recommended for employees who met the following NCI (2017b) at-risk criteria:
- No screening in previous 12 months
- Individuals aged older than 50 years or those aged 40–50 years with a family history of colon cancer

Employees who did not meet NCI criteria but requested the free CRC screening were included. The ONN distributed all FIT kits, recorded all participants’ contact information, provided instructions, and discussed individuals’ questions or concerns. This was her customary procedure during community service events.

Data Collection
The KAS was administered immediately before and immediately after the educational session. The hospital ONN tracked the number of FIT kits distributed, the number returned within four weeks, and the number of participants who had positive screening results. These aggregate data were provided to the project leader without any individual identifiers. One week after distribution, the ONN made personal telephone calls to all participants who accepted but had not returned their FIT kits. The city wellness nurse posted reminder flyers in all departments. After three weeks, the ONN mailed 100 personal letters to the employees who had not returned their FIT kits. All participants who returned kits for evaluation were notified of their individual screening results by the ONN. Results within normal limits were reported by regular mail; results not within normal limits were reported by registered mail. Participants with results that were not within normal limits were encouraged to see their primary care provider for follow-up. Upon request of any participant, provider referrals were made for follow-up care. Data were analyzed with IBM SPSS Statistics, version 23.0.

Results
Fifty-two individuals accepted a FIT kit, 12 submitted them to the laboratory for screening, and 5 had positive CRC indicators. Table 2 depicts the distribution and return rate for FIT tests in Hopkins County for 2013–2016.

Sample Characteristics
An initial sample of 193 employees participated in the education and CRC knowledge assessments. Seven of the participants were removed from the data set because of response set or a missing pre- or posteducation KAS, resulting in 186 usable assessments. The participants’ ages ranged from 20–65 years, with a mean age of 40.6 (SD = 10.95). The majority were men (n = 169) and Caucasian (n = 167). Only one-third of the participants had a college or advanced degree (n = 55). Demographic characteristics of the participants are shown in Table 3.

Knowledge Assessment
The mean knowledge scores from the 14-item assessment tool were 8.29 (SD = 1.862) before and 13.27 (SD = 1.363) after the educational session. Knowledge scores were categorized as low

<table>
<thead>
<tr>
<th>YEAR</th>
<th>DISTRIBUTED</th>
<th>RETURNED</th>
<th>POSITIVE RESULTS</th>
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<tbody>
<tr>
<td>2013</td>
<td>37</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>2014</td>
<td>44</td>
<td>4</td>
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<td>12</td>
<td>5</td>
</tr>
<tr>
<td>2016</td>
<td>4</td>
<td>0</td>
<td>–</td>
</tr>
</tbody>
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FIT—fecal immunochemical test
knowledge (scores of 0–3), moderate knowledge (scores of 4–9), and high knowledge (scores of 10–14) (Sanchez, Palacios, Cole, & O’Connell, 2014). The majority of participants (n = 140) in this sample were in the moderate knowledge category before the educational intervention; however, an even greater majority (n = 181) scored in the high knowledge category after the education session, as depicted in Figure 2.

A paired-samples t test demonstrated a significant increase in mean total KAS scores from pre-education (X = 8.29, SD = 1.86) to posteducation (X = 13.27, SD = 1.36) ([t(181)] = 35.289, p < 0.0001; two-tailed). The mean increase in KAS scores was 4.95 (95% confidence interval [4.7, 5.26]). The eta squared statistic (0.87) indicated a large effect size for this intervention. Because of the low reliability coefficient alphas obtained for this sample, individual subscale scores were not evaluated for statistically significant changes.

Screening Outcomes
More than half of the participants (n = 130) elected to take home FIT screening kits. Of the 29 participants (15%) who submitted their screening kits for evaluation, eight (4%) had positive colon cancer indicators and received referral recommendations.

Discussion
The literature supports personalized CRC education to promote informed choices regarding type of CRC screening and to increase adherence to screening (Dignan et al., 2014; Feltner et al., 2012; Green et al., 2013; Menon et al., 2011; Morrow et al., 2010; Wortley et al., 2014). CRC education programs in rural communities, similar to the current project community, have been recommended (Dignan et al., 2014; Feltner et al., 2012; Westfall et al., 2013). Multiple authors emphasize the significance of informed choices in promoting CRC screening through common interventions (Dignan et al., 2014; Feltner et al., 2012; Green et al., 2013; Menon et al., 2011; Morrow et al., 2010; Smith et al., 2012; Westfall et al., 2013; Wortley et al., 2014).

This project evaluation demonstrated an improvement in knowledge and intent to participate in screening following CRC education, as reported in the literature. Several studies (Dignan et al., 2014; Feltner et al., 2012; Green et al., 2013; Menon et al., 2011; Morrow et al., 2010; Wortley et al., 2014) were also able to demonstrate increased adherence to screening following CRC screening education. In the current study, the participants viewed a handout during the formal educational session. The concurrent, on-site exposure to the ONN, who provided instruction and education on the FIT kit, was beneficial. In addition, providing the FIT kit to all individuals who wanted to participate, keeping results confidential, and providing appropriate follow-up for participants were strategies that enhanced the CRC screening rate.

An unanticipated outcome of the project was the number of anecdotal discussions that took place in the departmental educational sessions and one-on-one. One man openly shared his story of being diagnosed and treated for colorectal cancer at age 42 years. He told his fellow employees that he was lucky that his treatment was successful and urged everyone to participate in screening. Several participants wanted to know more about decreasing risk factors for themselves or family members. Many wanted to share stories about someone they knew who had lost his or her life to cancer. Overall, the participants were welcoming, engaged, and open to the educational intervention and screening.

Locations for project implementation varied greatly from a formal department classroom to a work shed in the local cemetery. Knowing there would be a variety of settings, the decision to use a verbal script and hard copies of educational materials versus an electronic presentation was an appropriate alternate strategy and made the implementation feasible.

Partnering with the ONN from the local hospital was critical to the success of the project. The distribution of 130 FIT kits with...
29 returns and 8 positive results is nearly the same as had been accomplished in the previous three years on the CRC Screening Days in the same community (H. Tow, personal communication, March 18, 2016). In the previous community effort and this project, several participants demonstrated positive results, indicating a need for follow-up with a healthcare provider. Finding positive CRC indicators in the eight employees demonstrated the potential life-saving value of the targeted education and screening (see Table 4).

**Limitations**

One limitation to this project was the reliability of the KAS tool. Although Sanchez et al. (2013) reported subscale Cronbach alphas from 0.74–0.94, the subscales for this project sample did not have acceptable reliability coefficients. Another limitation of the KAS was that only one item was reverse-scored. Upon consulting with a statistical expert, it was noted that disparity in instrument reliability comparisons could be from (a) a lack of construct validity reported in the literature, (b) the dichotomous nature of all items, (c) the limited number of items in each subscale (one subscale had only two items), and (d) the difference in sample demographics (B. Davis, personal communication, March 12, 2016). Sanchez et al. (2013) reported reliability in their sample of primarily Hispanic women, whereas this project included predominantly White men.

**Implications for Nursing Practice**

Results of the project and detection of positive indicators contribute to the National Colorectal Cancer Roundtable (2017) goal to screen 80% of the nation’s population by 2018. More importantly, this project allowed the detection of positive cancer indicators in eight individuals that may have otherwise gone undetected. Eliminating barriers through education was supported by this project’s increase in knowledge, as evidenced by the total KAS score improvement and the FIT kit return rate. Preliminary findings of this project were shared with the community hospital cancer committee; all were in agreement to increase focus on targeted education rather than randomly handing out FIT kits at the annual community awareness day in March.

**Future Outreach**

The community hospital has committed to future, purposeful targeted educational outreach programs. Two specific ideas for sustaining and improving community-based CRC screening have come from this project. First, during the March 2016 CRC Screening Day, the FIT kit education and distribution process was altered from previous years. Rather than receive receive FIT kits, interested participants received flyers with information for individualized screening counseling appointments with the ONN. Second, the ONN has proposed a local private business employing about 500 people as the next site for targeted education and screening. Finally, a recommendation for specifically targeting audiences and providing education for all types of cancer screening has emerged from this project recommendation.

**TABLE 4.**

**FIT KIT DISTRIBUTION AND USE DATA FOR THE CURRENT PROJECT COMPARED TO THE GENERAL COMMUNITY PROJECT**

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>DISTRIBUTED</th>
<th>RETURNED</th>
<th>POSITIVE RESULTS</th>
</tr>
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<tbody>
<tr>
<td>General community, 2013–2016</td>
<td>137</td>
<td>28</td>
<td>11</td>
</tr>
<tr>
<td>Current project, 2016</td>
<td>130</td>
<td>29</td>
<td>8</td>
</tr>
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FIT—fecal immunochemical test
Conclusion

In this project, targeted community education successfully increased CRC knowledge and screening rates. Increasing CRC screening rates to 80% by the end of 2018 will take the efforts of leaders at all levels (ACS, 2015). Ongoing commitment to participate in CRC education and screening supported by the local hospital and cancer education community has already contributed to this effort.

The TTM model was useful in identifying health behaviors and implementing an effective educational intervention to facilitate decision making for CRC screening. This model will be a guiding framework for future evidence-based education and cancer screening. These positive influences on individual health behaviors will promote overall health outcomes for targeted community populations.

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REFERENCES


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