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Surgical versus General Practitioner Assessment: Diagnostic Accuracy in Two-Week Wait Colorectal Cancer Referrals.

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Abstract

Aim It has been recommended that patients with suspected colorectal cancer should proceed straight to an endoscopic test to increase the speed of diagnosis, using only the information in the general practitioner's referral letter. This study aims to establish whether the diagnostic accuracy of the first surgical outpatient assessment is significantly greater than the general practitioner's assessment and if so by what means.

Methods Demographic variables, symptoms and signs were collected from the first surgical outpatient assessment letters and the general practitioners' referral letters in two-week wait colorectal cancer referrals made between 2002-2005. Multiple logistic regression models derived from both the surgeons' and the general practitioners' letters were compared with receiver operator characteristic curves.

Results Variables were collected from 978 two-week wait colorectal cancer referrals. The median age was 69 years (range 19-98) and the male to female ratio was 1:2. Seventy-eight referrals were diagnosed with colorectal cancer. Surgeons' models demonstrated significantly greater diagnostic accuracy than general practitioners' models (area under the curve; 0.84 vs. 0.73, P < 0.003). General Practitioners' letters contained significantly less information than surgeons' letters (P < 0.001), but correcting for this did not account for the difference in diagnostic accuracy. The single variable that accounted for the difference in diagnostic accuracy was examination of the rectum by rigid sigmoidoscopy.

Conclusion Rigid sigmoidoscopy adds significant diagnostic accuracy to the clinical assessment of patients with suspected colorectal cancer. If rigid sigmoidoscopy were omitted, patients would lose the opportunity of an earlier diagnosis by this low-risk technique.

What is new in this paper?

This is the first report to demonstrate that surgical outpatient clinic assessment of two-week wait colorectal cancer referrals has significantly greater diagnostic accuracy than general practitioner assessment, due to the use of rigid sigmoidoscopy in rectal examination.

Introduction

Delay in receiving treatment is thought to account for the shorter colorectal cancer (CRC) survival observed in the United Kingdom compared to the best reports from Western Europe.[1] The urgent, two-week wait pathway was established to address this issue by reducing the time between the general practitioner's referral to the first surgical outpatient assessment,[2] but there is no evidence that this has resulted in earlier diagnosis of CRC.[3] An alternative "straight to test" pathway was introduced in Leicester where patients at high-risk of CRC are sent straight to an endoscopic test without a surgical outpatient assessment, using only the information in the general practitioners' referral letter.[4] The straight to test pathway resulted in earlier diagnosis of CRC by on average 15 days.[5]

The aim of this study is to determine whether surgical assessment demonstrates significantly greater diagnostic accuracy than general practitioner assessment by comparing the first surgical outpatient assessment letter with the general practitioner's referral letter in two-week wait CRC referrals. The null hypothesis is that surgical assessments do not demonstrate significantly greater diagnostic accuracy than the general practitioners' assessments. If the letters provide equivalent information then the null hypothesis is not rejected and this would provide evidence to support a straight to test pathway. If the null hypothesis is rejected, the reason why the first surgical outpatient assessment is significantly more accurate will be sought in order to improve the diagnostic pathway.

Patients and Methods

Referrals through the two-week wait CRC pathway at Eastbourne District General Hospital between February 2002 and December 2005 were examined. A proforma was used to collect variables from the first surgical outpatient assessment letters and the general practitioners' referral letters including: age, gender, change in bowel habit, duration of symptoms, family history of CRC, loss of appetite, microcytic anaemia, mucus, perianal symptoms, rectal bleeding, rectal mass, right-sided abdominal mass, tenesmus and weight loss.[6]

The diagnosis of CRC was searched for in the patients' notes, pathology records and in the regional cancer registry in the three years following the referral. Referrals with less than three years follow-up were excluded. Referrals that resulted in diagnoses of cancer other than CRC were excluded from statistical modelling. The remaining data were divided randomly into training and testing sets. The training data set was used to determine if single binary variables correlated with the diagnosis of CRC. Variables that correlated significantly ($p<0.05$) with the outcome of CRC in either letter were included in multiple logistic regression (MLR) analysis. Variables from the surgeons' and the general practitioners' letters were then analysed separately. Binary variables were included in the final MLR models if they significantly and independently predicted the outcome of CRC. The testing data set was used to produce receiver operator characteristic (ROC) curves for equivalent GP and surgeon-derived MLR models. The area under the ROC curves (AUC), representing the diagnostic accuracy of the models, was compared by Hanley's method.[7] Using the method described by Obuchowski et al with an estimated 10% difference in the AUCs, a sample size of 282 cases in the training and testing sets was required to achieve 80% power.[8]

Results

Variables were collected from both the first surgical outpatient assessment letters and the general practitioners' referral letters in 978 two-week wait CRC referrals. Twenty-three other referrals were assessed, sixteen were excluded, because letters were missing from the notes and eight were excluded, because the patient was allocated a two-week wait CRC appointment incorrectly. The included referrals represent approximately two-thirds of the 1509 referrals made via the two-week wait CRC pathway over the entire study period. The median age of the referrals was 69 years (range 19-98) and the male to female ratio was 1:2. Seventy-eight referrals were diagnosed with colorectal cancer. Thirty-one referrals were diagnosed with rectal cancer and 47 referrals were diagnosed with colonic cancer. Change in bowel habit was the most frequent complaint documented in both surgeons' and general practitioners' letters. Information in the surgeons' letters was significantly more comprehensive than in the general practitioners' letters (χ^2 = 4.840, 1df, P < 0.0278). (Table 1)

Twelve referrals resulted in diagnoses of cancer other than CRC and were excluded. Univariate analysis revealed that increasing age and the presence of rectal bleeding, microcytic anaemia, a right-sided abdominal mass and a rectal mass correlated significantly with CRC. The surgeons' multivariate models were significantly more accurate at diagnosing colorectal cancer than the general practitioners' models (area under the curve; surgeons = 0.84, general practitioners = 0.73, P < 0.003). (Figure 1) The difference between the models was not removed when correction was made for less comprehensive information recorded in the general practitioners' letters (P = 0.013). The only variable that accounted for the significant difference in diagnostic accuracy between the surgeons' and general practitioners' models was rectal examination using information from digital rectal examination and rigid sigmoidoscopy. Without the information from rectal examination, the diagnostic accuracy of the models equalises (P=0.444) (Figure 2) and with the information from rectal examination, the significant difference is maintained (P<0.05). General practitioners never documented the use of rigid sigmoidoscopy in addition to digital rectal examination as part of rectal examination whilst surgeons routinely documented the use of rigid sigmoidoscopy in addition to digital rectal examination as part of

rectal examination. Rigid sigmoidoscopy was diagnostic in 23 (74%) referrals with rectal cancer. A rectal mass was not documented in 8 (26%) of these referral letters. General Practitioners documented the presence of a rectal mass in 129 referral letters. Sigmoidoscopy ruled out rectal cancer in 110 (85%) of these referrals.

Discussion and Conclusions

This study demonstrates that the diagnostic accuracy of surgical assessment is significantly greater than general practitioner assessment in two-week wait colorectal cancer referrals. This is due to the accuracy of rectal examination and the surgeons' use of rigid sigmoidoscopy, not because less comprehensive information is recorded in the general practitioners' referral letters. Rigid sigmoidoscopy made a significant contribution to managing 12% of referrals.

In order to address the potential limitations of chance and bias in this study, a large data set was used, representing two-thirds of the entire cohort of patients referred via the two-week wait CRC pathway to achieve >80% power. Variables from surgeons' and general practitioners' letters were collected and processed in the same way and no outliers were removed from the statistical analysis. Three years follow-up were allowed to detect all missed cancers, which were sought in the regional cancer registry as well as the patients' notes and pathology records. All variables present in the letters were included in the analysis, which was not limited to those chosen by experts [6] and the weighting given to these variables was statistically derived and not taken from the literature.[9]

Other published reports support the conclusion of this study. Aljarabah found that the presence or absence of a rectal mass was the most likely finding documented in general practitioners' referral letters to be changed at surgical outpatient clinic assessment.[10] Similarly Flashman found that a rectal mass had the greatest difference in diagnostic yield of CRC between the surgical outpatient clinic assessments and the general practitioners' referral letters.[11] However, although these studies described a similar disparity between the diagnostic accuracy of GPs' and surgeons' assessments of rectal masses, they did not apply a statistical test to determine if this was significant.

The most specific criterion for CRC is a palpable rectal mass [12, 13] and this is particularly important when patients do not have high-risk symptoms.[6] It is recommended practice for general practitioners to perform a digital rectal examinations on all patients with a possible diagnosis of CRC before making a two-week wait referral, however it is rare for them to

perform rigid sigmoidoscopy.[12, 13] Rigid sigmoidoscopy is standard practice for surgeons in the first outpatient assessment of two-week wait referrals. If general practitioners were to perform rigid sigmoidoscopy routinely before making two-week wait CRC referrals, the referral letters would be as accurate as the first surgical outpatient assessment and a straight to test pathway would be more appropriate. However, because rigid sigmoidoscopy is not widely practised by general practitioners, the current practise of referral for surgical assessment may be preferable.

Rapid diagnosis of benign and malignant conditions is beneficial to patients and clinicians. If rigid sigmoidoscopy were omitted in a straight to test pathway, patients would lose the opportunity of an earlier diagnosis by this low-risk technique.

Acknowledgements

References

1. Thomson CS, Forman D. Cancer survival in England and the influence of early diagnosis: what can we learn from recent EUROCARE results? *Br J Cancer* 2009; **101 Suppl 2:** S102-9.

2. Department of Health. *Referral guidelines for suspected cancer.* 2000.

3. Thorne K, Hutchings HA, Elwyn G. The effects of the Two-Week Rule on NHS colorectal cancer diagnostic services: a systematic literature review. *BMC Health Serv Res* 2006; **6:** 43.

4. Hemingway DM, Jameson J, Kelly MJ, Leicester Colorectal Specialist Interest Group Project Steering C. Straight to test: introduction of a city-wide protocol driven investigation of suspected colorectal cancer. *Colorectal Dis* 2006; **8:** 289-95.

5. Hammond TM, Fountain G, Cuthill V, Williams J, Porrett TR, Lunniss PJ. Straight to test. Results of a pilot study in a hospital serving an inner city population. *Colorectal Dis* 2008; **10:** 569-76.

6. Thompson MR, Perera R, Senapati A, Dodds S. Predictive value of common symptom combinations in diagnosing colorectal cancer. *Br J Surg* 2007; **94:** 1260-5.

7. Hanley JA, McNeil BJ. A method of comparing the areas under receiver operating characteristic curves derived from the same cases. *Radiology* 1983; **148:** 839-43.

8. Obuchowski NA, Lieber ML, Wians FH, Jr. ROC curves in clinical chemistry: uses, misuses, and possible solutions. *Clin Chem* 2004; **50:** 1118-25.

9. Selvachandran SN, Hodder RJ, Ballal MS, Jones P, Cade D. Prediction of colorectal cancer by a patient consultation questionnaire and scoring system: a prospective study. *Lancet* 2002; **360:** 278-83.

10. Aljarabah MM, Borley NR, Goodman AJ, Wheeler JM. Referral letters for 2-week wait suspected colorectal cancer do not allow a 'straight-to-test' pathway. *Ann R Coll Surg Engl* 2009; **91:** 106-9.

11. Flashman K, Faux W, O'Leary DP, Senapati A, Thompson MR. Diagnostic Yields of the Six Department of Health (DOH) Higher Risk Criteria for the 'Two Week Standard' Clinic (TWSC). *Colorectal Dis* 2002; **4:** 48.

12. Barwick TW, Scott SB, Ambrose NS. The two week referral for colorectal cancer: a retrospective analysis. *Colorectal Dis* 2004; **6:** 85-91.

13. Springall RG, Todd IP. General practitioner referral of patients with lower gastrointestinal symptoms. *J R Soc Med* 1988; **81:** 87-8.