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Validation of Australian and Victorian guidelines for colonoscopy triage.

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Declarations

JDE and HE were involved in the development of the colonoscopy triage guidelines which are evaluated in this paper.

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Introduction

The demand for colonoscopy in Australia has grown substantially over the last decade placing significant pressure on public hospital waiting lists. This was highlighted in the Medicare Benefits Schedule Review Taskforce, Gastroenterology Committee Report: in the 10 years from 2004-05 to 2014-15 there was a 51% increase in MBS-funded colonoscopies and 177% increase in colonoscopies with polypectomy.(1) The First Australian Atlas of Healthcare Variation from the Australian Commission on Safety and Quality in Health Care reported a 30-fold variation in colonoscopy rates by remoteness and socio-economic status.(2) The latest data from the National Bowel Cancer Screening Program show a median time from positive result to colonoscopy of 52 days; of the 25% of colonoscopies performed in public hospitals, the median time from positive result to endoscopy was 84 days.(3) There are no publicly available data on overall waiting times for colonoscopy but they are often much longer than this for symptomatic patients in public hospitals. One of the key recommendations from the Third Australian Atlas of Healthcare Variation was that State and Territory Health Departments adopt triaging systems to prioritise colonoscopy for individuals most at risk of bowel cancer.(4)

In 2017 Cancer Council Australia published evidence-based guidelines for the prevention, early detection and management of colorectal cancer, which were subsequently approved by the National Health and Medical Research Council.(5) Within these wide ranging guidelines were recommendations about the maximum time from first presentation to healthcare to colonoscopy (120 days for those with a positive bowel cancer screening test or symptomatic patients in triage Categories One and Two), and colonoscopy triage categories for symptomatic patients. In the same year, the Victorian Department of Health and Human Services developed their own colonoscopy triage categorisation guidelines which included symptomatic patients or those with a positive faecal occult blood test used for screening, and surveillance and therapeutic indications.(6)

The Optimal Cancer Care Pathways (OCCP) is a nationally endorsed program which recommends care at critical points along the cancer care pathway.(7) The colorectal cancer OCCP lists individual symptoms or signs of colorectal cancer requiring investigation, including colonoscopy within four weeks if symptoms suggest cancer.

While all these guidelines are based on epidemiological evidence for the symptoms and signs associated with colorectal cancer, it is not known what their potential impact would be on colonoscopy triage if applied across the public healthcare system. This paper reports a validation of these three guidelines, using data from a large metropolitan public hospital endoscopy service, to examine their diagnostic performance and potential impact on demand for urgent colonoscopies.

Methods

Reference dataset

We conducted a clinical audit of 2,378 colonoscopies from 1 October 2014 to 30 June 2016 performed at Western Health endoscopy units, Melbourne, Victoria, and which had arisen from general practitioner referrals, regardless of specific reason for request. This represented 45.6% of all colonoscopies performed at Western Health during that period. We manually extracted data from hospital medical records including patient demographics; symptoms, signs and family history of bowel cancer reported in the referral letter and out-patient records; colonoscopy triage category assigned by Western Health endoscopy service; and final diagnosis, including histological diagnosis where available. At that time, there were no widely agreed colonoscopy classification criteria and each health service used their own internal system to determine urgency. Western Health deployed several different clinicians within the gastroenterology and surgical endoscopy units to conduct triage. Western Health is a large public health network servicing the western suburbs of Melbourne; there are endoscopy units at three hospitals with a colonoscopy service comprising gastroenterology endoscopists, colorectal surgical endoscopists and an advanced practice nurse endoscopist. Western Health endoscopic services has a specific interest in therapeutic colonoscopy and endoscopic mucosal resection for removal of large or complex colorectal polyps.

Guideline validation

The Western Health colonoscopy dataset was used as the reference standard for comparison against the following colonoscopy triage and referral guidelines:

1. The Cancer Council Australia Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer (referred to henceforth as the 'National guidelines').(5) Colonoscopies where indicated for surveillance due to previous polyps or colorectal cancer, or screening for family history, were considered triage Category 2.
2. The Victorian Colonoscopy Categorisation Guidelines.(6)
3. The Optimal Cancer Care Pathway (OCCP) for People with Colorectal Cancer.(8) Based on the recommendation of colonoscopy within four weeks for those with the listed indications requiring investigation, we classified all those patients with the signs or symptoms listed in the OCCP as triage Category 1.

The following measures of performance were obtained by manually applying each set of guidelines against the data extracted for each colonoscopy referral:

- a. The proportion of all colonoscopies assigned to each triage category.
- b. The detection rate i.e. the proportion of cancers which would be assigned to triage Category 1 (the sensitivity of Category 1 to detect cancer).(9)
- c. The conversion rate i.e. the proportion of triage Category 1 colonoscopies which would diagnose a cancer (the positive predictive value of Category 1 to detect cancer).

We calculated the predicted shift in distribution of triage categories from the current performance at Western Health to that if each guideline were applied systematically. For specific types of symptomatic patient, both the Victorian and National guidelines recommend the use of the immunochemical faecal occult blood test (FOBT) to inform the triage categorisation; furthermore, for certain symptoms the symptom duration is used to determine the triage category. For many referrals this information was unavailable. We therefore applied the guidelines in two ways:

- a. Strict guideline adherence, using only available data;
- b. Adjusted, in which the following assumptions were made: where an FOBT was required, assume it was negative; where symptom duration was not reported, assume it was ≥ 6 weeks.

In certain cases, especially when applying strict guideline adherence rules, referrals were deemed unclassifiable due to the absence of information in referral letters. We compared proportions meeting triage Category 1, detection and conversion rates for each guideline against the reference Western Health triage, using the Chi-squared test. This study was approved by the Western Health Human Research Ethics committee (QA2013.110 amended 1.3.18.).

Results

Data were available on 2,378 colonoscopies. Western Health endoscopy services had triaged these referrals accordingly: 76.3% Category 1, 16.0% Category 2, 5.4% Category 3. There was no triage category recorded for 2.3% of colonoscopies. The following abnormalities were found in 1,819 patients: 46.8% polyps; 29.9% haemorrhoids; 29.0% diverticular disease; 3.9% cancer; 3.1% inflammatory bowel disease; 15.6% other diagnoses. There were 93 colorectal cancers diagnosed of which 86 were adenocarcinomas, three neuroendocrine, two squamous cell carcinomas, one lymphoma and one metastatic melanoma. Twelve cancers were diagnosed following a positive National Bowel Cancer Screening Program test.

Redistribution of triage categories by guidelines

National guidelines

Applying the guidelines strictly meant that 32.2% were unclassifiable due to information absent in the referral letter, predominantly about symptom duration. An additional 6.3% referrals would require an FOBT before they could be triaged. After adjusting for absent information, applying the National guidelines led to a significant reduction in the proportion of Category 1 colonoscopies (from 76.3% to 58.6%; 95% CI for difference 15.0 – 20.3% $p < 0.0001$). Table 1 demonstrates the redistribution of colonoscopy triage applying the adjusted National guidelines. For example, of the 1,814 colonoscopies triaged by Western Health as Category 1, 1,279 (70.5%) would remain as Category 1, 13.7% would be reclassified as Category 2, 3.7% as Category 3, 1.7% would be not indicated and 10.3% would be unclassifiable. The main reasons for colonoscopies remaining unclassifiable, even after adjustment for absent information, were that the National guidelines do not account for therapeutic procedures, such as endoscopic mucosal resection, and that iron deficiency alone is not considered an indication for colonoscopy.

Victorian guidelines

Applying the Victorian guidelines strictly meant that 25.6% were unclassifiable, principally due to absent information about symptoms. An additional 5.8% would require an FOBT to determine the triage category. After adjusting for absent information, applying the Victorian guidelines led to a significant reduction in the proportion of Category 1 colonoscopies (from 76.3% to 66.3%; 95% CI for difference 7.4 – 12.6% $p < 0.0001$). Table 2 demonstrates the redistribution of colonoscopy triage applying the adjusted Victorian guidelines. For example, of the 1,814 colonoscopies triaged by Western Health as Category 1, 1,432 (78.9%) would remain as Category 1, 12.8% would be reclassified as Category 2, 3.4% as Category 3, 1.9% would be not indicated. Overall, even after adjustment for absent information in referrals, 5.9% of colonoscopies remained unclassifiable and 2.5% would be not indicated.

Optimal Cancer Care Pathways

Applying the criteria in the Optimal Cancer Care Pathways resulted in 78.6% of colonoscopies classified as triage Category 1; 21.4% of colonoscopies remained unclassifiable principally because they were performed either for surveillance or for a therapeutic procedure.

Cancer diagnostic performance

Table 3 presents the distribution of triage categories by each guideline for the 93 patients diagnosed with cancer. The Western Health triage process achieved an 88.2% detection rate with a conversion rate of 4.5% (i.e. approximately 22 urgent colonoscopies performed to diagnose one cancer, with approximately 1 in 8 cancers diagnosed through an alternative route). One person was diagnosed at a routine surveillance colonoscopy and ten patients were initially referred to the Emergency Department (ED) and were not formally triaged. These ED presentations included five patients with symptoms not captured in certain guidelines.

The adjusted Victorian guidelines were associated with the highest detection rate (91.4%) and a conversion rate of 5.4%; these were not statistically significantly different to the Western Health process (detection rate difference 3.2% 95% CI -6.4 - 12.8% $p = 0.47$; conversion rate difference 0.9% 95% CI -0.6 - 2.4% $p=0.22$). One patient was deemed not indicated for colonoscopy based on the long duration of symptoms; another patient, aged 59 with abdominal pain, would have been triaged as Category 3. Five remained unclassifiable: two were initially referred to ED with acute abdominal pain and three had symptoms not captured by the guidelines: loin pain and haematuria, dyspnoea and dizziness, perianal ulcer, which may all reflect incidental diagnoses of cancer.

There was a statistically significant lower detection rate between the adjusted National guidelines and Western Health triage (65.6% vs 88.2%, difference 22.6%, 95% CI 9.9 - 34.6% $p = 0.0003$) with no difference in the conversion rates. Even after adjustment for absent information, 25.8% remained unclassifiable: 12 of these were diagnosed by histological analysis of endoscopic mucosal resection specimens and five had an abnormal CT scan, neither of these indications is covered in the National guidelines; five had symptoms not captured by the guidelines (iron deficiency alone, loin pain and haematuria, dyspnoea and dizziness, perianal ulcer). There were four patients deemed not indicated for colonoscopy, one based on long duration of symptoms and three patients aged 63-74 with weight loss but no abdominal symptoms. Three patients required an FOBT to enable triage; the assumption that these FOBT tests were negative placed them in Category 3. The sensitivity of an FOBT test is such that, in reality, these three patients would likely have been triaged as Category 1.

The Optimal Cancer Care Pathways (OCCP) had a detection rate of 80.6% and conversion rate of 4.0%; 19.4% of patients were unclassifiable using the OCCP criteria. Of these, 12 were diagnosed following endoscopic mucosal resection, one after a surveillance colonoscopy, and five had symptoms not captured by the OCCP.

Discussion

This is the first study to test the performance of Australian triage guidelines for colonoscopy. After adjusting for information absent in referral letters, the Victorian guidelines performed most effectively. They would reduce the proportion of referrals triaged as Category 1 by 10% without any adverse effects on conversion or detection rates. To achieve this would require efforts to improve the quality of information in referral letters, especially relating to symptom duration. In addition, 5.8% of referrals would require an FOBT to inform the triage.

There are limitations to this study. Our reference dataset was based on GP referrals for colonoscopy to a single endoscopy service, covering three hospitals in metropolitan Melbourne. This represents one of the larger public hospital endoscopy services in Victoria, and our relatively large dataset means that it is likely to be reasonably representative of other public hospital endoscopy services in Australia. We had to apply certain rules to account for information absent from referral letters about symptom duration and FOBT results which possibly led to a small underestimation of the detection rate for the National guidelines, and potential error in the estimates around redistribution of triage categories. Even though we have data on a large cohort of patients having colonoscopy, there were only 93 cancers diagnosed. This limited our power to detect differences in diagnostic performance for cancer between guidelines. We recognise that not all referrals for colonoscopy are for the purpose of excluding cancer. The triage guidelines included in this study were designed principally with that focus, although some indirectly account for other serious conditions such as inflammatory bowel disease. All GP referrals for colonoscopy would potentially be triaged using the same criteria and so we chose to include all GP referrals regardless of assumed indication.

Internationally there have been several guidelines designed to determine the 'appropriateness' of colonoscopy, based on the likely diagnostic yield.⁽¹⁰⁾ For example, the European EPAGE II criteria have been shown to have sensitivity and a negative predictive value for detecting significant lesions of 93.1% and 75.5% respectively.⁽¹¹⁾ However, these guidelines have not attempted to rank referrals for colonoscopy in terms of urgency or inform triage. Since the publication of the national and Victorian triage guidelines, an Australian risk prediction model was published using data from 467 colonoscopies performed in a Queensland endoscopy unit.⁽¹²⁾ This demonstrated the potential to improve colonoscopy triage using a combination of age, blood tests and FOBT.

The Victorian guidelines performed better than the National guidelines and the Optimal Cancer Care Pathways. This is principally because the Victorian guidelines were designed to cover all potential indications for colonoscopy, whereas the National guidelines focus on triage of symptomatic patients or surveillance for family history. There were consequently fewer unclassifiable colonoscopies when

applying the Victorian guidelines. We included the Optimal Cancer Care Pathways for completeness, given their national prominence, while recognising that they are not specifically designed to inform colonoscopy triage. We discovered some potential limitations in the National guidelines to identify patients at increased risk of an undiagnosed colorectal cancer. Specifically, older patients with weight loss alone are not captured, and markers of iron deficiency, and not just anaemia, should be included as an indication for colonoscopy, particularly in people aged over 60 years.

In our study, we have shown that guidelines which account for age, symptoms, FOBT in certain symptomatic patients, and markers of anaemia could improve the triage process compared with current approaches. However, this introduces several important implementation challenges. Standard referral letters often lack the level of detail required to apply these triage criteria, particularly about symptom duration and abnormal test results. The National colonoscopy triage guidelines recommend that endoscopy units adopt standard GP referral proformas as part of their implementation to solve this issue.⁽¹³⁾ Based on the Victorian guidelines, we estimate that approximately 6% of patients referred by their GP would require an FOBT to inform the triage process. Endoscopy units would need to establish systems to implement FOBT testing in these symptomatic patients at the point of referral, especially where they operate models of direct access colonoscopy. The National and Victorian triage guidelines are relatively complex to apply systematically. Previous studies have shown that the use of nurse-led triage can improve the adherence to guidelines for surveillance colonoscopy.⁽¹⁴⁾ Alternatively, adherence could be supported by an online triage calculator that implements the Victorian guidelines, and highlights where further referral information or an FOBT is required before the patient can be triaged.

Current national guidelines recommend a maximum of 120 days from first presentation to healthcare until colonoscopy for both Category 1 and Category 2 referrals. In this study, only a single case of colorectal cancer was categorised as Category 2 using either the Victorian or National criteria. The main effect of applying the triage criteria is through downgrading Category 1 referrals to Category 2. However, the benefit on reduced pressure on endoscopy units would only be achieved if the maximum time to endoscopy were shorter for Category 1 than for Category 2. Western Health triaged 92.3% of all referrals as either Category 1 or 2; the adjusted Victorian and adjusted National guidelines would only reduce this to 87.1% and 80.0% respectively. We suggest that the maximum time of 120 days could safely be applied to only Category 1 colonoscopies if the Victorian guidelines were fully implemented.

We have demonstrated the validity of colonoscopy triage guidelines. If successfully implemented, they could significantly improve the triage process, reduce demand for urgent colonoscopies and potentially lead to more timely colorectal cancer diagnosis in Australian public hospitals.

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Table 1. Redistribution of triage categories when applying the adjusted National guidelines.

			Adjusted National guidelines									
Western Health			Category 1		Category 2		Category 3		Not Indicated		Unclassifiable	
Categorisation	n	%	n	%	n	%	n	%	n	%	n	%
Category 1	1814	76.3	1279	70.5	249	13.7	68	3.7	31	1.7	187	10.3
Category 2	381	16.0	80	21.0	154	40.4	48	12.6	16	4.2	83	21.8
Category 3	128	5.4	13	10.2	94	73.4	7	5.5	2	1.6	12	9.4
Not Available	55	2.3	21	38.2	13	23.6	2	3.6	1	1.8	18	32.7
TOTAL	2378		1393		510		125		50		300	

Table 2. *Redistribution of triage categories when applying the adjusted Victorian guidelines.*

			Adjusted Victorian guidelines									
Western Health Triage			Category 1		Category 2		Category 3		Not Indicated		Unclassifiable	
Categorisation	n	%	n	%	n	%	n	%	n	%	n	%
Category 1	1814	76.3	1432	78.9	233	12.8	61	3.4	35	1.9	53	2.9
Category 2	381	16.0	103	27.0	154	40.4	42	11.0	21	5.5	61	16.0
Category 3	128	5.4	17	13.3	95	74.2	4	3.1	3	2.3	9	7.0
Not Available	55	2.3	25	45.5	13	23.6	1	1.8	0	0.0	16	29.1
TOTAL	2378		1577		495		108		59		139	

Table 3. Comparative distribution of triage of cancer cases and respective conversion and detection rates.

	Western Health Triage		Optimal Care Pathway Guidelines		State Guidelines Strict		National Guidelines Strict		State Guidelines Adjusted		National Guidelines Adjusted	
Categorisation	n	%	n	%	n	%	n	%	n	%	n	%
Category 1	82	88.2	75	80.6	77	82.8	55	59.1	85	91.4	61	65.6
Category 2					1	1.1	1	1.1	1	1.1	1	1.1
Category 3	1	1.1							1	1.1	3	3.2
Not Available	10	10.8										
FOBT required							3	3.2				
Not Indicated					1	1.1	1	1.1	1	1.1	4	4.3
Unclassifiable			18	19.4	14	15.1	33	35.5	5	5.4	24	25.8
Conversion rate		4.5		4.0		6.2		5.1		5.4		4.4
Detection rate		88.2		80.6		82.8		59.1		91.4		65.6

Abstract

Background and aims. This study aimed to assess the diagnostic performance of National and Victorian colonoscopy triage guidelines and potential redistribution of triage categories.

Methods. Diagnostic validation study comparing colonoscopy triage guidelines against a reference colonoscopy dataset. *Participants:* reference dataset of 2,378 colonoscopies from 1 October 2014 to 30 June 2016. Comparison with triage categorisation determined using: National Cancer Council Australia guidelines; Victorian triage guidelines; Optimal Cancer Care Pathways recommendations. *Main outcome measures.* i. Proportion of colonoscopies assigned to each triage category; ii. detection rate (proportion of cancers assigned to triage Category 1); iii. conversion rate (proportion of triage Category 1 colonoscopies which diagnose a cancer).

Results. After adjusting for data absent in referrals, the National and Victorian guidelines reduced the proportion of Category 1 colonoscopies compared with the reference triage (National 76.3% vs 58.6%; 95% CI for difference 15.0 – 20.3% $p < 0.0001$. Victorian 76.3% vs 66.3%; 95% CI for difference 7.4 – 12.6% $p < 0.0001$). Victorian guidelines were associated with the highest detection rate (91.4%) and a conversion rate of 5.4% although the number of cancers limited the power to detect significant differences on these metrics. There was a higher proportion of unclassifiable colonoscopies using the National guidelines than the Victorian ones due to their focus on symptomatic indications.

Conclusions. The Victorian guidelines could reduce the proportion of Category 1 colonoscopies by 10% without reducing conversion or detection rates. This would require improvements in the quality of referrals and ordering faecal occult blood tests in 6% of symptomatic patients.

Keywords. Colonoscopy. Triage. Guideline. Colorectal neoplasms. Risk assessment.

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