

Colonoscopy Key Performance Indicators in a Rural General Australian Hospital

A Martin, G Purcell, J Roberts-Thomson, D Brockwell

Citation

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Abstract

We evaluated colonoscopic neoplastic yield (adenomas and cancers) in a rural endoscopic unit alongside several key performance indicators known to influence yield. A second aim was to compare neoplastic yield according to colonoscopic indication. **Methods** - We retrospectively audited 371 colonoscopies (163 male, 208 female) undertaken over six months (2007-2008) at the Mersey Hospital, Tasmania. **Results** - Caecal intubation rate was 86.79% (males 90.8%, females 83.65%); bowel preparation judged as good (56.87%), fair (22.37%), poor (13.48%), not recorded (7.28%). Adenoma Detection Rate (ADR) was 11.86% (males 18.4%, females 6.7%). Inclusion of cancers - Significant Neoplastic Lesion Rate (SNL) was 15.9% (males 20.86%, females 12.02%). Mean withdrawal time to anus was 5.76 minutes with significantly higher ADR for 6-10, 11-15 and >15 minutes than 0-5 minutes ($p < 0.0001$). SNL detection rates for major presenting indications were expressed as number needed to screen (NNS) with 95% confidence intervals (CI). Results: PR bleeding, NNS = 5, CI 3.45-7.69; Anaemia, NNS = 9.5, CI = 4-25; Abdominal Pain, NNS = 12.76, CI 5.26-33; Change in bowel habit, NNS = 6, CI 3.33-12.5; Family history colorectal cancer, NNS = 4.83, CI 3.03-8.33; Positive Faecal Occult Blood, NNS = 4.26, CI = 2.94-6.67, without significant sex differences amongst groups ($p = 0.5186$). **Conclusions** - ADR fell short of benchmark standards (25% males, 15% females); with slightly lower than recommended caecal intubation rate ($\geq 90\%$). Adequacy of bowel preparation was comparable to reference ranges. A statistically-significant trend between rapid withdrawal times and lower ADR was found, although caution should be exercised in interpretation.

INTRODUCTION

Colonoscopy is without dispute the gold standard for clinical evaluation of the colon.¹ However its effectiveness as a tool for the detection of significant neoplastic lesions, (adenomas and cancers) – here referred to as “SNL”, has been shown to be closely correlated with several key performance indicators. These form the basis of current screening guidelines and include: 1). Caecal Intubation rate², 2). Adequacy of bowel preparation³ and 3). Withdrawal time to anus^{4,5}.

A caecal intubation rate of $\geq 90\%$ is the recommended standard by the U.S. Multi-Society Task Force on Colorectal Cancer among other advisory bodies⁶, while published rates vary widely from 55-98.8%². Successful caecal intubation has been shown to be heavily dependent on the clinical experience of the operator⁷⁻⁸; although factors independent of the operator may limit outcomes including previous pelvic surgery, female gender and a long transverse colon⁹⁻¹⁰. Longer withdrawal times furthermore are associated with higher adenoma detection rates (ADR) after adjustment of

other variables, with the U.S. Multi Society Task Force on Colorectal Cancer recommending a minimum of 6-10 minutes; that being the mean time for operators with low rates of missed adenomas^{4,11-12}. The Task Force (2002) also recommended a benchmark ADR of 25% for males and 15% for females over 50¹³.

We evaluated colonoscopies undertaken at the endoscopic unit of a rural general hospital for: 1). SNL detection rate (including ADR). 2). Caecal intubation rate, 3). Adequacy of bowel preparation and 4). Withdrawal time to anus. Secondly, we evaluated SNL detection rates for different colonoscopic indications with relevance to the wider body of knowledge contributing to the sometimes difficult question of when to screen.

PATIENTS AND METHODS

DATA RETRIEVAL

Data was retrieved retrospectively. Colonoscopic indication, adequacy of bowel preparation, endoscopic findings and success/failure of caecal intubation were entered from

medical records. Withdrawal time to anus was retrieved from a log book kept in the endoscopy unit and histopathology from an electronic database.

PATIENTS

All patients who had a colonoscopy at the Mersey General Hospital, Tasmania over six months (Nov 2007- April 2008) were included.

BOWEL PREPARATION

Prior to colonoscopy, all patients received a leaflet entailing directions for fasting and bowel preparation. Patients were instructed to restrict intake to clear fluids after breakfast from the day before colonoscopy with units of Picoprep® or Picolax® at 15:00, 17:30 and 19:00 followed by fasting from 6:30 on the day of colonoscopy. Bowel Preparation was assessed semi-subjectively as good (>75% bowel wall visualised), fair (35-75% visualised) and poor (<35% visualised)¹⁴

PROCEDURES

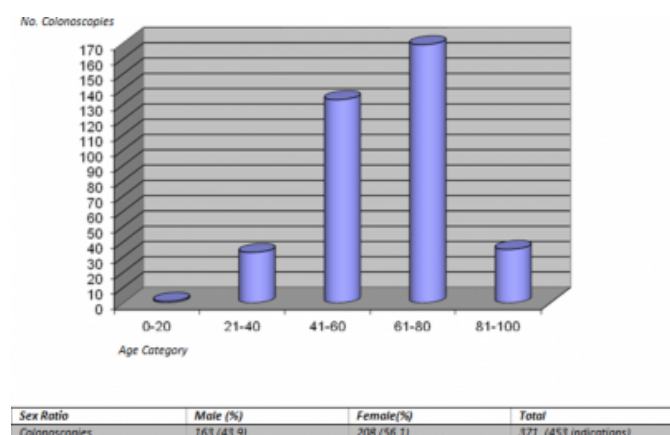
All patients received propofol for sedation plus a narcotic (fentanyl or alfentanil) and/or midazolam. There were nine endoscopists of which seven were General Surgeons, one registrar and one physician. Completion was defined as visualisation of one or all of the Triradiate Fold, Appendiceal Orifice and the Ileo-caecal Valve.

RESULTS

DEMOGRAPHICS

371 patients received colonoscopies (163 male, 208 female) for 453 indications. The vast majority were in age categories 41-60 and 61-80.

Figure 1



ENDOSCOPIC FINDINGS

153 procedures (41%) were normal. 77 polyps were detected in 73 patients of which 52 were adenomas. 15 cancers were detected in 15 patients, all adenocarcinomas. Diverticular Disease was detected in 99 patients (26.7%)

Figure 2

Endoscopic Finding	Number of Patients (%)
Normal Colonoscopy	154 (41.5)
Polyps	73 (19.7); Adenomas n = 44
Cancer	15 (4.0)
Diverticular Disease	99 (26.7)
Non Malignant Obstructing Mass	5 (1.3)

Other – Haemorrhoids (10), proctitis/colitis (9), pruritis ani (1), caecal inflammation (2), Anal Thrush (1), Melanosis coli (1), bleeding mucosa (1), angiodysplasia (1), Rectal Ulcer Syndrome (1), not recorded (14)

COLONOSCOPY KEY PERFORMANCE INDICATORS

ADR fell short of benchmark standards at 11.86% of procedures overall (males 18.4%, females 6.7%). Inclusion of cancers (SNL detection rate) yielded 15.9% (males 20.86%, females 12.02%) with a statistically significantly higher proportion for males ($p < 0.0001$), whereas there were no significant differences in SNL detection rates between age categories of 21-40, 41-60, 61-80, >80 ($p = 0.3145$)

Figure 3

Neoplastic Detection Rate (% of procedures)	Male	Female	Overall
Adenoma	18.4	6.7	11.86 (n = 44 positive procedures with 52 lesions)*
Cancer	2.2	5.32	5.04 (n = 15 positive procedures with 15 lesions)**
SNL	20.6	12.02	15.9 (n = 59 positive procedures with 67 lesions)

*14 adenomas had villous components
** All adenocarcinomas

Overall caecal intubation rate was 85.6% (males 90.5%, females 81.4%) not including those not recorded (0.9%). Most common causes for failure were poor bowel preparation (n = 18), obstructing mass/stricture (n = 9) and excessive bowel looping or difficult angulation (n = 9).

Figure 4

Caecal Intubation Rate	Successful (%)	Unsuccessful	Not Recorded
Total	321 (85.6)	46	3
Male	148 (90.5)	14	1
Female	174 (81.4)	32	2

Figure 5

Reasons for Failed Caecal Intubation	Frequency
Excessive bowel looping/angulation	9
Obstructing stricture/mass	9
Excessive diverticulosis making progress dangerous	3
Poor bowel prep	18
No Cecum due to previous surgery	2

Other – bowel perforation (1), bowel spasm (1), adverse reaction to anaesthetic (1), not recorded (2)

Bowel preparation was judged as adequate in 79.24% (good = 56.87 %, fair = 22.37%), poor = 13.4%, not recorded = 7.28%.

Figure 6

Adequacy of Bowel Preparation	No. (%)
Good	211 (56.9)
Fair	83 (22.4)
Poor	30 (13.3)
Not recorded	27 (7.3)

Mean withdrawal time to anus was 5.76 minutes. ADR for withdrawal time categories of 0-5, 6-10 and > 11 minutes were compared defining ADR as number of lesions detected rather than positive procedures yielding adenomas (or SNL) consistent with previous studies^{4,11-12}. There were no significant differences in male: female ratio ($p = 0.3749$) or the major colonoscopic indications listed in Table 5 ($p = 0.9614$) between categories. Withdrawal times of 6-10 and >11 minutes yielded greater ADR than 0-5 minutes ($p < 0.0001$) with no differences between the two longer categories ($p = 0.1714$). All patients with multiple adenomas (6 patients with 12 adenomas) were in the longer time categories.

Figure 7

Withdrawal time to anus	Withdrawal Time (min)	Adenoma detection/Total Colonoscopies	Statistical Analysis (X ²)
A	0-5	14/191	
B	6-10	23/77	$p < 0.0001$ comparing ADR for categories A and B $p < 0.0001$ comparing ADR for categories A and C
C	≥ 11	15/32	$p = 0.1714$ comparing ADR for categories B and C
Incomplete		0/47	
Not recorded		0/52	

SNL DETECTION RATES ACCORDING TO INDICATION

Below we compare Number Needed to Screen (NNS) for detection of SNL against colonoscopic indication using X² univariate analysis. PR bleeding, change in bowel habit, family history of colorectal cancer and positive Faecal Occult Blood all showed high diagnostic yield. For each indication category there were no significant differences in sex ratio ($p = 0.5186$).

Figure 8

Indication	No. (M = males; F = females)	Significant Neoplastic Lesion	Adenoma	Cancer	Number needed to Screen*	CI (95%)
Symptomatic						
PR Bleeding	100 (M 52, F 48)	20(20%)	17	6	5	3.6-7.7
Abdominal Pain	51 (M16, F 35)	4(7.84%)	3	1	12.8	5.3-33
Anaemia	38 (M11, F27)	4 (10.5%)	3	1	9.5	4-25
Change Bowel Habit	48 (M17, F31)	8 (16.7%)	7	2	6	3.3-12.5
Other - bowel obstruction (3), abdominal distension (3), ascites (2), enterocutaneous fistula (1), abdominal/pelvic mass (1), faecal incontinence (1), perianal itch (1), lethargy (1), investigation of suspected IBD (2), investigation of suspected diverticulitis (2)						
Screening						
Family History of Cancer	58 (M 27, F 31)	12(20.7%)	11	2	4.8	3.0-8.3
FOB +ve	81 (M 35, F46)	19(23.5%)	15	6	4.3	2.9-6.7
Other - Family History IBD (1), FAP (1), investigation of radiological findings (2),						
Surveillance						
Past History of Colorectal Cancer	18 (M 9, F 9)	1(5.6%)	1	0	18	3.57- ^{##}
Past history of polyps	26 (M 13, F 13)	3(11.1)	3	0	9	3.5-33.3
Other - Past History IBD (7), Past History Extra-colonic malignancy (5)						

*Clinical categories compared with X² goodness of fit tests. Results: 1). No statistically significant differences between indications for distribution of age groups 21-40, 41-60, 61-80, >80, $p = 0.3145$. 2). A greater overall SNL detection rate for males, $p < 0.0001$. 3). No statistically significant differences between proportions of males and females for each indication, $p = 0.5186$

DISCUSSION

Colonoscopy, alongside Faecal Occult Blood testing has been shown to lower mortality. The Australian Institute of Health and Welfare (AIHW) statistics for 2006 listed Colorectal Cancer as the second most common cause of cancer at an annual incidence of 13.1% of all newly diagnosed cancers¹⁵. Similarly, 9.7% of all mortality attributable to cancer was due to colorectal cancer¹⁶. Detection of adenomas remains a good surrogate for malignancy, with a 5% transformation rate¹⁷. ADR in our study fell below benchmark standards, especially in women; although the wide range of ADR in the literature must be appreciated.

ADR is subject to numerous variables. Male sex as shown in our study is a recognised independent risk factor¹¹. Notably our study had a higher proportion of female participants. There were no statistically significant differences across age categories; although the majority of studies point to age being an independent risk factor¹⁸. Adequacy of bowel preparation ranked reasonably well at 79.24% alongside a 77% adequacy rate found across 93,004 cases in the US¹⁹ without including 7.28% of cases for which quality of bowel preparation was not recorded. Importantly, the semi-subjective nature of assessing quality of bowel preparation must be recognised, especially given that no universally-recognised system for evaluating quality of bowel preparation exists¹⁹.

Our finding of lower ADR at withdrawal times 0-5 minutes is significant and consistent with a wide body of literature¹². Importantly we have accounted for the confounding effects of sex ratio and relative proportions of screening indications on withdrawal time categories. Similarly, all patients with multiple adenomas detected belonged to longer withdrawal

time categories. The significance of the latter point is uncertain, but it may be speculated that initial detection of adenomas may cause the endoscopist to slow down. However, an important confounder to higher ADR at longer withdrawal times is the time taken to snare polyps during withdrawal which intuitively would increase with number of polyps detected. Importantly we have not recorded for adenoma size. The malignant potential of adenomas < 10 mm remains controversial²⁰.

Few studies have been performed comparing the diagnostic yield of presenting indications. Importantly there was a large amount of overlap with 453 indications across the 371 patients, especially for abdominal pain and PR bleeding. Our findings were somewhat comparable to a significantly larger Dutch trial¹⁸ (n = 4623) which found SNL detection rates of 15% for PR bleeding; 21% for abdominal pain and/or change in bowel habit; 8% for Anaemia; 10% for past history of Colorectal Cancer and 13% for past history of polyps. Significantly their SNL detection rate for family history of colorectal cancer was 10% compared to our finding of 20.69%. Faecal Occult Blood remains a useful screening tool for asymptomatic patients with published meta-analyses showing reduction in mortality from colorectal cancer by 14-16%²¹⁻²²; hence the federal initiative (2006) of the largely successful National Bowel Screening Program with detection rates of 5.2% for cancers and 12.4% for adenomas²³.

References

1. Lindsay D, Freeman J, Cobden I, Record C. Should Colonoscopy be the first investigation for colonic disease? *BMJ* 1998;296:167-69.
2. Mitchell R, McCallion K, Gardiner K, Watson R, Collins J. Successful colonoscopy; completion rates and reasons for incompleteness. *The Ulster Medical Journal* 2002;71(1):34-37.
3. Gorard D, McIntyre, A. Completion rate to caecum as a quality measure of colonoscopy in a district general hospital *Colorectal Disease* 2004;6:243-49.
4. Rex D, Bond J, Winawer S. Quality in the technical performance of colonoscopy and the continuous quality improvement process for colonoscopy: recommendations of the U.S. Multi-Society Task Force on Colorectal Cancer. *Am J Gastroenterol* 2002;97:1296-308.
5. Barclay R, Vicari J, Doughty A. Colonoscopic withdrawal times and adenoma detection during screening colonoscopy. *N Eng J Med* 2006;355:2533-41.
6. Bowles C, Leicester R, Romaya C, Swarbrick E, Williams C, Epstein O. A prospective study of colonoscopy practices in the UK today: Are we adequately prepared for national colorectal cancer screening tomorrow? *Gut* 2004;53:277-90.
7. Parry B, Williams S. Competency and the colonoscopist: a learning curve *Aust NZ J Surg* 1991;61(6):419-22.
8. Zauber A. Quality Control of Flexible Sigmoidoscopy: Which Polyps Count? . *Gastroenterology* 2004;126:1474-80.
9. Cirocco W, Rusin L. Factors that predict incomplete colonoscopy. *Dis Colon Rectum* 1995;38(9):964-68.
10. Saunders B, Fukunoto M, Haaligan S, Jobling C, Moussa M, Bartram C, et al. Why is colonoscopy more difficult in women? *Gastrointest Endosc* 2010;71:782-86.
11. Taber A, Romagnuolo J. Effect of simply recording colonoscopy withdrawal time on polyp and adenoma detection rates. *Gastrointest Endosc* 2010;71:782-86.
12. Lieberman D. A call to action – measuring the quality of colonoscopy. *N Eng J Med* 2006;355:2588-89.
13. Benson M, Reichelderfer M, Said A, Gaumnitz E, Pfau P. Variation in Colonoscopic Technique and Adenoma Detection Rate at an Academic Gastroenterology Unit. *Dig Dis Sci* 2010;55:166-71.
14. Selehi S, Leung E, Wong L. Factors affecting outcomes in Colonoscopy. *Gastroenterology Nursing* 2007;31:56-63.
15. Australian Institute of Health and Welfare. National Bowel Cancer Screening Program: annual monitoring report 2009: data supplement 2010, Part 6 Incidence of bowel cancer [PDF on internet]. Canberra: Commonwealth of Australia, [released 28 October 2009]. Available from <http://www.aihw.gov.au/publication-detail/?id=6442468298&tab=2>.
16. Australian Institute of Health and Welfare. National Bowel Cancer Screening Program: annual monitoring report 2009: data supplement 2010, Part 7 Mortality from bowel cancer [PDF on internet]. Canberra: Commonwealth of Australia, [released 28 October 2009]. Available from <http://www.aihw.gov.au/publication-detail/?id=6442468298&tab=2>.
17. Morson BC, Dawson IMP, Day DW, Jass JR, Price AB, Williams G. *Morson and Dawson's Gastrointestinal Pathology*. Oxford: Blackwell Scientific Publications, 1990.
18. Droste J, Craanen M, Van Der Halst R et al. Colonoscopic yield of colorectal neoplasia in daily clinical practice. *World Journal of Gastroenterology* 2009;15(9):1085-92.
19. Denis B, Weiss A, Peter A, Bottlaender J, Chiappa P. Quality assurance and gastrointestinal endoscopy: an audit of 500 colonoscopic procedures. *Gastroenterol Clin Biol* 2004;28:1245-55.
20. Noshirwani K, Van Stolk R, Rybicki L, Beck G. Adenoma size and number are predictive of adenoma recurrence: implications for surveillance colonoscopy. *Gastrointest Endosc* 2000;51:433-37.
21. Heresbach D, Manfredi S, D'halluin P, Bretagne J, Branger B. Review in depth and meta-analysis of controlled trials of colorectal cancer screening by faecal occult blood test. *Eur J Gastroenterol Hepatol* 2006;18(4):427-33.
22. Towler B, Irwig L, Glasziou P, Kewenter J, Weller D, Silagy C. A systematic review of the effects of screening for colorectal cancer using the faecal occult blood test, hemoccult. *BMJ* 1998;317(7158):559-65.
23. Australian Institute of Health and Welfare. Cancer in Australia: an overview, 2008 [PDF on internet]. Canberra: Commonwealth of Australia, [Released 9 December 2008]. Available from: www.aihw.gov.au/publications/can/ca08/ca08.pdf

Author Information

A.P Martin, MBBS, BPharm, BPharm Sci Hons

Surgical Registrar, Frankston Hospital

G.A Purcell, MBBS, BSc

Surgical Registrar, Bundaberg Base Hospital

J Roberts-Thomson, MBBS, FRACS

General Surgeon, Mersey Community Hospital

D Brockwell, MBBS, FRACS

General Surgeon, Mersey Community Hospital