Cancer Council Australia

Clinical practice guidelines for surveillance colonoscopy

CLINICAL PRACTICE GUIDELINES FOR SURVEILLANCE COLONOSCOPY

Please note that the *Clinical Practice Guidelines for Surveillance Colonoscopy (2011)* are currently under revision.

Please contact guidelines(at)cancer.org.au if you would like to be notified via email when the draft guidelines are launched for public consultation in 2018.

Resources for health professionals

Note: These resources have been developed, reviewed or revised within the last five years, however they are based on the *Clinical Practice Guidelines for Surveillance Colonoscopy (2011)* and *Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer (2005)*, which were developed, reviewed or revised more than five years ago.

- Algorithm for Colonoscopic Surveillance Intervals - Adenomas
- Algorithm for Colonoscopic Surveillance Intervals - Following Surgery for Colorectal Cancer
- Algorithm for Colonoscopic Surveillance Intervals - IBD

1 Foreword

Back to content page

Foreword

Bowel cancer is common and frequently lethal. In 2007, more than 14,200 Australians were diagnosed with colorectal cancer (CRC) and more than 4,000 died from it, making it the nation's second leading cancer killer. Lifetime risk of CRC (by age 85) was 1 in 12. Despite these sobering statistics, there is a potential window of opportunity afforded by the polyp-cancer sequence of CRC, during which colonoscopy can remove polyps or detect cancer while it is still curable.

These Guidelines are an update (and a substantial expansion) of several small sections of the 2005 Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer. They focus on the appropriate use of colonoscopy in CRC prevention and address three simple questions;

(i) when to repeat colonoscopy after adenomatous polypectomy,

(ii) when to repeat colonoscopy after curative resection for colorectal cancer, and

(iii) when to perform colonoscopy in those patients with inflammatory bowel disease, who have an increased risk of developing CRC?

Thus, they address the issue of appropriate scheduling of future colonoscopy in patients known to be at above-average risk for CRC development (i.e. patients who have already had adenomatous polyps removed or surgery for CRC, and patients with inflammatory bowel disease). The purpose of these Guidelines is to assist those involved in the Australian healthcare system in making decisions about the timing of surveillance colonoscopy, namely referring general practitioners and colonoscopists, with the intention of reducing the incidence of and mortality from CRC.

In the last 10-15 years, there have been major changes in thinking about colonoscopy and its effectiveness in reducing deaths from CRC. It is apparent that colonoscopy has its limitations; awareness has grown about the issue of missed lesions and it seems that colonoscopy may not be as protective against the development of CRC in the proximal colon as it is more distally. It has also become clear that the efficacy of colonoscopy in reducing the risk of CRC is crucially dependent on careful inspection; withdrawal time has emerged as an important but crude surrogate marker of procedural quality.

In assessing the literature to develop these Guidelines, it has frequently been necessary to extrapolate from published evidence. It is also challenging to interpret data from studies 10 or 20 years old, given technical improvements in colonoscopy in the meantime and growing awareness about how carefully the procedure needs to be performed to maximise its effectiveness. It remains to be seen whether the anticipated more complete clearance of colonic neoplasia by "modern" colonoscopy will translate into recommendations for longer surveillance intervals in future guidelines.

In Australia, colonoscopy has also become a public health issue since the advent of the National Bowel Cancer Screening Program. An offshoot of the NBCSP, the Quality Working Group, addressed a broad range of elements of quality in the delivery of colonoscopy, one of which is the scheduling of future colonoscopies in patients at above-average risk of developing CRC. As guidelines, the recommendations which follow cannot be applied rigidly to each and every patient. Nevertheless, this up-to-date, evidence-based literature review may help

colonoscopists to better manage not only their patients, but also their colonoscopy waiting lists and balance the demands of groups of patients with different procedural indications. Frequent surveillance colonoscopy, repeated earlier than recommended by guidelines, should not be seen as an acceptable substitute for high-quality colonoscopy. It should also be remembered, as evidenced by the Quality Working Group's comprehensive report, that appropriately timed surveillance colonoscopy represents only one step in the overall pathway of quality colonoscopy delivery.

Dr Cameron Bell

Chair, Surveillance Colonoscopy Guidelines Working Party

2 Introduction

References

3 Summary of recommendations

3.1 Summary of recommendations

For explanation of levels of evidence and grades for recommendations, see #Levels of evidence and grades for recommendations below.

3.2 Colonoscopic surveillance after polypectomy

3.2.1 Adenomas and risk of developing colorectal cancer

Point(s)
*Determination of risks for patients with adenomas must clearly distinguish between 1. variables that relate to the likelihood of any particular adenoma having a malignant focus and 2. variables that relate to patient, pathological and epidemiological characteristics which predict a risk of future (metachronous) adenomas and cancers. Patients whose only polyps are small, pale, distal, hyperplastic polyps require no colonoscopic follow-up..

Point(s)
Proximal location of adenomas may be a risk factor for metachronous neoplasia. The extent to which this is driven by the difficulty of detecting proximal polyps, because of their flat and unobtrusive nature (ie. sessile serrated polyps), poor bowel preparation and anatomical blind spots in the right colon, is unclear. For these reasons the right colon deserves particularly careful scrutiny at colonoscopy.
Because of the complexity of multivariate analyses equations to predict of individual patient risk of(for metachronous polyps), their use currently is difficult to apply to day to day practiceoffers little benefit over simpler and more practical guideline-driven decisions.

3.2.2 Polypectomy

Point(s)
All polyps should be considered for removal. Diminutive polyps (5mm or less) may be too numerous to be cleared completely. In patients with multiple small polyps, a sample of at least three should be taken for histological study. However, if a syndromic diagnosis is under consideration, then sampling of many more polyps is important, to guide decisions on which gene should be subjected to mutational analysis.
Tattooing any polyp site where there is a possibility that surgical resection will be needed is important at the primary colonoscopy if at all possible, or very soon after with a second procedure. This is necessary even for conventional surgery, as the site of polypectomy may well be impalpable, but particularly important where follow-up treatment may be laparoscopic, as the surgeon has no capacity to palpate the area.

3.2.3 Malignant polyps

Point(s)
In general, malignant polyps which, 1. Have a clear margin of excision, 2. Are well or moderately differentiated, 3. Lack lymphatic or venous invasion and 4. Are endoscopically assessed as totally removed can be managed without subsequent surgical resection. However, the decision needs to be individualized with respect to the particular histological and endoscopic features and the patient’s age and co-morbidities.

3.2.4 Follow-up surveillance for adenomas

Point(s)
High quality colonoscopy is critically important for good practice and patient safety. Adenoma detection rates (ADRs) should be monitored, though they will be influenced by patient mix (eg. age profile, indications). ADRs within the National Bowel Cancer Screening Program provide a sound basis for benchmarking.
Colonoscopy surveillance intervals should be planned when the colonoscopist is satisfied that the colon has been completely cleared of polyps and the polyp histology is known.

3.2.5 First surveillance intervals following removal of low-risk conventional adenomas only

Recommendation	Grade
Low-risk individuals – conventional adenomas only First surveillance intervals should be no sooner than 5 years following the complete removal of low-risk conventional adenomas only (1–2 small [<10mm] tubular adenomas without high-grade dysplasia).	**D**

Point(s)
Consistently high-quality colonoscopy is imperative for optimal cost effectiveness and for implementation of uniform surveillance guidelines.
Polyp/adenoma size as per the endoscopist documentation should be used for determining surveillance intervals. All endoscopists should ensure size measurements are accurate using a reference standard (eg an open biopsy forceps or snare).
Surveillance intervals should be determined after the colon has been cleared of all significant neoplasia, once histology is known and in the context of individualised assessment of benefit to the patient.
A shorter surveillance interval of 5 years could be considered for men who fit the criteria for the metabolic syndrome, because they may have increased risk of metachronous advanced neoplasia following removal of low-risk adenomas.
Return to the National Bowel Cancer Screening Program with a faecal occult blood test after 4 years, is an appropriate option and should be discussed with the patient.

Point(s)
Patients with 1–2 diminutive (<6mm) low-risk adenomas have a very low risk of metachronous neoplasia and should be returned to the NBCSP after 4 years unless there are significant extenuating factors.
Individuals with a significant family history of colorectal cancer should be assessed according to current Australian clinical practice guidelines for the prevention, early detection and management of colorectal cancer (see Risk and screening based on family history) in addition to these recommendations, and the shorter interval used.

Point(s)
Low-risk individuals – conventional adenomas only First surveillance interval of 10 years is appropriate for most individuals following complete removal of low-risk conventional adenomas only (1–2 small [<10mm] tubular adenomas without high-grade dysplasia).

3.2.6 First surveillance intervals following removal of high-risk conventional adenomas only

Recommendation	Grade
High-risk individuals – conventional adenomas only First surveillance intervals should be within 5 years following removal of high-risk conventional adenomas only, i.e. those with one or more of the following features: ■ size ≥10mm ■ high-grade dysplasia ■ villosity ■ 3–4 adenomas.	**D**

Point(s)
Surveillance intervals should be determined after the colon has been cleared of all significant neoplasia, once histology is known, and in the context of individualised assessment of benefit to the patient.
Consistently high-quality colonoscopy is imperative for optimal cost effectiveness and for implementation of uniform surveillance guidelines.

Point(s)
Polyp/adenoma size as per the endoscopist documentation should be used for determining surveillance intervals. All endoscopists should ensure size measurements are accurate using a reference standard (eg an open biopsy forceps or snare).
Polyps removed at colonoscopy should be sent separately for histology to guide surveillance recommendations.
Clinicians should accurately include features relevant to surveillance intervals in their procedure reports so that individualised surveillance recommendations can be made.

Point(s)
High-risk individuals – conventional adenomas only First surveillance intervals following removal of high-risk conventional adenomas only should be stratified according to the type and number of high-risk features (size ≥10mm, high-grade dysplasia (HGD), villosity, 3–4 adenomas): A surveillance interval of 5 years is recommended for patients with either of the following: + 1–2 tubular adenomas with HGD or tubulovillous or villous adenomas (with or without HGD), all of which are <10mm + 3–4 tubular adenomas without HGD, all of which are <10mm A surveillance interval of 3 years is recommended for patients with any of the following: + 1–2 tubular adenomas with HGD or tubulovillous or villous adenomas (with or without HGD), where the size of one or both is ≥10mm + 3–4 tubular adenomas, where the size of one or more is ≥10mm + 3–4 tubulovillous and/or villous adenomas and/or HGD, all <10mm

3.2.7 First surveillance intervals following removal of large sessile or laterally spreading adenomas

Point(s)
Consideration should be given to referring large sessile and laterally spreading lesions to experienced clinicians trained in and regularly undertaking high quality EMR to reduce the risk of recurrence.
Patients with large sessile and laterally spreading lesions should be informed of the requirement for

Point(s)
scheduled surveillance before proceeding to EMR.
At surveillance following piecemeal or en-bloc excision of large sessile and laterally spreading lesions, the EMR scar should be identified, photodocumented and systematically evaluated for recurrence, including biopsies. These individuals are at high risk for synchronous and/or metachronous lesions and require very careful evaluation of the remaining colon at the same time.
Endoscopic mucosal resection (EMR) of large sessile and laterally spreading lesions (>20mm) is usually piecemeal and all lesions that undergo piecemeal excision are at higher risk of recurrence and require scheduled surveillance. Risk factors for recurrence after EMR are piecemeal excision, larger lesion size (>40mm) and the presence of high-grade dysplasia in the resected specimen.
In patients who have undergone piecemeal excision of large sessile and laterally spreading lesions (in whom the first surveillance colonoscopy at 6 months is clear), the next surveillance colonoscopy should be considered around 12–18 months, especially in those who had large lesions (>40mm) or high-grade dysplasia at index EMR.
Consideration should be given to tattooing all lesions which may need to be identified subsequently. Those that may need surgical resection should be tattooed distal to the lesion in three locations around the circumference of the bowel to facilitate recognition.
Consistently high-quality colonoscopy is imperative for optimal cost effectiveness and for implementation of uniform surveillance guidelines.
Polyp/adenoma size as per the endoscopist documentation should be used for determining surveillance intervals. All endoscopists should ensure size measurements are accurate using a reference standard (eg an open biopsy forceps or snare).

Point(s)
Large sessile and laterally spreading lesions First surveillance interval should be approximately 12 months in individuals who have undergone **en-bloc** excision of large sessile and laterally spreading lesions.
Large sessile and laterally spreading lesions First surveillance interval should be approximately 6 months in individuals who have undergone **piecemeal** excision of large sessile and laterally spreading lesions.

3.2.8 First surveillance intervals following removal of serrated polyps (with or without conventional adenoma)

Recommendation	Grade
Sessile and traditional serrated adenomas (with or without conventional adenomas) First surveillance intervals should be no greater than 5 years and should be based on features of synchronous conventional adenomas (if present) following complete removal of sessile and traditional serrated adenomas.	**D**

Point(s)
Surveillance is recommended for 'clinically significant' serrated polyps: + sessile serrated adenomas + traditional serrated adenomas + hyperplastic polyps ≥10mm.
High-quality endoscopy is imperative to identify accurately and to completely remove sessile and traditional serrated adenomas and synchronous conventional adenomas.
Polyp/adenoma size as per the endoscopist documentation should be used for determining surveillance intervals. All endoscopists should ensure size measurements are accurate using a reference standard (eg an open biopsy forceps or snare).
Polyps removed should be submitted separately for histologic assessment to inform surveillance recommendations.
High-quality pathology interpretation is critical to correctly diagnose sessile and traditional serrated lesions and advanced serrated polyps.
High-quality reporting from endoscopists and pathologists is required to allow accurate risk stratification for surveillance interval recommendations.
Surveillance intervals should be determined after the colon has been cleared of all significant neoplasia, once histology is known and in the context of individualised assessment of benefit to the patient.
Small, particularly distal, true hyperplastic polyps do not require surveillance.
Clinicians should be aware of the cumulative serrated polyp count and diagnostic criteria for serrated polyposis syndrome and recommend surveillance. See *Clinical practice guidelines for the prevention, early detection and management of colorectal cancer*, Serrated polyposis syndrome for diagnostic

Point(s)
criteria and recommended surveillance.

Point(s)
Sessile and traditional serrated adenomas (with or without conventional adenomas) First surveillance intervals should be based on the number, size and presence of dysplasia in the serrated polyps and synchronous conventional adenomas (if present) following complete removal of sessile and traditional serrated adenomas. **Clinically significant serrated polyps only** 5 years for: + 1–2 sessile serrated adenomas all <10mm without dysplasia. 3 years for: + 3–4 sessile serrated adenomas, all <10mm without dysplasia + 1–2 sessile serrated adenomas ≥10mm or with dysplasia, or hyperplastic polyp ≥10mm + 1–2 traditional serrated adenomas, any size. 1 year for: + ≥5 sessile serrated adenomas <10mm without dysplasia + 3–4 sessile serrated adenomas, one or more ≥10mm or with dysplasia + 3–4 traditional serrated adenomas, any size. **Clinically significant serrated polyps and synchronous conventional adenomas** 5 years for: + 2 in total, sessile serrated adenoma <10mm without dysplasia. 3 years for: + 3–9 in total, all sessile serrated adenomas <10mm without dysplasia + 2–4 in total, any serrated polyp ≥10mm and/or dysplasia + 2–4 in total, any traditional serrated adenoma. 1 year for: + ≥10 in total, all sessile serrated adenomas <10mm without dysplasia

Point(s)
≥5 in total, any serrated polyp ≥10mm and/or dysplasia ≥5 in total, any traditional serrated adenoma. **Synchronous high-risk conventional adenoma (tubulovillous or villous adenoma, with or without HGD and with or without size ≥10mm)** 3 years for: 2 in total, sessile serrated adenoma <10mm, without dysplasia 2 in total, serrated polyp ≥10mm and/or dysplasia 2 in total, any traditional serrated adenoma. 1 year for: ≥3 total adenomas, sessile serrated adenoma any size with or without dysplasia ≥3 total adenomas, one or more traditional serrated adenoma.

3.2.9 First surveillance intervals following removal of ≥5 conventional adenomas only

Recommendation	Grade
≥5 conventional adenomas only First surveillance intervals following complete removal of ≥5 conventional adenomas only, should be no longer than 3 years.	**D**

Point(s)
Surveillance intervals should be determined after the colon has been cleared of all significant neoplasia, once histology is known, and in the context of individualised assessment of benefit to the patient.
Consistently high-quality colonoscopy is imperative for optimal cost effectiveness and for implementation of uniform surveillance guidelines.
Polyp/adenoma size as per the endoscopist documentation should be used for determining surveillance intervals. All endoscopists should ensure size measurements are accurate using a reference standard (eg an open biopsy forceps or snare).
Polyps removed at colonoscopy should be sent separately for histology to guide surveillance recommendations.

Point(s)
Clinicians should accurately record adenoma features relevant to surveillance intervals so that individualised surveillance recommendations can be made.
An underlying familial predisposition to colorectal cancer should be considered in all individuals with ≥10 polyps removed. Referral to a familial cancer clinic should be considered, along with appropriate psychological support. Separate screening and surveillance recommendations apply to patients with diagnosed or likely familial syndromes (see Should family history affect surveillance intervals?).

Point(s)
≥5 conventional adenomas only First surveillance intervals should be within 3 years and stratified based on the number, size and histology following complete removal of ≥5 adenomas only. For those with 5–9 adenomas, recommended surveillance intervals are: + 3 years if all tubular adenomas <10mm without high grade dysplasia (HGD) + 1 year if any adenoma ≥10mm or with HGD and/or villosity For those with ≥10 adenomas, the recommended surveillance interval is 1 year, regardless of size or histology.

3.2.10 Should family history affect surveillance intervals?

Recommendation	Grade
Family history of CRC First surveillance intervals following adenoma removal in those with a family history of colorectal cancer should be based on patient factors and the adenoma history, unless a genetic syndrome is known or suspected.	**D**

Point(s)
To identify those who may have an increased familial risk of colorectal cancer, a family history of

Point(s)
colorectal cancer and associated malignancies including number of affected relatives, relatedness and age of onset should be taken and updated every 5 to 10 years.
In individuals who are undergoing screening colonoscopy for colorectal cancer based on family history, adenoma surveillance and screening recommendations should be compared and the shorter interval used. Refer to Clinical practice guidelines for the prevention, early detection and management of colorectal cancer (2017) (see Recommendations for risk and screening based on family history of colorectal cancer).
To address individual's concerns, clinicians should take adequate time to explain the relationship of family history to recommended surveillance intervals and refer for counselling where appropriate.

3.3 Role of surveillance colonoscopy after curative resection for colorectal cancery

3.3.1 Pre and perioperative colonoscopy in patients with colorectal cancer undergoing resection

Recommendation	Grade
A preoperative colonoscopy should be attempted in all patients with a newly diagnosed colorectal cancer.	**C**
Colonoscopy should be performed 3–6 months after resection for patients with obstructive colorectal cancer in whom a complete perioperative colonoscopy could not be performed and in whom there is residual colon proximal to the location of the pre-operatively obstructing cancer.	**C**

Point(s)
In cases of a colorectal cancer that may be difficult to identify at surgery, particularly using the laparoscopic approach, submucosal tattoo should be placed in three places approximately 2 cm distal to the lesion at the time of colonoscopy. This should be clearly documented in the colonoscopy report.
If the index colorectal cancer (CRC) obstructs the lumen and prevents passage of a colonoscope, consideration should be given to specific pre-operative assessment of the proximal colon by alternative means. CT colonography (CTC) can be considered. However, its role in this clinical

Point(s)
scenario requires further analysis. It is safe to perform same-day CTC following an incomplete colonoscopy, including in patients who have had a biopsy or simple polypectomy. CTC should be delayed in patients with complex endoscopic intervention and in patients at high risk of perforation, such as those with active colitis or high-grade stricture.
Proximal visualisation is unnecessary if the colon proximal to the cancer is to be included in the resection specimen. In patients with residual un-visualised colon, colonoscopy should be performed 3–6 months after surgery, providing no non-resectable distant metastases are found.
In patients with a defunctioning loop ileostomy, it is preferable to undertake colonoscopy after this is reversed to enable adequate bowel preparation.

3.3.2 Patient selection for surveillance colonoscopy following resection

Point(s)
Patients with hereditary colorectal cancer syndromes should have surveillance colonoscopy performed post-operatively as per the Clinical practice guidelines for the prevention, early detection and management of colorectal cancer.
Other clinically high-risk patients should be considered for more frequent surveillance colonoscopy after surgery than would otherwise be recommended (e.g. initial post-operative colonoscopy at 1 year and then 1–3 yearly depending on personalised estimate of risk). These include patients: + whose initial diagnosis was made younger than age 40 years + with suspected but un-identified hereditary colorectal cancer syndromes + with multiple synchronous cancers or advanced adenomas at initial diagnosis.

3.3.3 Follow-up colonoscopy after colorectal cancer resection

Recommendation	Grade
Colonoscopy should be performed 1 year after the resection of a sporadic cancer, unless a complete postoperative colonoscopy has been performed sooner. **Recommendation unchanged from 2011 edition of clinical practice guidelines for surveillance colonoscopy.**	**C**

Recommendation	Grade
If the perioperative colonoscopy or the colonoscopy performed at 1 year reveals advanced adenoma, then the interval before the next colonoscopy should be guided by recommended surveillance intervals according to polyp features. **Recommendation unchanged from 2011 edition of clinical practice guidelines for surveillance colonoscopy.**	**C**
If the colonoscopy performed at 1 year is normal or identifies no advanced adenomas, then the interval before the next colonoscopy should be five 5 years (i.e. colonoscopies at 1, 6, and 11 years after resection). **Recommendation unchanged from 2011 edition of clinical practice guidelines for surveillance colonoscopy.**	**C**

Point(s)
Patients undergoing either local excision (including transanal endoscopic microsurgery) of rectal cancer or advanced adenomas or ultra-low anterior resection for rectal cancer should be considered for periodic examination of the rectum at 6-monthly intervals for 2 or 3 years using either digital rectal examination, rigid proctoscopy, flexible proctoscopy, and/or rectal endoscopic ultrasound. These examinations are considered to be independent of the colonoscopic examination schedule described above
Patients with incomplete colonoscopy pre-operatively (e.g. impassable distal lesion) should have a semi-urgent elective post-operative colonoscopy when feasible, independent of surveillance intervals.
Surveillance colonoscopy in those age ≥75 years should be based on age and comorbidity as assessed by the reproducible and validated Charlson score. Charlson score is useful to assess life expectancy and could be implemented to stratify benefits of surveillance colonoscopy in the elderly (see Table 18. Charlson score for colonoscopy benefit).

Point(s)
If surveillance colonoscopy reveals adenoma, then the interval before the next colonoscopy should be guided by polyp features (evidence-based recommendation, Grade C). However, if subsequent colonoscopy is normal, then surveillance should revert back to the intervals recommended for initial cancer surveillance (colonoscopy at 6 and 11 years post resection).

Point(s)
Recommendation unchanged from 2011 edition of clinical practice guidelines for surveillance colonoscopy.
If all colonoscopies performed at 1, 6 and 11 years post resection are normal, follow-up can be with either of the following options: + faecal occult blood test every 2 years + colonoscopy at 10 years (i.e. 21 years post resection) **Recommendation unchanged from 2011 edition of clinical practice guidelines for surveillance colonoscopy.**

3.4 Colonoscopic surveillance and management of dysplasia in inflammatory bowel disease (IBD)

3.4.1 Initiation of surveillance in IBD

Recommendation	Grade
Surveillance colonoscopy should commence after 8 years of onset of inflammatory bowel disease symptoms in those with at least distal (left-sided) ulcerative colitis or Crohn's colitis with involvement of at least one third of the colon.	**C**
In the presence of primary sclerosing cholangitis (PSC), surveillance colonoscopy should commence upon the diagnosis of PSC.	**B**

Point(s)
A family history of colorectal cancer in a first degree relative represents an intermediate risk factor. Surveillance colonoscopy may begin after 8 years of the onset of symptoms of inflammatory bowel disease, or 10 years before the age of the youngest relative with colorectal cancer,whichever is earliest.
Those with isolated proctitis or small bowel Crohn's disease do not require surveillance colonoscopy.

3.4.2 Surveillance interval for IBD patients

Point(s)
Consider increased frequency of surveillance (intervals less than 3 years) in patients with a family history of CRC in a first-degree relative <50 years of age because this may be an additional risk factor for CRC.

Point(s)
Patients with IBD at high risk of CRC (those with PSC, ongoing chronic active inflammation, prior colorectal dysplasia, evidence of intestinal damage with colonic stricture, pseudopolyps or foreshortened tubular colon or family history of CRC at age ≤50 years) should undergo yearly surveillance colonoscopy.
Patients with IBD at intermediate risk of CRC (those with quiescent disease, no high risk features or family history of CRC in a first-degree relative) should undergo surveillance colonoscopy every 3 years.
Patients with IBD at low risk of CRC (those with quiescent disease and no other risk factors, and with inactive disease on consecutive surveillance colonoscopies) may undergo surveillance colonoscopy every 5 years.

3.4.3 Recommended surveillance techniques in IBD patients

Recommendation	Grade
Chromoendoscopy should be incorporated into surveillance procedures, especially in high-risk patients.	**A**
Taking targeted, rather than random, biopsies is the recommended method of identifying dysplasia in patients with inflammatory bowel disease.	**B**
Random biopsies are recommended in IBD patients with PSC, prior dysplasia, and intestinal damage (colonic stricture or foreshortening).	**C**
Standard-definition colonoscopy is not recommended for surveillance procedures, especially in the absence of chromoendoscopy	**B**

Point(s)
IBD surveillance requires high-quality colonoscopy: + performing the colonoscopy when the patient is in clinical and endoscopic remission + excellent bowel preparation + the use of high-definition colonoscopes + ensuring optimal and full visualisation of the mucosal surface during slow withdrawal.
Dye spray chromoendoscopy can be applied with a spray catheter or by incorporating dye in the reservoir of the water pump.
Either methylene blue or indigo carmine is an appropriate dye for chromoendoscopy.
Upon identification of invisible dysplasia on random biopsies, confirmation of diagnosis and grade is required by at least two GI pathologists. Chromoendoscopy is then recommended to determine if there is multifocal dysplasia.

Point(s)
Proceduralists performing surveillance colonoscopy in patients with IBD should be familiar with and adhere to surveillance guidelines.

3.4.4 Management of elevated dysplastic lesions in patients with IBD

Recommendation	Grade
Raised lesions containing dysplasia may be treated endoscopically provided that the entire lesion is removed and there is no dysplasia in flat mucosa elsewhere in the colon.	**C**
If a raised dysplastic lesion cannot be completely removed, surgical intervention is strongly recommended.	**D**

Point(s)
The important objective for the endoscopist performing surveillance procedures is to identify lesions that are safely and completely resectable endoscopically. This is based on endoscopic features of

Point(s)
the identified lesion and elsewhere in the colon.
Nomenclature should reflect the SCENIC international consensus statement on surveillance and management of dysplasia in inflammatory bowel disease. The term 'dysplasia associated lesion or mass (DALM)' should not be used.
Consider referral to an experienced endoscopist to perform surveillance for inflammatory bowel disease using chromoendoscopy to exclude multi-focal dysplasia followed by endoscopic resection of the dysplastic lesion.
Close colonoscopic surveillance is required following endoscopic resection of dysplasia given the risk of multifocal dysplasia and metachronous dysplasia.

Point(s)
In the presence of multifocal low-grade dysplasia that cannot be removed endoscopically, at least frequent surveillance colonoscopy is required. Surgical management is an alternative based on case-by-case discussion. Surveillance colonoscopy with chromoendoscopy within 3–12 months should be carried out after endoscopic resection of an elevated dysplastic lesion in inflammatory bowel disease.

3.4.5 High-grade dysplasia in IBD

Recommendation	Grade
Patients with endoscopically non-resectable high-grade dysplasia should undergo colectomy.	**C**
For patients with endoscopically resectable high grade dysplasia, whether polypoid or non-polypoid, continued colonoscopic surveillance after complete resection of the lesion is recommended rather than referral for colectomy.	**C**

Point(s)
Patients with resected high-grade dysplasia should undergo further surveillance in 3–12 months. Subsequent surveillance intervals depend on the findings of each subsequent surveillance

Point(s)
colonoscopy.
Patients with invisible high-grade dysplasia (HGD) should undergo more intensive colonoscopic surveillance than patients with visible HGD.

3.4.6 Low-grade dysplasia in IBD

Recommendation	Grade
Unifocal low-grade dysplasia should be followed by ongoing surveillance using high-definition white-light endoscopy and chromoendoscopy at 6 months. If 6-month surveillance colonoscopy is normal, surveillance should be repeated annually.	**C**
Low-grade dysplasia in flat mucosa should be evaluated for multifocal dysplasia by an endoscopist with expertise in inflammatory bowel disease surveillance using high-definition white-light endoscopy and/or chromoendoscopy.	**C**

Point(s)
When determining an individual's appropriate surveillance frequency, the risk factors for progression of low-grade dysplasia (LGD) towards high-grade dysplasia (HGD) or colorectal cancer are: older age at diagnosis of LGD (age >55 years), male sex and inflammatory bowel disease duration of >8 years at diagnosis of LGD.
Multifocal low-grade dysplasia is associated with a sufficiently high risk of future cancer that colectomy is usually recommended. Patients who elect to avoid surgery require follow-up surveillance at 3 months, preferably with chromoendoscopy and high-definition white-light endoscopy. If 3-month surveillance colonoscopy is normal, surveillance should be repeated annually.

Point(s)
Visible dysplasia should be resected endoscopically and then followed up with surveillance colonoscopy with high-definition white-light endoscopy and chromoendoscopy within 3–12 months.
Consider shorter surveillance intervals for flat dysplasia located in the distal colon, as this is associated with higher risk of progression.

3.4.7 Indefinite dysplasia in IBD

Recommendation	Grade
Indefinite dysplasia in flat mucosa does not require surgery, but follow-up colonoscopic surveillance is recommended, preferably with chromoendoscopy, at more frequent intervals.	**D**

Point(s)
If indefinite dysplasia is detected at random biopsy, repeat colonoscopy with enhanced imaging techniques may assist in defining an endoscopically resectable lesion, or a lesion amenable to further targeted biopsies.
If there are features of active inflammation, repeat colonoscopy following escalation of therapy may assist in further defining indefinite dysplasia.

Point(s)
Indefinite dysplasia should be reviewed by a second gastro-intestinal pathologist.
After detecting indefinite dysplasia, inflammation (if present) should be treated and colonoscopy should be repeated.

3.5 Psychosocial aspects

3.5.1 Anxiety and colonoscopy: approaches to minimise anxiety and its adverse effects

Point(s)
Providing pre-colonoscopic advice to patients by means of educational material, video and clinical explanation can assist in improving the patient experience with the procedure, and in reducing decreasing anxiety and abdominal pain during the procedure.
Endoscopists should aim to control pain and discomfort during a colonoscopy procedure in order to

Point(s)
reduce patient anxiety.
Physicians should be able to provide accurate and relevant information about colonoscopy for patients who are undergoing open access colonoscopy (without prior consultation with an endoscopist).
Gastroenterology clinics are recommended to evaluate shifting towards a biopsychosocial approach to healthcare and encouraging patients to participate in decision-making in order to provide them with a greater sense of control, thus reducing anxiety.
The use of neutral language around colonoscopy may be useful in order to break down the stigma and taboo surrounding the procedure and bowel health issues.
Clinicians should ensure that patients understand the standard practice and convey information about the procedure as clearly as possible (e.g., whether they will be conscious, whether they will experience pain, etc.). Note: Clinicians should also follow the Clinical Care Standards that apply to the preparation of patients for procedures, including informed consent (see Australian Commission on Safety and Quality in Health Care Colonoscopy Clinical Care Standards).
Patients who receive the amount of information consistent with their preferences (information seekers versus avoiders) report lower anxiety and more satisfaction with the intervention, and experience less pain and shorter time in recovery. Colonoscopists can assess patients' desire for information by asking the patient directly, for example "how much information would you like about XX (this procedure)? Are you someone who prefers to get a lot of information or just the basics?"
Music provided to patients prior to and during colonoscopy may reduce their discomfort.

3.5.2 Is a global sedation protocol available for surveillance colonoscopy?

Point(s)
Controversy continues with regard to choice of drugs for sedation and monitoring patients during colonoscopy.

3.6 Socio-economic factors

3.6.1 Impact made by socioeconomic factors in treatment groups undergoing surveillance colonoscopy

Point(s)
After curative resection for colorectal cancer, survival outcomes in disadvantaged patients may be improved by clinicians and health systems by addressing the barriers and access to optimal clinical care.

3.7 Levels of evidence and grades for recommendations

These guidelines are intended for use by all practitioners and health workers who require information about surveillance colonoscopy - in adenoma follow-up, following curative resection of colorectal cancer, and for cancer surveillance in inflammatory bowel disease. They are specifically revising the colonoscopic surveillance sections of the Clinical Practice Guidelines for the prevention, early detection and management of colorectal cancer 2005 chapters 8, 9, 17, and introduce a new chapter on cancer surveillance in inflammatory bowel disease. They also cover psychosocial care (chapter 18 in the 2005 Guidelines), socio economic factors and cost effectiveness (chapters 23 and 22 in the 2005 Guidelines). The guidelines have been produced by a process of systematic literature review; critical appraisal and consultation encompassing all interested parties in Australia (see Appendices).

The following table provides a list of the evidence-based recommendations detailed in the text of each chapter. The table below provides details on the highest level of evidence identified to support each recommendation (I-IV). The Summary of Recommendations table includes the grade for each recommendation (A-D). The key references that underpin the recommendation are provided in the last column. Individual levels of evidence can be found in the Evidence Summaries for each recommendation in each chapter.

Each recommendation was assigned a grade by the expert working group taking into account the volume, consistency, generalisability, applicability and clinical impact of the body of evidence supporting each recommendation.

When no Level I or II evidence was available and in some areas, in particular where there was insufficient evidence in the literature to make a specific evidence-based recommendation, but also strong and unanimous expert opinion amongst the working group members about both the advisability of making a clinically relevant statement and its content, recommended best practice points were generated. Thus, the practice points relate to the evidence in each chapter, but are more expert opinion-based than evidence-based. These can be identified throughout the guidelines with the following: Practice point (PP).

Grade of Recommendation	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendations but care should be taken in its application.
D	Body of evidence is weak and recommendation must be applied with caution

Source: National Health and Medical Research Council. NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra: NHMRC; 2009. (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf)

Levels of Evidence

Designations of levels of evidence for intervention research questions (NHMRC, 2009)[1]

Level	Intervention
I	A systematic review of level II studies
II	A randomised controlled trial
III-1	A pseudo-randomised controlled trial (ie alternate allocation or some other method)
III-2	A comparative study with concurrent controls: • non-randomised, experimental trial • cohort study • case-control study • interrupted time series with a control group
III-3	A comparative study without concurrent controls: • historical control study • two or more single-arm studies • interrupted time series without a parallel control group
IV	Case series with either post-test or pre-test/post-test outcomes

Source: National Health and Medical Research Council. NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra: NHMRC; 2009. (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf)

Back to top

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Back to top

4 Plain language summary

References

4.1 Advances in colonoscopy, CT colonography and other methods - Introduction

Contents

4.1.1 Colonoscopy

4.1.1.1 Accuracy of colonoscopy

Like most other diagnostic tests, colonoscopy has a false negative rate for detection of colorectal cancer and adenomas. This needs to be taken into consideration when decisions are made about the choice and timing of surveillance procedures. While the overall sensitivity for colorectal cancer is 95%,[1] the available literature suggests that cancer miss rates are higher in the proximal colon than elsewhere in the large bowel.[2] In a systematic review of polyp miss rates as determined by tandem colonoscopy, Van Rijn et al (2006)[3] identified studies in which patients had undergone two same-day colonoscopies with polypectomy. The research yielded six studies, involving a total of 465 patients. The pooled miss rate for polyps of any size was 22%. Adenoma miss rate by size was 2.1% for adenomas ≥10 mm, 13% for adenomas 5–10mm, and 26% for adenomas 1–5 mm, respectively. Analysis of the data suggests that, in expert hands, colonoscopy rarely misses polyps ≥10 mm, but the miss rate increases significantly with smaller sized polyps.

In a more recent study, Heresbach et al 2008[4] examined adenoma miss rate by performing a large multicentre study, with same-day back-to-back video colonoscopy performed by two different colonoscopists in randomised order and blinded to results of the other examination. The miss rates for all polyps, all adenomas, polyps ≥ 5 mm, adenomas ≥5 mm, and advanced adenomas were, respectively, 28 %, 20 %, 12 %, 9 % and 11 %. Greater diameter (1-mm increments) and number of polyps (≥3) were independently associated with a lower polyp miss rate, whereas sessile or flat shape was significantly associated with a higher miss rate.[4]

Back to top

4.1.1.2 Technological developments

In recent years there has been rapid progress in instrument design to enhance colonoscopic identification of lesions, reduce miss rates and reduce complications.[3][5][6] The new features include high definition colonoscopy, wide angle colonoscopy, narrow band imaging (NBI), hood-assisted colonoscopy and chromoendoscopy. High definition, wide angle and narrow band imaging technologies have been incorporated into most of the latest generation of colonoscopes. However, more studies are needed to assess the place of these various modifications, especially chromoendoscopy, in colonoscopic surveillance.

Back to top

4.1.1.2.1 High definition colonoscopy

As the name suggests, high definition (HD) colonoscopy system uses a high-definition 1080-line television and a high resolution charge-coupled device (CCD) with up to 1 million pixels, which provides images double the quality of normal television.[7][8] While Pellise et al[7] did not find any improvement over standard colonoscopy, Buchner et al indicated that adenoma detection rates are improved through use of high-definition colonoscopy, which can detect subtle mucosal changes.[8] In their retrospective study, the adenoma detection rate was higher among patients who underwent high definition white light compared with standard definition white light colonoscopy (28.8% versus 24.3%; P = .012). These findings remained after adjusting for potentially confounding variables.[8]

Back to top

4.1.1.2.2 Wide angle colonoscopy

With this method, the instrument has a field of vision of 170°, which is 30% more than the conventional model. The aim is to improve the detection of lesions hidden behind colonic folds. With one exception[9], all studies reported in the available literature from 2003 to 2010 suggest that prototype wide angle colonoscopes do not eliminate polyp miss rates, but have the potential to reduce examination time and improve visualisation in the periphery of the endoscopic field of view.[7][10][11][12]

Back to top

4.1.1.2.3 Narrow Band Imaging (NBI)

The NBI technology uses a band-restricted light source centred at 415 nm (blue) and 540 nm (green). The narrowed light penetrates the mucosa and submucosa and is absorbed primarily by haemoglobin. Thus, surface micro-vessels are visible as dark structures. Because the density and shape of micro-vessels change in neoplasia, NBI and equivalent technologies have the potential to aid in the diagnosis of neoplastic lesions. In addition, NBI helps distinguish between different histologic groups and assess depth of invasion.[13][14]

In a randomised controlled trial, 401 patients were assigned to undergo wide angle colonoscopy using either conventional high-resolution imaging or NBI during instrument withdrawal. When the two techniques were compared in consecutive subgroups of 100 patients, adenoma detection rates in the NBI group remained stable (approximately 25%) whereas these rates steadily increased in the control group (8%, 15%, 17%, and 26.5%, respectively). Significant differences in the first 100 cases (26.5% versus 8%; p=0.02) could not be maintained in the last 100 cases (25.5% versus 26.5%, p=0.91). The increased adenoma detection rates with NBI colonoscopy were statistically not significant.[15][16] Similar results were reported by Rex and Helbig19 and Kaltenbach et al.[17]

Significant differences were, however, identified when NBI was used to detect additional polyps in members of Lynch syndrome (HNPCC) families.[18]

Although less well-studied with regard to their potential additive benefit in polyp detection, other commercial image modification/enhancement technologies, I-Scan (Pentax instruments) and FICE (Fujinon), are available and are similarly conveniently accessible on the respective instruments.

Back to top

4.1.1.2.4 Chromoendoscopy

Chromoendoscopy (or dye spray) has been introduced to enhance the detection of polyps particularly diminutive flat lesions that may be otherwise difficult to detect.[19]

When combined with high magnification, chromoendoscopy was found to be highly efficient for separating adenomatous from non-adenomatous polyps[20] and for detecting changes in patients with inflammatory bowel disease.[21] Chromoendoscopy is becoming the standard method for detection of dysplasia in inflammatory bowel disease.[22]

However, based on results from their studies, Lapalus et al[23] and Le Rhun[24] could not recommend the systematic use of chromoendoscopy and structure enhancement, although the detection of small adenomas in the proximal colon was improved. In the randomised prospective study by Lapalus et al,[23] a combination of chromoendoscopy and structure enhancement was used to increase the adenoma detection rate in high-risk patients with a personal history of colorectal adenomas and/or a family history of colorectal cancer.[12]

Separate randomised controlled trials published within the same year also suggest that chromoendoscopy detects more polyps missed by standard colonoscopy than intensive inspection[25][26]particularly in patients with Lynch syndrome.[27][28] Although very promising, its use has not yet become widespread.

More recently, Sanduleanu et al[29] combined chromoendoscopy (C) with confocal laser endomicroscopy (CLE) that allows real-time in vivo microscopy of the mucosa and provides accurate histopathology. The study concluded that C-CLE accurately discriminates adenomatous from nonadenomatous colorectal polyps and enables evaluation of the degree of dysplasia during ongoing endoscopy.

Back to top

4.1.1.2.5 Hood-assisted colonoscopy

Hood assisted colonoscopy is colonoscopy with a transparent retractable extension. A transparent “hood” (or “cap”) is a simple device that can be attached to the tip of a colonoscope before performing the examination. Although adding to the cost of colonoscopy, it has been proposed as a method for shortening withdrawal time in addition to improving adenoma detection rates.[30]

Some consider that use of the hood mainly helps less experienced colonoscopists. With more experienced colonoscopists, the hood does not improve either the caecal intubation rate or the adenoma detection rate, but does shorten the caecal intubation time. It therefore should be reserved for selected cases, especially when initial caecal intubation fails.[31]

Back to top

4.1.1.3 Quality of colonoscopy

Many factors affect the quality of colonoscopy, including the provision and proper maintenance of appropriate equipment, adherence to up-to-date protocols for all phases of the procedure, and having processes in place for regular auditing of outcomes and on-going quality improvement.

All such factors are directly relevant to surveillance colonoscopy in the three settings covered by these guidelines, in which detection of metachronous polyps (for patients with prior adenomatous polypectomy or colorectal cancer resection) and visible dysplasia (for patients with inflammatory bowel disease) is pivotal to

surveillance purposes. Above all, the colonoscopist must have the necessary technical skills and understanding to perform colonoscopy effectively and with safety. Colonoscopy is highly operator-dependent.[32] The colonoscopist therefore should have undergone supervised training that meets the requirements of appropriate professional bodies as well as meeting agreed standards for ongoing competence. Basic skills include torque steering, loop recognition and reduction, recognition of landmarks to confirm complete examination, and the ability to carefully withdraw the colonoscope to maximize lesion detection and to perform polypectomy.

Higher lesion detection rates are associated with adequate distension, suction and cleaning, position change, and slow and meticulous examination of the colonic mucosa, including areas behind folds.[33] Measurement and recording of colonoscope withdrawal time (the time taken between caecal intubation and colonoscope withdrawal from the anus, excluding the time taken for biopsy and polypectomy) is a key indicator of adequacy of the examination.[33]

Advances continue to be made in colonoscopic techniques (e.g. the use of carbon dioxide rather than air for insufflation, availability of foot pedal-operated water jets to clear faecal matter and through-channel narrow endoscopes for retroflexion in the caecum and rectum) that may allow easier examination and greater patient comfort and safety. Colonoscopy is considered to be a relatively safe procedure for the diagnosis of colorectal disease. However, as with any invasive procedure, there is a risk of adverse events occurring either directly or indirectly as a result of the procedure.[34]

The National Bowel Cancer Screening Program (NBCSP) Quality Working Group report recommends standards, objectives and performance indicators for use in Australia, as set out below. They are grouped together for three phases – before, during and after the procedure – as high quality colonoscopy depends on decisions and actions taken during each phase.

Back to top

4.1.1.3.1 Indicators of quality for the pre-procedure phase

Indications for colonoscopy should comply with national guidelines and risk factors should be assessed, with recording of actions taken to address specific risks (Table 1.1).

What will your patients expect?
• That there is a valid indication for the procedure • That risk factors (e.g. anticoagulant therapy, presence of severe co-morbidities) will be identified well before colonoscopy and action taken to minimise risk

Table 1.1: Clinical standards, objectives and indicators for the pre-procedure phase - indications and assessment of risk

Standard	Objective	Performance indicators
Standard 1 : Patient indications and risks A comprehensive assessment of indications for the procedure and risks and co-morbidities is undertaken for each patient prior to the performance of the procedure.	**Objective 1.1: Assessment of patient indications** The colonoscopist ensures that there is full documentation and reporting of the indications for colonoscopy as listed for each patient category	**A** 100 per cent documentation and reporting of the following indications for colonoscopy for: o Asymptomatic patients: –family history (as per CRC Guidelines 2005)[35] ; –previous colorectal cancer or adenomatous polyps (as per CRC Guidelines 2005)[35]; –colitis surveillance for patients with increased cancer risk; and –positive faecal occult blood test. o Symptomatic patients: – symptoms documented on report. o Date of previous colonoscopy (if applicable).
		A 100 per cent documentation and reporting of the assessments for: o Sedation risks with reference to the American Society of Anesthesiologists (ASA) classifications.

	Objective 1.2: Assessment of patient risk and co-morbidity The colonoscopist ensures that there is full documentation and reporting of information about patient risk and co-morbidity.	o Action related to specific risks including: – the need to cease aspirin or other antiplatelet drugs or anti-coagulants; –the need for antibiotic prophylaxis; and – diabetes mellitus. o Patients cancelled on the day due to unforeseen co-morbidities.

Informed consent should be obtained from all patients or their parent/legal guardian, using a structured approach. Preferably, it should be obtained before the period of bowel preparation. The patient needs to understand what is involved in the procedure and the possible risks, both in general and in the patient's specific case (Table 1.2).

What will your patients expect?
• To be given a clear explanation of what is involved in the procedure and to have an opportunity to ask for more information • That this information will be provided before embarking on bowel preparation

Back to top

Table 1.2: Clinical standards, objectives and indicators for the pre-procedure phase - patient consent

Standard	Objective	Performance indicators
		A Every patient (or parent /legal guardian where applicable) is provided with:

Standard 2: Patient consent Informed consent using a structured approach is obtained from all patients (or parent/legal guardian where applicable) for all procedures prior to the procedure(s) being undertaken.	**Objective 2.1: Patient information, education and consent** The colonoscopist ensures that the patient (or parent/legal guardian where applicable) provides his/her informed consent to all aspects of the procedure(s) to be undertaken by confirming that the information detailed in the performance indicators is provided at all times.	-A full explanation about the requirements for adequate bowel preparation. -A full explanation of the procedure. -A full explanation of the risks and complications involved including co-morbidity and sedation risks, and also the risks associated with not having the procedure. -Opportunities to ask questions and receive advice on options.

Back to top

Proper bowel preparation is required to allow full examination of the large bowel, to improve the outcome and to avoid the need for a repeat procedure (Table 1.3). The timing of bowel preparation also influences the quality of cleansing of the bowel.[36]

What will your patients expect?
• That they be given clear information about the details of the bowel preparation protocol, including the importance of maintaining hydration • That the type of preparation be selected according to any special risk factors (e.g. older age, renal impairment) as well as their personal preference

Table 1.3: Clinical standards, objectives and indicators for the pre-procedure phase - bowel preparation

Standard	Objective	Performance indicators
Standard 3: Bowel preparation		**A** 100 per cent of patients receive bowel preparation education.

Standard	Objective	Performance indicators
Bowel preparation is undertaken to a high standard.	**Objective 3.1: Bowel preparation** The colonoscopist ensures that high quality bowel preparation is performed that is appropriate for individual patient risk factors and preferences.	**B** There is 100 per cent documentation of the type and quality of bowel preparation. **C** Less than 10 percent of patients require a repeat colonoscopy examination due to poor bowel preparation.

Back to top

4.1.1.3.2 Indicators of quality for the procedure phase

Key indicators for competence include volume, i.e. the number of procedures performed annually[37][38], caecal intubation rate[39][40], instrument withdrawal time[41][42], adenoma detection rate[43][44] and complication rates.[38][45]

The European Panel on the Appropriateness of Gastrointestinal Endoscopy (EPAGE) multicentre study provided a unique opportunity to examine the quality and technical performance of a large number of colonoscopies performed at multiple centres in different countries in Europe. Consecutive patients were referred for colonoscopy from 21 centres in 11 countries and 6,004 patients were included. The study found that variations in colonoscopy practice exist. Patients from centres where over 50% of the endoscopists were of senior rank were roughly twice as likely to have an adenoma diagnosed. Longer average withdrawal duration was associated with more frequent detection of adenomas.[46]

The NBCSP Quality Working Group's recommended standards, objectives and performance indicators relating to proficiency of the proceduralist are set out in Table 2.1.

What will your patients expect?
• That the colonoscopist is well trained in the procedure and meets agreed standards for competence • That there will be skilful and thorough examination of all parts of the large bowel.

What will histopathologists expect?
• That polyps sent for examination will be identified by site within the large bowel • That colonoscopists will carefully measure and record the size of these polyps, either in situ or after retrieval, to enable adenomas to be classified as advanced (≥10 mm in diameter) or non-advanced (<10 mm in diameter) on the basis of their size

What will quality reviewers expect?
• That colonoscopists will document the extent of the examination to be able to accurately calculate their ileo-caecal intubation rate • That colonoscopists record instrument withdrawal times, a surrogate marker of careful examination behind folds • That colonoscopists periodically calculate their adenoma detection rate

Back to top

Table 2.1: Clinical standards, objectives and indicators for the procedure phase proficiency of proceduralist

Standard	Objective	Performance indicators
Standard 4: Proficiency of proceduralist Proceduralists are proficient in providing high quality colonoscopies.	**Objective 4.1: Measures of the proficiency of the proceduralist** The proceduralist ensures that the following data is captured and recorded: o Number of colonoscopies he/she performs per annum. o Caecal intubation rate determined by photo-documentation of caecal landmarks. (Definition of caecal intubation: passage of the instrument tip proximal to the ileocaecal valve so that the entire caecal caput is visible.) o Mean colonoscope withdrawal time from the caecum. o Adenoma detection rate. o Rate of polyp recovery for pathological examination.	**A** Each proceduralist performs more than 250 procedures per five years. **B** The caecal intubation rate for each proceduralist is 90 per cent or greater for general patients and 95 per cent or greater for screening patients. **C** The mean colonoscope withdrawal time from the caecum for each proceduralist is 6 minutes or greater for procedures where there is no polypectomy performed. **D** The adenoma detection rate for each proceduralist is more than 20 per cent in patients over 50 years of age undertaking an initial colonoscopy. **E** The rate of polyp recovery for pathological examination for each proceduralist is more than 90 per cent.

Back to top

The literature identifies a range of complications and adverse events associated with colonoscopy. One Australian study investigated the rates of these complications.[45] The authors conducted an audit in three teaching hospitals in Western Australia from September 1989 to December 1999. The main complications identified were post-colonoscopy bleeding and post-colonoscopy perforation of the bowel. The rates of bleeding and perforation were found to be 0.21% and 0.1% respectively. Other complications included abdominal pain, nausea/vomiting, excess sedation, cardiovascular complications, cerebrovascular complications and pulmonary aspiration. The death rate associated with colonoscopy was 0.01%.

Following an extensive Medline database search (published from 2000 onwards), Panteris et al[47] found that the frequency of perforation is 1 in 1400 for all colonoscopies and 1 in 1000 for therapeutic colonoscopies. Advanced age, female sex, the presence of multiple co-morbidities, diverticular disease, and bowel obstruction have been shown to increase the risk of perforation.[38][47][48][49]

Rare complications include rupture of the spleen[50][51][52] and acute appendicitis.[53] These uncommon or rare procedural complications need to be balanced against the risks of not performing colonoscopy in each of the three clinical situations addressed by these guidelines (namely post-cancer resection, post-adenoma removal and in chronic inflammatory bowel disease). In each of these clinical scenarios, the patient is at above- average risk in their lifetime of developing CRC if surveillance colonoscopy is not repeated. while this risk (of developing CRC) differs amongst patients in each of the three different clinical situations (and even between patients with differing prior adenoma findings, e.g. one or two small adenomas versus multiple villous adenomas more than 1 cm in size) and may be difficult to accurately quantify for a given individual, it is in each scenario more than 1 in 17 by age 75 for males and more than 1 in 27 by age 75 for females.

Complications arising during a procedure should be well documented and reported as proposed by the NBCSP Quality Working Group (Table 2.2)

What will your patients expect?
• That the procedure will be performed safely and with minimal discomfort

Back to top

Table 2.2: Clinical standards, objectives and indicators for the procedure phase - minimisation of patient complication

Standard	Objective	Performance indicators
	Objective 5.1: Measures of patient complications The proceduralist ensures that the following data are captured and recorded: o Colonic perforations caused by colonoscopy.	**A** Colonic perforations caused by colonoscopy in less than 1 in 1,000 colonoscopy procedures. **B** Post-polypectomy bleeding in less than 1 in 100 patients who have had a polypectomy.

Standard	Objective	Performance indicators
Standard 5: Minimisation of patient complications Patient complications associated with colonoscopy are minimised.	o Post-polypectomy bleeding. o Sedation complications: – respiratory depression or airway obstruction requiring unplanned intervention; – hypoxia defined as pulse oximetry greater than 10 percentage points lower than awake pre-procedural baseline for greater than 60 seconds consecutively during or after the procedure; – hypotension requiring drug or fluid therapy; – cardiac arrhythmia requiring intervention; – pulmonary aspiration of gastric contents; – the use of reversal agents; and – patient complaint about sedation. o Abnormal discomfort or pain: warranting hospital admission; delaying discharge; or patient complaint of inadequate pain relief during procedure. o Procedure related death within 30 days.	**C** Sedation complications: o Respiratory depression or airway obstruction requiring unplanned intervention in less than 1 in 100 patients. o Hypoxia defined as pulse oximetry greater than 10 percentage points lower than awake pre-procedural baseline for greater than 60 seconds consecutively during or after the procedure in less than 1 in 100 patients. o Hypotension requiring drug or fluid therapy in less than 1 in 100 patients. o Cardiac arrhythmia requiring intervention in less than 1 in 1,000 patients. o Pulmonary aspiration of gastric contents in less than 1 in 1,000 patients. o The use of reversal agents in less than 1 in 10 patients. o Patient complaint about sedation in less than 1 in 100 patients. **D** Abnormal discomfort or pain in less than 1 in 100 patients. **E** Procedure related death within 30 days in less than 1 in 10,000 patients.

Back to top

4.1.1.3.3 Indicators of quality for the post-procedure phase

Several studies have found marked variation in the quality of reports describing findings at colonoscopy.[54] The NBCSP Quality Working Group recommendations for comprehensive reporting and management in the post-procedure phase are set out in Table 3.

What will your patients expect?
• Verbal and written information about the results of the procedure • Verbal and written instructions about action to take if problems occur after discharge

What will your patients expect?
• Information about follow-up review

What will referring doctors expect?
• Prompt receipt of a detailed report on the procedure • A copy of any histopathology report • Recommendations for further action

What will quality reviewers expect?
• That colonoscopists will conduct periodic audits of performance indicators • That colonoscopists will welcome the opportunity to participate in quality improvement activities

Back to top

Table 3: Clinical standards, objectives and indicators for the post-procedure phase – documentation and reporting of performance information

Standard	Objective	Performance indicators
	Objective 6.1: Documenting and reporting of relevant performance information The colonoscopist ensures that he/she: o Completes a standard structured report on the procedure, with a copy or letter provided to the referring general practitioner (and/or NBCSP) that includes information on: – the standard of bowel preparation; – depth of insertion of colonoscope; – presence of pathology; – any intervention performed; and – any unexpected outcomes.	

Standard	Objective	indicators
Standard 6: Provision of detailed performance information Detailed information about the quality of the procedure and the colonoscopist's performance is provided to relevant stakeholders.	o Provides a written report on colonoscopy findings for patients and ensures that patients are given contact details in case of an emergency. o Completes and forwards a pathology request form to the pathologist, where applicable, with identification of the referring general practitioner and status as an NBCSP participant where applicable so that the information can be added to the National Register. o Completes the required NBCSP reports where applicable. o After a complete colonoscopy, documents a follow-up appointment with the referring general practitioner, specialist or colonoscopist and, where appropriate, provides information on the recommended time for the patient to undergo the next colonoscopy. o After an incomplete colonoscopy, documents a plan for repeat colonoscopy, barium enema or CT colonography, and provides information on appropriate follow-up action. Compiles an analysis of performance using the procedure indicators detailed under Standards 4 and 5 for the purpose of ongoing performance review and professional development.	**A** Detailed quality and performance information in relation to the Objective is documented and provided for all patients at all times. **B** Self-audit and analysis of proceduralist performance on a half-yearly basis.

Strategies for implementing the recommendations of the Quality Working Group and monitoring procedural quality are clearly beyond the scope of the current review.

Back to top

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Back to top

4.2 Bowel preparation

Contents

4.2.1 Bowel preparation

High quality bowel preparation is a crucial pre-requisite for successful colonoscopy. Inadequate bowel preparation is associated with lower polyp and adenoma detection rates, longer procedure time, increased need for repeat procedures, higher cost and patient drop out from screening programs.[1][2][3][4][5][6]

With this in mind, overseas guidelines have recommended acceptable rates of bowel preparation adequacy, ranging from 85% (ASGE[7]) to 90% (ESGE[8].)

The ideal bowel preparation should be safe, effective and well tolerated but a single preparation type and dosing regimen will not suit all patients. Safe bowel preparation requires an understanding of preparation types and their potential adverse outcomes. Preparation timing is important for efficacy and dietary preparation has implications for satisfaction and tolerance. Understanding the risk factors for poor preparation helps individualise regimens for optimal outcome.

Back to top

4.2.1.1 Available Bowel Preparation Types

Most bowel preparations are based on an osmotic mechanism of action and work by retaining or drawing fluid into the bowel lumen (see Table 2). Some also contain a stimulant. Polyethelene glycol (PEG) based preparations generally have a good safety profile and should be considered the first choice for patients at older age or with organ dysfunction including renal failure, heart failure and cirrhosis.

Combination preparations with sodium picosulfate, magnesium oxide and citric acid both contain osmotic and stimulant effects. They are lower in volume than PEG-based preparations, which may enhance compliance but may also increase the risk of dehydration if adequate additional fluids are not consumed. They should be used with caution in the elderly, those with renal impairment or at risk of dehydration.

Sodium phosphate is a potent hyperosmotic preparation. It has been associated with cases of acute kidney injury and phosphate nephropathy causing irreversible renal failure. This preparation should be avoided in those of older age, or with kidney, heart or liver disease, inflammatory bowel disease or patients on medications that alter renal blood flow/electrolytes.[9][10]

There is limited head to head data on efficacy to recommend one specific type of bowel preparation over another. However, lower volume PEG based preparations appear to be as effective as high volume PEG based preparation.[11][12]

Table 2: Available Bowel Preparation Types

Main Ingredient	Action	Main Types	Volume (without clear fluids)	Pro's	Con's
				• Safe and effective	

Main Ingredient	Action	Main Types	Volume (without clear fluids)	Pro's	Con's
PEG	Osmotic	PEG PEG + ascorbate components PEG + ascorbate components	1000 mL x 3 1000 mL x 2 * # 500 mL x 2 ** #	• Modest fluid /electrolyte shift when consumed as per recommendations • Choice for: - Renal failure - Congestive heart failure - Cirrhosis - Elderly - At risk dehydration • No histological changes in IBD	• Larger volumes may be less well tolerated
Sodium picosulfate, magnesium oxide, citric acid	Stimulant and osmotic	Sodium picosulfate + magnesium oxide and citric acid	250mL x 2 *** %	• Lower volume	• Generally well tolerated • Beware in renal impairment (transient hyper-magnesemia) • Beware dehydration (consider PEG based preparation in elderly /comorbidities)
					• Risk dehydration and AKI • Risk phosphate nephropathy and irreversible renal failure

Ingredient	Action	Main Types	(without clear fluids)	Pro's	Con's
Sodium Phosphate	Hyperosmotic	Sodium Phosphate liquid**** Sodium Phosphate tablets****	45 mL x 2 32 tablets	• Low volume or tablet form	• Avoid in: - elderly - heart failure - renal impairment - Cirrhosis - IBD - Patients on medications that alter renal blood flow /electrolytes

PEG = Polyethylene Glycol

- Recommended 500mL additional clear fluids per litre
- Recommended 500mL minimum additional clear fluid per litre
- Recommended 500ml minimum additional clear fluids per dose
- 750ml minimum additional clear fluid recommended per dose

1. recommend avoiding in G6PG deficiency

% recommend avoiding in PKU

Back to top

4.2.2 References

4.2.3 References

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Back to top

4.3 Advances in technique

Contents

4.3.1 Technique advances

[DH]

In addition to technological improvements in colonoscope design and adjunctive technologies, various techniques have been evaluated to improve the performance of colonoscopy for the detection of colorectal neoplasia and reduce the operator-dependence of colonoscopy. These techniques are intended to assist in exposing hidden mucosa, and complement those technologies that can assist in highlighting and improving recognition of mucosal lesions.

4.3.1.1 Instrument insertion

4.3.1.1.1 Water exchange/immersion

Water exchange is the technique of filling the colon with water during instrument insertion, while simultaneously removing dirty water for clean water. Several studies have shown a benefit for adenoma detection, for which the mechanism is improvement in the quality of bowel preparation. An infusion volume of at least 500mL appears necessary.[1] It does, however, increase procedure time by prolonging the insertion time to caecum.[1]

4.3.1.2 Instrument withdrawal

4.3.1.2.1 Mucosal inspection technique

Colonoscopy is a highly operator-dependent procedure, and the magnitude of the difference in adenoma detection between high and low detector endoscopists in the same practice context far exceeds the improvements seen from technological adjuncts or advances in colonoscopy.

Colonoscopy fundamentally requires deliberate and systematic interrogation of the colorectal mucosa. The technique for mucosal inspection that has been showed to be associated with improved detection requires: (a) systematic deflection of the instrument tip during withdrawal to scrutinise the proximal surfaces of colonic folds, flexures and valves; (b) intensive washing and suctioning of residual debris and pools and fluid and (c) adequate luminal distension.[2] Intraprocedural cleansing of the colon is essential to achieving high rates of adequate preparation, with mean washing times of over 4 minutes reported.[3]

Both external review of technique (by videorecording[4]) or audit of detection performance[5] is known to motivate improvements in detection. Training in mucosal inspection behaviours and in lesion recognition improves adenoma detection.[6][7][8]

4.3.1.2.2 Withdrawal time

The importance of withdrawal time for high quality colonoscopy has been over-emphasised after the initial landmark study demonstrating an association between longer withdrawal time and adenoma detection rates.[9] Effective inspection of the colorectal mucosa takes time, however, time is not the required behaviour. Rather, effective detection requires meticulous mucosal exposure technique together with recognition of neoplastic lesions. Institutional policies of forced withdrawal time targets have not been successful,[10] unless combined with education and timed segmental inspection targets.[11] Withdrawal time remains only a surrogate indicator of those mucosal inspection behaviours required for neoplasia detection.

4.3.1.2.3 Right colon examination

Observational studies from the USA and Germany have consistently shown lower levels of protection against cancer in the proximal colon after colonoscopy.[12][13][14][15] Studies have examined the benefit of instrument retroflexion in the proximal colon, performed after an initial inspection from the caecum to the hepatic flexure in the forward view. Retroflexion is possible in the right colon in over 90% of patients,[16] although randomised controlled trials have shown that a second forward-view examination of the proximal colon is as effective for additional polyp detection as a second examination in retroflexion.[17][18] The yield of a second right colon examination is higher when polyps have been found on the forward view, and in patients who are older, male and have bleeding indications.[16]

4.3.1.3 Polyp size estimation

Content to be added, including practical tips such as catheter diameter comparison, open snare, open Bx forcep

4.3.1.4 Routine polypectomy

[[Content to be added, c. overing: • CSP • Avoid HS • Large benign polyps in expert centres, not surgery]]

Back to top

Practice point

Fundamental colonoscopic inspection technique requires systematic exposure of the proximal sides of folds and flexures, intensive intraprocedural cleansing, and adequate distension of the colon.

Practice point

Training in the fundamentals of mucosal exposure and inspection techniques and in the endoscopic appearance for recognition of adenomas and serrated lesions improves the effectiveness of colonoscopy.

Practice point

Water exchange can improve adenoma detection through an effect on mucosal cleansing and higher rates of adequate bowel preparation.

Practice point

Withdrawal time is a secondary measure of mucosal inspection technique, and may not motivate the inspection behaviours required for detection of neoplastic lesions.

Practice point

A second examination of the proximal colon in either the forward view or in retroflexion can improve lesion detection, particularly in patients with an expected higher prevalence of neoplasia.

Back to top

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4.4 Technological advances

Contents

4.4.1 Colonoscopy

4.4.2 Technological advances

Since the guidelines were updated in 2011, there has been ongoing research and development in endoscope design aimed at improved detection of colonic neoplasia, reducing miss rates and enhanced lesion characterisation for diagnosis.[1][2] These new features include technologies aimed at increased mucosal views through wider angle visualisation and ultra-magnification endoscopic systems allowing in vivo histological assessment. Many of these technologies are now commercially available however there is still a need for further studies including cost-benefit analysis to be done before they can be adopted as mainstream practice. Established technologies such as high definition colonoscopy, wide angle colonoscopy and electronic chromoendoscopy (e.g. NBI, FICE, i-SCAN), these are now incorporated into all of the latest generation colonoscopes with high-definition white light endoscopy (HD-WLE) now the standard of care in routine colonoscopy.

Back to top

4.4.2.1 Extra-Wide-Angle-View Colonoscopy

Since 2011, wide angle colonoscopy with vision of 170° has become a standard in the latest generation colonoscopes. Despite the aim of improving the detection of lesions hidden behind colonic folds, all studies, with one exception[3], in the available literature suggest that wide angle colonoscopes do not significantly reduce polyp miss rates which have been estimated to be has high as 31% in systematic reviews[2][4][5][6]

Given these high rates of missed lesions, there has been an emergence of new technologies aimed at reducing miss rates through wider mucosal visualisation upto 330° including, Third Eye® Retroscope® and Third Eye® PanoramicTM (Avantis Medical Systems, Sunnyvale, CA, USA); Fuse® Full Spectrum Endoscopy® colonoscopy platform (Endo-Choice Inc., Alpharetta, GA, USA); and the Extra-Wide-Angle-View colonoscope (Olympus, Tokyo, Japan)[2]. While many of these technologies have shown promise through increased detection rates over standard forward viewing colonoscopy, none have shown an absolute superiority to standard colonoscopy and therefore cannot be recommended as standard of care. Continued emphasis has been placed on excellent bowel preparation, completed procedures to caecum and methodical, attentive and slow withdrawal as the keys to polyp detection.[7]

Back to top

4.4.2.2 Ultra-Magnifying Technologies

In recent years there has been increasing interest in a 'predict-resect-and-discard' policy for management of diminutive polyps.[8][9][10] Ultra-magnifiying technologies such as confocal light endomicroscopy (CLE) and endocytoscopy (EC) have advanced considerably and are now commercially available. These emerging technologies may offer most in correct histological classification of polyps prior to resection and discard or in IBD surveillance however due to cost, time and the expertise required they are still not part of mainstream practice.[11]

Back to top

4.4.2.3 Electronic Chromoendoscopy

In the era of push button technologies, electronic chromoendoscopy (EC) refers to imaging technologies available at the push of a button resulting in detailed contrast enhancement of blood vessels which aid in lesion detection and characterisation.[12] There are now a wide range of available technologies including narrow-band imaging (NBI; Olympus), flexible spectral imaging colour enhancement (FICE; Fujinon) and i-scan (Pentax).[13][14]

NBI technology is the most commonly used and researched optical digital method of performing image-enhanced endoscopy. First generation NBI had poor brightness and contrast enhancement, which limited its usefulness. In 2012, the second-generation NBI was released which was able to deliver brightness more than one-and-a-half times as high as the first-generation NBI and twice the viewable distance in the lumen.[15]

The utility of EC over WLE endoscopy has been evaluated in four broad areas including adenoma detection in average risk individuals, adenoma detection in hereditary syndromes, dysplasia detection in Inflammatory Bowel Disease, and lesion characterisation.

With respect to adenoma detection in average risk individuals, most studies have compared NBI to WLE with numerous studies including multiple meta-analyses not demonstrating an advantage for NBI over WLE.[16][17][18][19] Given these poor results, additional studies are required to determine the final application of these modalities in routine endoscopy practice.

In contrast to average risk populations, EC has been demonstrated to result in improved detection rates over WLE in high risk settings[20][21] and EC is currently endorsed by the ESGE to routinely use HD panchromoendoscopy in patients with known or suspected Lynch Syndrome or Serrated Polyposis Syndrome acknowledging however that overall evidence remains low.[22]

NBI is the only modality studied in dysplasia detection in IBD and has not been demonstrated to improve detection rates over WLE.[23]

Lastly, lesion characterisation remains an area of promise for EC technologies with several studies showing high accuracy with NPV > 90%.[24][25][26][27] It is however important to remember that these results have not been replicated outside of expert centres.

Practice point

High definition colonoscopes should be used routinely, as the mainstay of colonoscopy is a careful white light examination of the well prepared colon.

Practice point

Electronic chromoendoscopy has emerging utility in lesion characterisation, rather than lesion detection (see below).

Practice point

Electronic chromoendoscopy may enhance polyp detection in patients with known or suspected Lynch Syndrome or Serrated Polyposis Syndrome, however has no proven role in routine colonoscopy or IBD surveillance.

Back to top

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Back to top

4.5 Adjunct technologies

Contents

4.5.1 Colonoscopy

4.5.2 Adjunct technologies

4.5.2.1 'Add on' devices

Inspection on withdrawal could contribute to polyps being missed as visualization of the proximal surface of haustral folds may be limited. Several back-to-back colonoscopy trials have reported adenoma miss rates of up to 25%.[1][2] Sessile serrated adenomas or non-polypoid lesions have limited contrast in relation to the surrounding mucosa and can be overlooked.[3]. This may contribute to the relatively high risk of interval cancers in the proximal colon.[3][4] As a result, "add on" technologies which improve visualisation especially in areas behind haustral folds have been developed.

The following will be reviewed: (i)Transparent Cap (TC) (ii) EndoRing (iii) Endocuff (iv) G Eye colonoscope (v) 3rd eye Panoramic Retroscope.

The TC is the most studied add-on device. The cap is attached to the tip of a colonoscope prior to the examination. Although adding to the cost of colonoscopy, it has been proposed as a method for shortening withdrawal time in addition to improving adenoma detection rates (ADR).[5] When used by more experienced colonoscopists, the TC does not improve either the caecal intubation rate nor the ADR , but does shorten the caecal intubation time. It may have utility for difficult cases, especially when initial caecal intubation fails.[6] A metanalysis of 16 studies examining the role of the TC revealed a marginal benefit for Polyp Detection Rate (RR 1.08) and no difference in ADR.[7] The TC however has been shown to improve detection of serrated lesions (12.8% versus 6.6%).[8] Brand et al. recently published the results of a pooled analysis of 3 technologies (the 3rd Eye Retroscope, the Full Spectrum Endoscope, and the EndoRing), concluding that these adjunct technologies may enhance detection of small (<10 mm) adenomas.[9] In a multicentre back to back study involving 116 patients evaluating the EndoRing, the adenoma miss rate was 10% vs 48% while the polyp miss rate was 9% vs 53% (with and without the device).[10] A similar device; the EndoCuff, appears to increase the

detection of diminutive polyps and improve ADR.[11] However, a larger RCT involving 1063 patients showed no change in the ADR.[12] Shirin et al recently conducted a study over >1000 patients using a balloon based device, the G-Eye colonoscope.[13] Significantly more adenomas were detected when this technology was used compared to conventional colonoscopy. With all of these devices the additional cost is a factor that must be considered before incorporation into practice, considering the modest gains reported.

Back to top

4.5.2.2 Chromoendoscopy

Chromoendoscopy (or dye spray) has been introduced to enhance the detection of polyps, particularly diminutive flat lesions that may be otherwise difficult to detect.[14] When combined with high magnification, chromoendoscopy was found to be highly efficient in differentiating adenomatous from non-adenomatous polyps.[15][16][17] It has also been strongly advocated in patients undergoing surveillance for IBD.[18][19][20], although in a more recent non inferiority trial, high definition white light endoscopy was as effective as chromoendoscopy[21]. Based on results from their studies, Lapalus[22] and Le Rhun[23] could not recommend the systematic use of chromoendoscopy for overall adenoma detection, although there was improvement seen in detecting small adenomas in the proximal colon. Other studies reported that chromoendoscopy detected more polyps compared to standard colonoscopy[24][25] particularly in patients with Lynch syndrome.[26][27] Despite being advocated for close to 2 decades, chromoendoscopy struggles to be accepted in mainstream clinical practice and as a result appears to have been superseded by electronic image enhanced technologies for characterization of colorectal polyps.

Add Sentence on new study.[21]

4.5.2.3 Carbon dioxide (CO2) insufflation

A recent meta-analysis has confirmed that, when compared to air insufflation, CO2 insufflation clearly reduces post-colonoscopy pain and distension, allows more rapid caecal intubation, but does not improve completion rates or adenoma detection.[28] It appears to be safe even in patients with airways disease.[29] Barriers to implementation include the lack of incorporation of CO2 insufflation into standard endoscopy systems, the resulting cost of retro-fitting CO2 insufflation, and the ongoing cost of the gas itself estimated US$3 per procedure.[30]

Practice point
Add on technologies appear to improve the detection of diminutive and small colorectal polyps, but at asignificant extra cost.

Practice point

When compared to standard white light endoscopy, chromoendoscopy can improve the detection and characterization of colorectal polyps.

Practice point

Chromoendoscopy has been recommended for patients undergoing surveillance for IBD although a recent study has shown equivalence with high resolution white light endoscopy .

Back to top

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Back to top

4.6 Quality of colonoscopy

Contents

4.6.1 Quality of colonoscopy

High quality colonoscopy is dependent on patient-related factors, operator-related factors, system related factors and equipment.[1] Operator factors, which are arguably the most significant, include appropriate training and experience of the colonoscopist, proper risk assessment of the patient, complete examination to the caecum with adequate mucosal visualisation and bowel preparation, the ability to detect and remove polyps safely, adequate documentation, timely and appropriate management of adverse events, follow-up of histopathology and appropriate screening and surveillance intervals based on published guidelines.[2] In Australia the Conjoint Committee for Recognition of Training in Gastrointestinal Endoscopy provides a framework to certify training of endoscopists. Recently recertification of colonoscopists has been introduced by the Gastroenterological Society of Australia (GESA). Requirements for recertification every 3 years include at least 150 logged procedures over the 3 years with a 95% completion rate, at least 25% adenoma detection rate in eligible patients (intact colons, over 50 and without a diagnosis of inflammatory bowel disease IBD) and completion of a cognitive review. The aim of recertification is to maintain colonoscopy expertise, continue to develop skills and to increase the safety standards and quality of care delivered to patients.

Here we aim to focus on the colonoscopy procedure and the key performance indicators (KPIs) within this domain that have been identified for quality assurance. Key areas for quality KPIs for the colonoscopy procedure include consent, indication, preparation, caecal intubation rates, polyp detection and removal, withdrawal time and complication rates.[3]

Back to top

4.6.1.1 Consent

Patients must provide informed consent to undergo any endoscopic procedure. The requirements for an adequate bowel preparation form part of the consent, along with a full explanation of the procedure, including any risks and potential complications, the indication and any alternative investigation options. Patients must be given the opportunity to ask questions and receive advice.[4]

4.6.1.2 Indication

The Australian Quality Working Group[4] recommended that prior to colonoscopy, the colonoscopist should ensure that the indication for performing the colonoscopy is appropriate and documented. The indications for asymptomatic patients should conform to the colorectal cancer guidelines[5] and include a significant family history of colorectal cancer, personal history of colorectal cancer or polyps, colitis surveillance or a positive faecal blood test. The use of colonoscopy for screening other asymptomatic patients is not supported by the Australian government, though this is not the case in other countries, including the USA. Symptomatic patients should have relevant symptoms documented on the colonoscopy report.

Back to top

4.6.1.3 Preparation

Effective bowel preparation is obligatory for high quality colonoscopy. Approaches to bowel preparation are discussed elsewhere. Several societies suggest that poor preparation should be present in less than 10-15% of studies.[6][7] Several validated preparation scores exist but poor preparation is probably best defined clinically by the requirement to repeat the examination (ie ‘adequate’ vs ‘inadequate’), and should routinely be documented in the colonoscopy report.

Back to top

4.6.1.4 Caecal Intubation Rate

Caecal intubation is defined as deep intubation into the caecum with the tip of the colonoscope being able to touch the appendiceal orifice.[6] Caecal intubation demonstrates a complete examination of the colon, and is fundamental for colorectal cancer screening.[6] The intubation of the caecum should ideally be documented by an image of the appendiceal orifice and/or terminal ileum if intubated.[6] Lower caecal intubation rates correlate with higher rates of interval cancer and lower case volume with experienced operators achieving 95% or higher.[8] The Australian quality working group[4] set unadjusted (ie includes studies with poor prep and obstructing cancer) caecal intubation rates of 90% for general patients and 95% for patients undergoing screening colonoscopy. Other societies suggest appropriate caecal intubation rates of between 90-95%.[9] The GESA recertification guideline suggests a caecal intubation rate of at least 95%.

Back to top

4.6.1.5 Withdrawal Time

Longer withdrawal times are associated with increased adenoma detection.[10][11] The Australian Quality Working Group[4] recommends that the mean colonoscopy withdrawal time from the caecum for each proceduralist should be six minutes or greater for procedures where no polypectomy is performed. This recommendation is similar to European[6] and American[12] guidelines. However, as noted above, withdrawal time is likely to be a surrogate marker for adenoma detection rate and as such should not be relied upon as an independent marker of quality.[13]

Back to top

4.6.1.6 Polyp Detection, Removal and Retrieval

The NHS Bowel Cancer Screening Programme defines “adenoma detection rate” (ADR) as “the number of colonoscopies at which one or more histologically confirmed adenomas is removed, divided by the total number of colonoscopies performed”.[6] It is the best validated key performance indicator for colonoscopy, with the total number of adenomas per colonoscopy a less well studied alternative.[14] Studies of ADR variability between endoscopists report a three to six-fold difference in ADR.[10][15][16][17]. ADR does not address serrated polyp detection, which do not count toward ADR. Similarly, the detection of serrated polyps also differs between endoscopists.[18][19]

ADR correlates inversely with the incidence of interval colorectal cancer. Kaminski et al[20] demonstrated a significant increase in interval cancers in individual colonoscopists with an ADR below 20%. Corley et al demonstrated increasing benefit from higher ADRs.[21] The ESGE guidelines recognise that there is a difference between populations in whom screening colonoscopy is performed (eg US, where suggested ADR are 15%/25% for women/men) and for colonoscopy populations enriched with patients with positive faecal occult blood testing in whom the ADR should be nearer to 35%.[6] Recent guidelines suggest the ADR should be 25% (possibly different in males/females)[8]. The GESA recertification rate is for 25% in all patients over the age of 50 excluding those with IBD. Missed serrated polyps in the proximal colon do confer an increased risk of CRC and serrated detection targets have been suggested for screening colonoscopy (eg 5%). Australian colonoscopy cohorts have now regularly demonstrated serrated polyp detection rates above 10%.[22] European guidelines[6] recommend that a minimum of 90% of resected polyps should be retrieved.

ADR measurement often requires manual calculation and is time consuming to generate in endoscopy units without electronic linking between endoscopy reporting systems and histopathology reports. To overcome difficulties measuring ADR, a recent suggestion of using polypectomy rates (PR) as a surrogate for ADR has been studied and validated.[23][24] However, a study by Boroff et al warns that while the correlation with ADR is reliable in the right colon, it is not in the left colon.[25] Therefore, while PR measurement cannot be recommended as an alternative to ADR measurement, for endoscopy units that have difficulty in measuring ADR, PR is a reasonable first step.

Back to top

4.6.1.7 Complications

There is some evidence to suggest that an increased volume of colonoscopy performed by individual colonoscopists results in less complications.[26][27][28] As a result the UK NHS Bowel Screening Program suggests a lifetime experience of 1000 colonoscopies and an annual number of 150 colonoscopies prior to being certified to perform bowel cancer screening program colonoscopy.[29]

The traditional complications of colonoscopy include pain, aspiration, perforation and bleeding (usually post polypectomy). However, a missed cancer or advanced polyp is a bad outcome for the patient, which is mitigated by a high ADR. Perforation in screening colonoscopy approximates 1/1000[30] and could be used as a useful indicator of colonoscopy safety in large colonoscopy units or in national screening programs. This increases to around 1/500 post polypectomy.[30] The rates are higher when resecting larger polyps.[31] For screening populations enriched with positive faecal blood the likelihood of adenomas and advanced adenomas is increased [6] and the overall colonoscopy complication rate is likely to be increased unless the quality of colonoscopy at the grassroots level is high.

The British Joint Advisory Committee and the Australian Quality Working Group guidelines state colonoscopy perforation rates should be <1:1000,[4][32] while Rex et al[12] suggest perforation rates greater than 1 in 500 for all colonoscopies or 1 in 1000 for screening colonoscopies require evaluation of practice.

Post polypectomy bleeding is defined as rectal blood loss following a colonoscopy that requires a blood transfusion that may occur up to two weeks post polypectomy.[6] Bleeding is affected by many factors including the definition of bleeding, use of antiplatelet and anti-thrombotic medication, lesion characteristics, colonoscopist volume and different diathermy settings 77,79-81.[31][33][34][35] Due to this wide range of variables that impact on post polypectomy bleeding, there is a large range of reported incidence in the literature, with rates ranging from 1:10 to 1:300 colonoscopies.[36][37]

Practice point

Suitable information (and optimally consent) should be provided to patients prior to the commencement of bowel preparation for colonoscopy.

Practice point

Colonoscopy should be performed for accepted indications, which should be clearly documented.

Practice point

Less than 10% of patients should require repeat procedure due to poor bowel preparation.

Practice point

Unadjusted rates for caecal intubation should be ≥95%.

Practice point

Photo documentation of the appendiceal orifice +/- terminal ileum should be performed to confirm a complete examination.

Practice point

Withdrawal times of >6minutes for examinations without polypectomy are a surrogate marker for adenoma detection rates, but cannot be relied on as an independent quality indicator.

Practice point

Individual proceduralists should routinely document and maintain their adenoma detection rate at >25% in patients over 50 years of age in patients without a diagnosis of IBD.

Practice point

Serrated polyp detection rates are likely to be an equally valid marker of quality as ADR and increasing evidence suggests maintaining a rate of >10% in patients over the age of 50 without a diagnosis of IBD.

Practice point

Perforation rates post colonoscopy should be <1/1,000. This is more relevant for population programs and large endoscopy units rather than individual colonoscopists.

Practice point

All colonoscopists should have their training certified by the CCRTGE and undergo regular recertification through an endorsed program, at least 3 yearly.

Back to top

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Back to top

4.7 CT colonography

Contents

4.7.1 CT Colonography

[TS]

Computed tomography colonography (CTC) is a minimally invasive method of examining the colon and rectum. It requires bowel preparation and the oral administration of faecal tagging agents prior to the insertion of a rectal tube, which is used to inflate the colon with carbon dioxide. A low dose CT scan is then performed in two positions comprising a supine scan and then either a prone or lateral decubitus study. Advanced post-processing techniques and dedicated imaging software enables the colon to be examined in both a multi-planar 2D and 3D ‘virtual colonoscopy’ mode which simulates traditional endoscopic views. The procedure is well tolerated, does not require sedation and is extremely safe, with a perforation rate of 0.04%, the vast majority of which are asymptomatic and managed conservatively.[1] CTC can be performed immediately following a simple polypectomy but should be delayed in patients who have undergone complex endoscopic intervention as this increases the risk of perforation. Likewise CTC should be avoided in patients with active colitis or obstructing strictures.

Back to top

4.7.1.1 Polyp detection rates

In a study with over 1200 patients comparing same day CTC with segmentally unblinded optical colonoscopy (OC), CTC had a sensitivity of 94% for the detection of polyps over 10mm, performing as well as OC.[2] The high sensitivity of CTC for the detection of colorectal cancer has been confirmed in a subsequent meta-analysis involving 49 studies and 11,151 patients.[3] The sensitivity of CTC for the detection of polyps 6-9mm is variable and for these diminutive lesions a meta-analysis has demonstrated that CTC has a sensitivity of 59% for polyps 6-9mm.[4] A limitation of this analysis is that many of the included studies were published in 2005 or before, some dating back to 1997, and therefore do not benefit from technological advances in hardware and software, improved reader training and faecal tagging which are routinely used today. The natural history of polyps measuring 6-9mm is yet to be fully defined. Radiologists do not report polyps that are less than 6mm as the overwhelming majority of these do not harbour advanced histology.[5]

Back to top

4.7.1.2 Interval cancer rates

The interval cancer rates following a negative CTC are low and in one study involving 1050 patients with a negative CTC and follow up average of 4.7 years found one interval cancer[6] while another study with 1429 patients with negative CTC and average follow up of 5.7 years found 2 interval cancers, one occurring 5 years post CTC and the other 10 years post initial CTC.[5]. To maintain the high accuracy of CTC and the low interval cancer rate, reader training and experience is vital, and so CTC should only be reported by radiologists who are accredited for CTC interpretation by the RANZCR.

Back to top

4.7.1.3 Radiation dose and cancer risk

CTC requires the use of ionising radiation which carries a risk of producing radiation induced malignancy. The inherently high contrast between the gas containing gut lumen and soft tissue colonic wall allows for a low dose CT to be performed without reducing the sensitivity of the examination. Typical radiation doses for CTC are 5mSv or less[7] while the use of modern iterative reconstructive methods is allowing the dose to fall as low as 1 mSv which is less than half of the annual natural background radiation dose. Modelling of CTC every 5 years between the ages of 50-80, and using a relatively high dose of 7-8mSv would prevent between 24-35 colorectal cancers for every radiation induced malignancy.[8] The radiation dose of CTC is significantly lower than the dose acquired during inferior tests such as barium enema.

Back to top

4.7.1.4 Extracolonic findings

CTC examines not only the colonic mucosa but also the contents of the abdominal and pelvic cavities, the spine and lung bases. Hence extracolonic findings are frequently encountered, the vast majority of which can be accurately characterised as benign and of no clinical significance. The rates of potentially important findings, such as extracolonic malignancy and vascular aneurysms, varies and is up to 16% depending upon the definition used, the CTC technique and the population being studied.[9][10] The diagnosis of these conditions has potential benefit to patients, but may require further investigations.

Practice point

Due to its excellent safety profile and high accuracy for detecting colonic carcinoma, CTC is an alternative for patients unable to have colonoscopy. Bowel preparation is still required prior to the examination.

Practice point

In patients at risk of colorectal carcinoma, CTC should be performed following an incomplete colonoscopy to allow assessment of the entire colonic mucosa.

Practice point

It is safe to perform same day CTC following incomplete colonoscopy, including in patients who have had a biopsy or simple polypectomy. However, CTC should be delayed in patients with complex endoscopic intervention and in patients at high risk of perforation such as active colitis or high-grade stricture.

Practice point

CTC should only be interpreted by radiologists who have undergone specialist training and are accredited by the RANZCR.

Practice point

Patients with a CTC detected polyp over 10mm should be referred for polypectomy. Patients with polyps 6-9mm can be offered either polypectomy or repeat colonic examination at 3 years.

Back to top

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Back to top

4.8 Colonoscopic surveillance after polypectomy - Introduction

4.8.1 Colonoscopic surveillance after polypectomy

Patients who have adenomatous polyps removed at colonoscopy are then at above-average risk for the development of metachronous adenomatous polyps and colorectal cancer. This chapter aims to review the available evidence so that such patients can be advised about an appropriate interval for subsequent surveillance colonoscopy.

4.8.1.1 Contents

- Adenomas and risk of developing colorectal cancer
- Polypectomy
- Malignant polyps
- Follow-up surveillance for adenomas
- Hyperplastic polyposis

Clinical questions:

- What should be the surveillance colonoscopy for patients at low risk (1-2 small tubular <10mm adenomas)?
- What should be the surveillance colonoscopy for patients at high risk (>2 and ≥10mm adenomas or with HGD)?
- What should be the surveillance colonoscopy following sessile and laterally spreading adenomas?
- What should be the surveillance colonoscopy following following resection of serrated adenomas (SA) and sessile serrated adenomas (SSA)?
- What should be the surveillance colonoscopy for patients with adenoma multiplicity with or without polyposis syndrome?
- What should be the surveillance colonoscopy for patients with family history?
- What should be the surveillance colonoscopy for patients with previous neoplasia history?

Back to top

4.8.1.2 Issues requiring more clinical research study

- What is the optimal surveillance strategy after the removal of low risk adenomas?
- What is the risk of metachronous neoplasia after a series of normal surveillance investigations, stratified by risk parameters of the index adenoma(s)?
- Are sessile serrated adenomas per se indicators of excessive colon cancer risk?
- What are the characteristics of colonoscopies that precede interval cancers?
- Is the risk of early advanced adenomas related to quality of colonoscopy or biology and patient characteristics?
- Is high grade dysplasia a risk factor independent of size and other adenoma characteristics?
- Is multiplicity, independent of size, a risk factor for metachronous adenomas?

Back to top

4.9 First surveillance intervals following removal of low-risk conventional adenoma

Contents

4.9.1 What should be the surveillance colonoscopy for patients at low risk (1-2 small tubular <10mm adenomas)?

As indicated previously, patients with one or two tubular adenomas less than 10 mm in size represent a low-risk group compared with other patients with colorectal neoplasia. For these patients, a follow-up interval of five to ten years is proposed.[1][2][3][4][5][6] Among patients who had only one or two small tubular adenomas at a baseline examination and then no adenomas on their first surveillance colonoscopy, the probability of high-risk

findings on the next surveillance examination is similar to that for patients with a negative screening examination; thus, a ten-year follow-up colonoscopy schedule may be appropriate.[6] Atkin's data confirm the low risk of subsequent cancer in patients with one or two small adenomas, supporting follow-up of these patients similar to average-risk patient strategies – which includes colonoscopy in US guidelines, but only at ten yearly intervals.[7] In Australia, recommendations for average risk patients are to undergo immunochemical faecal occult blood test (FOBT) every one to two years from age 50 years.[8]

Back to top

4.9.2 Evidence summary and recommendations

Evidence summary	Level	References
Patients with one or two small tubular (<10mm) adenomas are at minimal risk for metachronous advanced neoplasia, ie. similar to (or slightly above) average risk individuals.	II	[2], [4], [5], [6], [3]

Evidence-based recommendation	Grade
In follow-up of patients with one or two small (<10 mm) tubular adenomas, the first surveillance colonoscopy should be performed at five years.	**B**

Evidence-based recommendation	Grade
If that colonoscopy is normal, the individual is considered to be at average risk for metachronous disease. Options for subsequent surveillance are ten-yearly colonoscopy, or FOBT at least every two years.	**B**

Practice point

- Low risk adenomas are those which lack advanced features, namely three or more adenomas at one colonoscopy, adenomas 10 mm or more in size, tubulovillous or villous histology or high grade dysplasia/cancer.
- There is no conclusive evidence that one or two small tubular adenomas constitute more than average risk for metachronous advanced adenomas or cancer.

Back to top

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Back to top

4.9.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

View PICO

4.9.5 Appendices

View body of evidence

View literature search documentation

4.10 First surveillance intervals following removal of high-risk conventional adenoma

Contents

4.10.1 What should be the surveillance colonoscopy for patients at high risk (>2 and ≥10mm adenomas or with HGD)?

Patients with high risk adenomas (also sometimes referred to as “advanced adenomas”) are those in whom either (i) three or more adenomatous polyps have been removed, (ii) at least one adenoma is > 10 mm in size, or (iii) the adenomas exhibit villous or tubulovillous histology or high-grade dysplasia. Multiple studies have indicated that such high risk adenomas indicate a risk for metachronous advanced adenomas and cancers.[1][2][3][4][5][6] These studies justify surveillance stratification based on index adenoma characteristics.

The definitive study on frequency of colonoscopy in high risk adenoma patients is provided by the US National Polyp Study. In a randomised controlled trial of surveillance intervals amongst 1418 adenoma patients, this study showed no difference in detection rates of advanced or any adenoma rates in follow-up colonoscopies randomised to one or three years.[7]

High risk adenomas may have a different risk of metachronous advanced neoplasia than resected cancers.

Back to top

4.10.2 Evidence summary and recommendations

Evidence summary	Level	References
Adenomas ≥10mm predict metachronous advanced neoplasia. Size is best measured by the colonoscopist with the polyp in situ.	III-1	[8], [2], [5]
Villosity and high grade dysplasia are risk markers for metachronous advanced neoplasia; however, there is a close relationship between size, villosity and dysplasia, making the independent contribution of villosity and dysplasia not uniformly identified in adenoma follow-up studies. High grade dysplasia, by definition is still confined to the epithelium and is not associated with any risk of invasion or extracolonic spread.	II	[9], [8], [10], [4], [3], [5], [6], [7]

Evidence-based recommendation	Grade
Surveillance colonoscopy should take place at three yearly intervals for patients with high risk adenomas (three or more adenomas, ≥10mm, or with tubulovillous, or villous histology, or high grade dysplasia).	**A**

Back to top

4.10.3 References

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Back to top

4.10.4 Appendices

View recommendation components	View pending evidence	View body of evidence	View all comments	View literature search
View PICO				

4.10.5 Appendices

View body of evidence	View literature search documentation

4.11 First surveillance intervals following removal of ≥5 adenomas (conventional adenoma)

Contents

4.11.1 What should be the surveillance colonoscopy for patients with adenoma multiplicity with or without polyposis syndrome?

Most published guidelines suggest that three or more synchronous (adenomas at baseline colonoscopy) require surveillance at three years and three to five years thereafter.[1][2][3] As mentioned above, the percentages of patients identified with new high grade adenomas at follow-up within three to five years increases with multiplicity of adenomas at baseline with 8.6%, 12.7%, 15.2%, 19.6% and 24.1% if one, two, three, four, and five or more adenomas were found at baseline colonoscopy.[1] An analysis of 697 patients in the Cleveland Clinic Foundation Adenoma Registry[4] showed that, compared with one or two small adenomas, the risk of metachronous adenomas is increased five-fold following removal of multiple (four or more) small adenomas and ten-fold following removal of multiple adenomas at least one of which is larger than 10 mm. In a meta-analysis of several colonoscopic surveillance studies,[5] patients with three or more adenomas at baseline were at an approximately two-fold increased risk of advanced neoplasia during surveillance compared with those with only one to two adenomas. In a more recent US pooled analysis[1] which included eight studies with a combined population of 9167 men and women with previously removed colorectal adenomas, advanced adenomas were detected at follow-up within five years in 12% (n = 1082) and cancer in 0.6% (n = 58). There was a highly significant linear trend of increasing frequency of advanced neoplasia (advanced adenomas and cancers) with increasing number of baseline adenomas detected. Compared with having a single baseline adenoma, risk was increased two-fold in those with three to four adenomas and was increased four-fold in those with five or more adenomas.

The high detection rate of advanced neoplasia at follow-up after removal of multiple adenomas might result from a higher miss rate combined with a potential for such adenomas to be more advanced.

Multiplicity of ten or more adenomas could indicate the need for a further colonoscopy at three to twelve months to secure a clean colon before surveillance colonoscopy commences.[6] As familial adenomatous polyposis (FAP) or MUTYH associated polyposis may be the cause, referral to a familial cancer clinic for mutational analysis of the APC and MYH genes should be considered.[7][6][8][9] If FAP has been confirmed, lifelong follow-up after surgery, possibly including chemoprevention, needs to be tailored to patients in relation to age, retention of the rectum and its attendant risk.

Back to top

4.11.2 Evidence summary and recommendations

Evidence summary	Level	References
The number of adenomas present at colonoscopy is one of the most important predictors of metachronous risk of advanced and non- advanced neoplasia. In some studies it can be identified independently of other risk factors.	II	[1], [3], [10], [5]

Evidence-based recommendation	Grade
As multiplicity of adenomas is a strong determinant of risk of metachronous advanced and non-advanced neoplasia, follow-up should be at twelve months for those with five or more adenomas and, because the likelihood of missed synchronous polyps being present, sooner in those with ten or more adenomas. If a polyposis syndrome accounts for the findings, follow-up colonoscopy should be within one year for patients with five or more adenomas at one examination.	**B**

Practice point
FAP or MYH associated polyposis should be considered with as few as ten adenomas; referral to a familial cancer clinic is advisable.

Back to top

4.11.3 References

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Back to top

4.11.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

View PICO

4.11.5 Appendices

View body of evidence | View literature search documentation

4.12 First surveillance intervals following removal of serrated polyps (± conventional adenoma)

Contents

4.12.1 What should be the surveillance colonoscopy following resection of serrated adenomas (SA) and sessile serrated adenomas (SSA)?

In one study, when a follow-up examination was performed at a mean of 29 months after initial examination in patients diagnosed with serrated adenomas at the time who underwent complete colonoscopy with good preparation, 24% were diagnosed with adenomatous polyps. A control group without serrated adenomas at initial examination had no adenomas at a follow-up examination at average time of 31 months.[1]

There are suggestions that surveillance following complete removal of small SSA without dysplasia should take place at five to ten years as for small tubular adenomas.[2] The same authors suggest that three years surveillance is appropriate for TSAs of any size or number. Patients with large sessile serrated adenomas with high grade dysplasia need intense follow-up between three to six months, though this depends more on the sessile nature of the polyp rather than its serrated pathology

In summary, at present there is not enough evidence to differentiate adenoma follow-up protocols for sessile serrated adenomas based on their serration alone.

Back to top

4.12.2 Evidence summary and recommendations

Practice point
At present there is not enough evidence to differentiate follow-up protocols for sessile serrated adenomas from standard adenoma follow-up guidelines. Follow-up should be determined as for adenomatous polyps, taking into account parameters such as, polyp size, number and presence of high grade dysplasia.

Back to top

4.12.3 References

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Back to top

4.12.4 Appendices

View recommendation components	View pending evidence	View body of evidence	View all comments	View literature search

4.13 First surveillance intervals following removal of large sessile or laterally spreading adenoma

Contents

4.13.1 What should be the surveillance colonoscopy following sessile and laterally spreading adenomas?

High rates of residual adenoma are identified following a piecemeal resection of large (generally regarded as >2cm in size) and sessile adenomas.[1][2][3][4][5] If there is doubt about whether the index lesion has been totally removed, the next colonoscopy should be done within three to six months.

Back to top

4.13.2 Evidence summary and recommendations

Evidence summary	Level	References
High rates of residual adenoma are identified following a piecemeal resection of large and sessile adenomas leading in some cases to doubts about total removal of the index lesion.	III-1	[1], [3], [4]

Evidence-based recommendation	Grade
If large and sessile adenomas are removed piecemeal, follow-up colonoscopy should be at three to six months and again at twelve months to ensure complete removal. If removal is complete, subsequent surveillance should then be based on histological findings, size and number of other adenomas (as set out in What should be the surveillance colonoscopy for patients at low risk (1-2 small tubular <10mm adenomas)? and What should be the surveillance colonoscopy for patients at high risk (>2 and ≥10mm adenomas or with HGD)?).	**B**

Back to top

4.13.3 References

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Back to top

4.13.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

4.13.5 Appendices

View body of evidence | View literature search documentation

4.14 Family history and surveillance intervals

Contents

4.14.1 What should be the surveillance colonoscopy for patients with previous neoplasia history?

Surveillance colonoscopy findings in conjunction with the baseline lifestyle and demographic risk factors should dictate the risk characteristics of patients, and suggest that patients with adenomas found at more than one screening/surveillance colonoscopy may be at higher risk than patients with adenomas on one examination but not on the next.[1][2] When the second examination shows no adenomas, the prevalence of high risk adenoma (one advanced adenoma or cancer or multiple (≥ 3) of any size) at the third examination was found to be only 4.9% if the adenoma was low risk (one or two adenomas <1 cm) at baseline, and 12.3% if the adenoma was high risk at base line.[2] Combined risk identification of adenomas removed at baseline and at a follow-up colonoscopy can be used as predictors for recurrence up to four years from baseline examination when risk level of adenomas are stratified by size, number and pathological examination. The presence of high grade adenomas identified at baseline colonoscopy increases the probability of metachronous adenomas at a surveillance procedure[3][1][2] within one to five years from baseline investigation.[3] Hence, a combined risk after baseline and at least one surveillance examination may be a better tool for prediction of outcome.[4][5][2]

Back to top

4.14.2 Evidence summary and recommendations

Evidence summary	Level	References
There is conflicting evidence about whether screening intervals should be lengthened for patients with a history of advanced neoplasia in the colon, even with a series of normal colonoscopies.	II	[1], [2]

Evidence-based recommendation	Grade
If advanced adenomas are found during subsequent surveillance, maintaining a three yearly schedule is prudent, but the choice should be individualised. The interval can be lengthened if advanced adenomas are not found.	**B**

Practice point

Endoscopists, therefore, should be encouraged to assess not only the current colonoscopy findings, but those of any previous colonoscopies.

Back to top

4.14.3 References

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Back to top

4.14.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

View PICO

4.14.5 Appendices

View body of evidence View literature search documentation

4.15 Subsequent surveillance colonoscopies

4.15.1 Second and subsequent surveillance colonoscopies

4.15.2 References

Back to top

4.16 The elderly and stopping rules

4.16.1 The elderly and stopping rules

4.16.2 References

Back to top

4.17 Malignant polyps

4.17.1 Malignant polyps

4.17.2 References

Back to top

4.18 Discussion

4.18.1 Discussion

4.18.2 References

Back to top

4.19 Surveillance colonoscopy after curative resection for colorectal cancer - Introduction

Introduction

4.20 Preoperative and perioperative colonoscopy in patients with colorectal cancer undergoing resection

Contents

4.20.1 What is the role of pre or peri-operative colonoscopy in CRC patients?

A complete examination of the large bowel, preferably by colonoscopy, should be performed at the time of cancer diagnosis to check for synchronous cancers and clear all synchronous polyps. A synchronous cancer is found in up to 5% of patients and synchronous adenomatous polyps in 20-40 % of patients.[1][2][3] Clearance of

synchronous lesions at perioperative colonoscopy reduces the rate of metachronous CRC.[4][5] If the index cancer obstructs the lumen and prevents a clearing pre-operative colonoscopy, consideration should be given to pre-operative assessment of the proximal colon by alternative means, e.g. CT colonography or air contrast barium enema. This, however, is unnecessary if the colon proximal to the cancer is to be included in the resection specimen. Failing this, colonoscopy should be performed three to six months after surgery, providing no distant metastases are found.[2]

Back to top

4.20.2 Evidence summary and recommendations

Evidence summary	Level	References
Evidence shows that perioperative colonoscopy (whether performed preoperatively, intraoperatively or postoperatively) reduces cancer-related mortality in patients diagnosed with CRC.	II	[3], [4], [5], [6]

Evidence-based recommendation	Grade
A perioperative colonoscopy should be attempted in all patients with a newly diagnosed colorectal cancer (CRC).	**B**

Evidence-based recommendation	Grade
Colonoscopy should be performed three to six months after resection for patients with obstructive colorectal cancer in whom a complete perioperative colonoscopy was not performed and in whom there is residual colon proximal to the obstructing cancer.	**B**

Back to top

4.20.3 References

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Back to top

4.20.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

View PICO

4.20.5 Appendices

View body of evidence | View literature search documentation

4.21 Follow-up colonoscopy after colorectal cancer resection

Contents

4.21.1 What should be the follow-up colonoscopy for patients after CRC resection?

Recommendations about the timing of colonoscopy after CRC resection should be based upon the "natural history" of metachronous colonic neoplasia, in order to meet the objectives of surveillance, namely early detection of metachronous cancer and timely polypectomy for metachronous adenomas. .

The natural history of metachronous cancer and polyps is best estimated by studies of the yields of colonoscopy at various time points after surgery, when pre- or peri-operative colonoscopy has excluded synchronous cancer and cleared synchronous polyps.

In the US Guidelines for Colonoscopy Surveillance after Cancer Resection[1], the literature to 2005 was summarised with regard to metachronous cancer development. In studies incorporating more than 9000 patients, 137 metachronous cancers were detected, 57 of which were found within 24 months of surgery. It could be argued that second cancers found so soon after surgery were in many instances missed synchronous (rather than metachronous) lesions but the importance of detecting them remains undiminished. The authors argued that such a rate of cancer detection (157 colonoscopies per metachronous cancer found) was comparable to the rate of prevalent cancer detection in the setting of screening colonoscopy (as practised in the US). It was this relatively high incidence of metachronous cancers within two years of surgery that led to the Guidelines' recommendation to perform post-operative colonoscopy at an interval of one year (with subsequent colonoscopies after an interval of three years and then five years, if all surveillance examinations were normal).

In the literature prior to 2005, Barillari[2] and Neugut[3] found that more than one-half of metachronous adenomas and cancers arose within the first twenty four months after surgery. In a 2000 study, Togashi et al[4] detected twenty-two metachronous colorectal cancers in 19 out of 341 patients after CRC surgery, 14 (64 %) of them within five years of surgery. Most were small, 10 mm or less in size, and many had a flat endoscopic appearance. In a study of 174 patients reported by Juhl et al in 1990[5], three-quarters of the colonoscopically detected neoplasms (adenomatous polyps and cancers) occurred within the first 24 months. In the period 12-30 months after surgery, four metachronous cancers and 37 advanced adenomas were detected. A retrospective review by Khoury et al[6] concluded that annual follow-up colonoscopy for two years after CRC surgery was beneficial and that the interval between subsequent examinations be increased depending on the result of the most recent examination[6].

However, not all of these earlier studies advocated colonoscopy within one to two years of surgery. Among 175 patients who underwent a curative resection for CRC between 1986 and 1992, colonoscopies performed one year after surgery and then at two-year intervals revealed no metachronous cancers or advanced adenomas . The authors suggested that only patients who had had synchronous adenomas at pre-operative colonoscopy should undergo follow-up colonoscopy at three years.[7] Similarly, Stigliano et al[8] conducted a retrospective study of 322 patients and found no metachronous cancers within the first two years after surgery. In their 2002 review, Berman et al[9] suggested that there were insufficient data to support the routine use of annual or more frequent colonoscopy to identify metachronous or recurrent CRC and they suggested post-operative colonoscopy be limited to every three to five years. The value of a large retrospective audit of patients after CRC resection by McFall et al, which concluded that most patients are at very low risk of developing significant

colonic pathology in the five years after resection, was limited by the fact that less than one-third of the patients underwent post-operative colonoscopy[10] and the mean interval between surgery and colonoscopy was more than four years. Similar reservations about the need for follow-up colonoscopy earlier than two to three years were expressed by Mathew et al[11], even though 10 out of 14 patients with neoplastic findings at surveillance colonoscopy were detected two years post-operatively.

A Western Australian study by Yusoff et al audited all patients who underwent surgical resection of CRC from 1989 to 2001[12] and found that no metachronous cancers (and only 1 of 11 recurrent anastomotic cancers) were found by surveillance of asymptomatic patients. The three metachronous cancers were all detected in symptomatic patients, at four, eight and nine years after surgery. In a subset of their patients, the yields for adenoma were 10 % at one year post-operatively, 28 % at two years and none at three years.

Another Australian study published in 2005 by Platell et al specifically evaluated the clinical utility of performing a colonoscopy 12 months after curative resection for CRC[13]. In 253 patients who had undergone complete colonoscopy prior to resection, 90 % received their first post-operative colonoscopy at a mean of 1.1 years. Although no recurrent or metachronous cancers were found, 149 polyps were detected in 30 % of patients, 42 % of which were adenomas and 13 % of which were villous or tubulovillous adenomas. Having observed such a high prevalence of advanced adenomas at 12 months (7.9 % of patients), the authors raised the possibility that, in contrast to recommendations in the Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer 2005[14],(that post-operative colonoscopy be performed at three to five years), a variably intense colonoscopy surveillance schedule might be justifiable. Similarly, the large study from Taipei mentioned earlier[15] concluded that a lifelong schedule of post-operative colonoscopic surveillance was necessary.

According to Hassan et al[16], who used a decision analysis model, early surveillance colonoscopy performed one year following CRC resection was clinically efficient and cost-effective in terms of cancer detection and prevention of cancer-specific death[16]. Compared to “no early colonoscopy” following surgery, the number of one-year colonoscopies required to find one CRC was 143 and the number needed to prevent one CRC-related death was 926. In a 2007 analysis of 1002 operated CRC patients, Rulyak et al[17] concluded that surveillance colonoscopy within one year of surgery was warranted because (i) 9 of the 20 metachronous cancers detected during the study period were found within 18 months of surgery and (ii) the rate of metachronous advanced neoplasia was significantly lower if colonoscopy was performed within 18 months of surgery (6.9 %) than if colonoscopy was delayed for three years or more (15.5 %).

In a 2009 study from China, Wang et al compared “intensive colonoscopic surveillance” (three monthly colonoscopy for the first year after surgery, then six monthly for the following two years and annually thereafter) with “routine colonoscopic surveillance” (at six, thirty and sixty months after surgery).[18] In the intensive surveillance group, one metachronous cancer was detected in the second year of surveillance, one in the fourth year and the third more than five years after initial surgery. In the routine surveillance group, no metachronous cancers were found at six months, four were found at 30 months, one was found at five years and one was found thereafter. The authors concluded that the routine schedule of surveillance was acceptable, with follow-up colonoscopy at one and two years after surgery and then three to five years thereafter.

Thus, while not all of the published evidence is in agreement, most studies demonstrate a significant incidence of metachronous cancers, advanced adenomas and other types of polyps after curative resection for CRC. In many studies, a high proportion of the metachronous neoplasia was detected within the first two years after surgery. Careful, high-quality colonoscopy at 12 months after surgery would be expected to detect the vast majority of this metachronous neoplasia. In turn, this should improve survival in patients operated on for CRC, by finding second cancers at a stage early enough to be cured by re-operation, and by removing metachronous adenomas while still benign. As a result, the weight of evidence from the literature would seem to support performing the initial post-operative surveillance colonoscopy at an interval of one year. If this examination does not reveal a metachronous cancer, the intervals between subsequent colonoscopies should probably be three and five years, depending on the number, size and histologic type of polyps (if any) removed.

Back to top

4.21.2 Evidence summary and recommendations

Evidence summary	Level	References
Follow-up colonoscopy reduces the mortality rate of patients after CRC resection. Most studies demonstrate a significant incidence of metachronous cancers, advanced adenomas and other types of polyps after curative resection for CRC.	II	[15], [17], [12], [2], [6], [4], [19], [20], [21], [22], [23], [3], [13], [16], [18]
In many studies, a high proportion of the metachronous neoplasia occurred within the first two years after surgery.	IV	[24]

Evidence-based recommendation	Grade
Colonoscopy should be performed one year after the resection of a sporadic cancer, unless a complete post-operative colonoscopy has been performed sooner.	**B**

Evidence-based recommendation	Grade
If the peri-operative colonoscopy or the colonoscopy performed at one year reveals advanced adenoma, then the interval before the next colonoscopy should be three years.	**C**

Evidence-based recommendation	Grade
If the colonoscopy performed at one year is normal or identifies no advanced adenomas, then the interval before the next colonoscopy should be five years.	**C**

Practice point

Patients undergoing either local excision (including transanal endoscopic microsurgery) of rectal cancer or advanced adenomas or ultra-low anterior resection for rectal cancer should be considered for periodic examination of the rectum at six monthly intervals for two or three years using either digital rectal examination, rigid proctoscopy, flexible proctoscopy, and/or rectal endoscopic ultrasound. These examinations are considered to be independent of the colonoscopic examination schedule described above.

Back to top

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Back to top

4.21.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

View PICO

4.21.5 Appendices

View body of evidence | View literature search documentation

4.22 Patient selection for surveillance colonoscopy following resection

Contents

4.22.1 Which CRC patients should be followed up with surveillance colonoscopy?

The Australian Clinical Practice Guidelines for the prevention, early detection and management of CRC, 2nd edition, 2005 proposed that follow-up should be offered to all patients who have undergone curative surgery and are fit for further intervention if disease is detected. This includes patients who have had malignant polypectomy or curative endoscopic resection of Stage I CRC but excludes patients with Stage IV CRC if their treatment does not offer the possibility of cure.

Back to top

4.22.1.1 Risk factors for local recurrence following resection for colorectal cancer

Recent studies suggest that follow-up after CRC resection could perhaps be customised according to a patient's individual risk.[1][2][3][4][5][6] For example, a number of studies have determined features of a primary CRC which increase the risk of local recurrence at the surgical anastomosis.[1][2][5][7][8] Most importantly though, anastomotic recurrence occurs far more often in rectal cancer patients than in colon cancer patients.[2][4] Local recurrence is also more likely to occur in patients undergoing local excision (including transanal endoscopic microsurgery) of their rectal primary cancers and unfortunately, many of these recurrences are associated with extra-colonic disease or local spread and are not curable.[5][9][10][11][12] With respect to this review, the vast majority of these rectal anastomotic recurrences are within reach of digital rectal examination or sigmoidoscopy and their detection does not require full colonoscopy.

The optimal combination and frequency of investigations in follow-up of patients after CRC resection has not been determined.[13] Importantly, the performance of annual colonoscopy has not been shown to improve five-year survival.[14] A meta-analysis by Tjandra et al concluded that intensive follow-up increased the re-resection rate for recurrent disease and improved overall survival but the survival advantage was not due to earlier detection of recurrence and cancer-related mortality was no better.[15]

The focus of the current chapter is on the use of surveillance colonoscopy. Although colonoscopy allows inspection of the anastomosis in passing, the principal purpose of surveillance colonoscopy after CRC resection is the detection of metachronous neoplasia. Thus, the above-mentioned risk factors for luminal/anastomotic recurrence are of limited relevance to the question of when surveillance colonoscopy should be performed following CRC surgery.

Back to top

4.22.1.2 Risk factors for metachronous neoplasia following resection for colorectal cancer

Having developed one CRC, patients are at risk for the development of metachronous polyps and their progression to metachronous cancers; Bouvier et al[16] reported the incidence of metachronous cancer as being 1.8% at five years, 3.4% at 10 years, and 7.2% at 20 years[16] with the greatest excess risk between one and five years post-surgery.

Preoperative colonoscopy is important to detect and treat synchronous polyps and cancers but may also assist in predicting which patients are more likely to develop future adenomas and cancers during follow-up. Some authors of both original studies and literature reviews have reported that the presence of synchronous polyps or

cancers is a risk factor for metachronous CRC[17][18][19][20][21] and for metachronous adenomatous polyps.[21][22] However, in a recent population-based study by Bouvier et al,[16] using a cancer registry as the source of information, no patient or tumour characteristics could be identified to predict which CRC patients would develop a metachronous cancer. Other authors have likewise failed to identify any link between synchronous adenomas and the development of subsequent metachronous CRC.[23][24]

Primary tumour location is also a risk factor for the development of metachronous cancer. In a study of more than 500 CRC patients from a cancer registry database, patients whose first cancer was located proximal to splenic flexure were found to be at twice the risk for developing a metachronous cancer compared to those with a first cancer in the distal colon.[7]

Metachronous and synchronous tumours are features of Lynch syndrome (also known as hereditary non-polyposis colorectal cancer or HNPCC).[25][26] A propensity for metachronous and synchronous colorectal cancers with a predilection for the proximal colon and development of cancer at an early age are well recognised characteristics of Lynch syndrome.[27]

Thus, reported studies have disagreed about whether patients who have undergone CRC resection can be stratified with regard to their risk of future development of metachronous polyps and cancers. Even in those studies where a positive predictive factor was identified, the strength of the association with the development of future colonic neoplasia was insufficiently strong to exclude patients without the factor from colonoscopic surveillance.

Back to top

4.22.1.3 Patient groups at very high risk for metachronous neoplasia following resection for colorectal cancer

In certain patients who have undergone curative resection for CRC, clinical features, family history and the findings at the pre-operative colonoscopy may dictate the need for particularly intense post-operative surveillance colonoscopy (see Chapter 7 of the Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer, 2nd edition, 2005).

In other groups of patients considered to be at increased risk of metachronous disease, consideration may be given following surgery to continuing with more frequent surveillance than would otherwise be recommended (e.g. initial post-operative colonoscopy at one year and then annually, second-yearly or third-yearly. These patients include those (i) whose initial diagnosis was made younger than 40 years of age, (ii) with probable or possible HNPCC (i.e. patients whose tumours are MSI-high and less than 50 years old at time of initial cancer diagnosis but not proved by genetic testing to have HNPCC), (iii) with hyperplastic polyposis and BRAF mutation and (iv) with multiple synchronous cancers or advanced adenomas at initial diagnosis.

Back to top

4.22.2 Evidence summary and recommendations

Practice point

- Patients with proved Lynch syndrome (HNPCC or hereditary non-polyposis colorectal cancer), should continue to have annual surveillance colonoscopy performed post-operatively because of the apparent rapid progression of neoplasia from adenoma to carcinoma.
- Surveillance of the residual colonic mucosa in patients with cancer in FAP should follow recommendations in Chapter 7 of the Clinical Practice Guidelines for the Prevention, Early Detection and Management of Colorectal Cancer, 2nd edition, 2005
- Patients including those:
    1. Whose initial diagnosis was made younger than 40 years of age,
    2. With probable or possible HNPCC (i.e. patients whose tumours are MSI-high and less than 50 years old at time of initial cancer diagnosis but not proved by genetic testing to have HNPCC),
    3. With hyperplastic polyposis and BRAF mutation and
    4. With multiple synchronous cancers or advanced adenomas at initial diagnosis should be considered following surgery to continuing with more frequent surveillance than would otherwise be recommended (e.g. initial post-operative colonoscopy at one year and then annually, second-yearly or third-yearly.

Back to top

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Back to top

4.22.4 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

4.23 Colonoscopic surveillance and management of dysplasia in IBD - Introduction

Contents

4.23.1 Introduction

Colorectal cancer (CRC) is one of the most devastating complications of chronic colitis in the setting of inflammatory bowel disease (IBD).[1] Current strategies in the reduction or management of colitis-associated CRC are chemoprophylaxis, colonoscopy surveillance of at-risk individuals, endoscopic removal of dysplastic lesions and proctocolectomy is a potentially curative treatment for those with precancerous dysplasia or early cancer. Maintaining mucosal healing may reduce colorectal carcinogenesis and chemoprophylaxis has been proposed using mesalazine, thiopurines and ursodeoxycholic acid in the setting of IBD with and without primary sclerosing cholangitis (PSC). There are some data linking colonoscopy with a reduced risk for CRC and mortality in IBD patients.[2] Guidelines[3] based on case series suggest that IBD surveillance may permit for earlier detection of cancers and improve prognosis. In Australia, there is increasing acceptance that improved endoscopic technologies has resulted in improved identification of dysplasia and permitted for resection of dysplastic lesions before resorting to proctocolectomy.[4] This chapter summarises the epidemiology of dysplasia in IBD, its classification, and outlines the current endoscopic surveillance strategies recommended to improve outcomes.

Back to top

4.23.2 Epidemiology

Since it was first recognised in 1925[5] the literature surrounding CRC in IBD has shown substantial variation in its incidence. This is thought to be due to referral centre bias, heterogeneity in study design and possibly environmental or geographical factors.[6] Furthermore, changes to the surveillance and management of dysplasia including the improvement of endoscopic technologies in the earlier identification of pre-cancerous dysplasia have undoubtedly affected both the reported rates and outcomes of dysplasia and CRC. Initial data suggested a difference in risk of CRC between those with UC and CD, but it is generally accepted that the risks are approximately equivalent stratifying for the extent of colonic involvement.[7][8][9][10] A meta-analysis of 116 studies including 54,478 patients derived an overall prevalence of CRC in any UC patient to be 3.7%. The incidence was reported as 3 cases per 1,000 person years duration.[11] When stratified for disease duration, the incidence increased from 2 to 7 to 12 per 1000 person years duration for the first, second and third decades respectively (corresponding to cumulative probabilities of 2%, 8% and 18%). In Australia, the cumulative incidences of CRC in ulcerative colitis (UC) for the first, second and third decades were 1% (95% confidence interval [CI]: 0-2), 3% (95% CI: 1-5) and 7% (95% CI: 4-10) respectively.[12] Similar findings have been recently described amongst a large Korean multicentre study[13] indicating that the cumulative incidence of CRC in IBD patients in low prevalence countries might be similar to that of Western countries. Ongoing reductions in the incidence of CRC in IBD may continue to be seen with regular surveillance colonoscopy, improvements in imaging and adenoma detection, and aggressive use of maintenance therapies to achieve mucosal healing.

Back to top

4.23.3 Pathological Characteristics

Intraepithelial dysplasia (superficial to the lamina propria) is the premalignant lesion in IBD associated CRC, and is classified as low grade (LGD) or high grade (HGD) according to histopathological features. The differentiation of LGD from HGD is based on the degree and extent of nuclear stratification, haphazardness and loss of nuclear polarity, nuclear atypia, nucleoli size, nuclear clumping and presence of atypical mitotic figures. LGD needs to be differentiated from reactive changes due to inflammation. The presence of neoplastic invasion is diagnostic of CRC. For the most part, IBD-associated CRC is histologically similar to sporadic CRC, although it exhibits several different pathobiological features. CRC in IBD, like its sporadic counterpart, is most commonly adenocarcinoma. Dysplasia in IBD is typically multifocal, and variously described as flat, indistinct, ulcerated, plaque-like, nodular, velvety, stricturing, or mass-like, whereas sporadic dysplasia is more classically unifocal and associated with discrete polyp formation.[10] Lesions arise from areas of the colon currently or previously inflamed, but may be in areas of microscopic inflammation rather than macroscopic involvement.[14] Being associated with chronic inflammation, colitis-associated dysplasia is most commonly located in the distal colon. The mean age at onset is lower in IBD than for sporadic CRC, and synchronous tumours traditionally were more common in IBD, occurring in up to 12%.[15] These adverse features, however, might arise from the more subtle lesions but also through inferior older generations of colonoscopic equipment failing to identify lesions.

Back to top

4.23.4 Dysplasia Risk

Risk stratification underlies the modern concept of IBD surveillance strategy. Compared to mucosal healing, the presence of objective mucosal inflammation (endoscopic or histologic) is associated with a greater risk of subsequent colorectal dysplasia. A meta-analysis showed that the odds ratio (OR) of colorectal dysplasia to be 3.5 (95% CI: 2.6-4.8) in those with any mucosal inflammation and OR of 2.6 (95% CI: 1.5-4.5).[16]

Increased duration of IBD increases CRC risk.[7][11][12] CRC risk increases markedly after ten years of disease duration in subjects with extensive colitis and somewhat later for those with limited left-sided colitis.

The age of onset might be an independent predictor for the development of CRC[8], adjusting for disease duration appears to ameliorate this effect.[17] Calculations regarding commencement of surveillance are therefore based upon disease duration not patient age. Nevertheless, a nationwide cohort study showed that childhood onset IBD was associated with increased gastrointestinal cancers (Hazard Ratio 18.0; 95% CI: 14.4-22.7).[18]

Greater extent of disease also provides an increase in cumulative inflammatory insults corresponding to the increased risk of CRC[17] in those with extensive colitis or pancolitis. An Australian UC cohort study found 24 CRC of whom 1 (1.6%) had proctitis, 8 (3.8%) had left-sided colitis and 12 (6.1%) had extensive colitis at study entry.[12]

Evidence of chronic intestinal damage also is associated with the risk of developing colorectal neoplasia. Colonic strictures[19][20][21], a foreshortened colon[19] and pseudopolyps[19][22] represent healing of severe inflammation. These endoscopic features have been shown to be associated with a higher rate of CRC in IBD.

The risk of developing colitis-associated CRC in the presence of PSC is increased. A meta-analysis performed by Soetikno et al[23] confirmed the CRC risk with PSC to be 4.8-fold the background rate seen in IBD patients. Australian data demonstrated a trend that CRC risk was increased in the presence of PSC with IBD (6%) compared to PSC without IBD (0%, P=0.08).[24] Interestingly, CRC associated with PSC and IBD tend to be predominantly located in the proximal colon.[25] CRC risk remains elevated following orthotopic liver transplant and ongoing yearly surveillance is recommended.[23]

As with sporadic CRC, family history of CRC is associated with a greater risk of developing dysplasia. For patients with IBD and a first degree relative with CRC the risk is at least two times baseline[26][27]

Back to top

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Back to top

4.24 Initiation of surveillance in IBD

Contents

4.24.1 When should surveillance colonoscopy be initiated for ulcerative colitis and Crohn’s patients, for ulcerative colitis and Crohn’s patients who have primary sclerosing cholangitis detection, for ulcerative colitis and Crohn’s patients with a strong family history?

Clinical experience, supported by various studies, shows that the development of CRC in IBD before ten years of disease duration is uncommon, except in individuals with primary sclerosing cholangitis (PSC) where malignant transformation of the colon may occur at an earlier stage.[1] Most expert opinion and published guidelines have recommended that surveillance should commence 8-10 years after disease onset in patients with extensive ulcerative colitis (UC) or Crohn’s colitis, or at the time of diagnosis of PSC if it co-exists.[2][3][4][5] For patients with left sided disease in whom the risk of cancer may be delayed, the recommended starting time for surveillance varies between 8-15 years after disease onset.[3][6]

Until recently, these propositions had not been tested. A recent study from The Netherlands found that nearly one in five patients developed CRC in IBD earlier than recommended initiation of surveillance. Some of these patients were not known to have IBD at the time of cancer detection, some had left sided-colitis, others had PSC and a proportion had Crohn's colitis.[7] As a result, experts now advise that in patients with either PSC or a family history of CRC, surveillance be initiated as soon these historical co-factors are recognised, and in others, surveillance should be initiated eight years after the onset of symptoms.[8]

Back to top

4.24.2 Evidence summary and recommendations

Evidence summary	Level	References
The risk of CRC in IBD is uncommon within eight years of disease onset except in those with co-existing PSC or a personal family history of CRC.	III-1	[9], [10], [11], [1], [7]

Evidence-based recommendation	Grade
Patients with ulcerative colitis extending beyond the sigmoid colon and individuals with Crohn's colitis that involves more than one-third of colon should commence surveillance no later than eight years after onset of symptoms.	**C**

Evidence-based recommendation	Grade
If Primary Sclerosing Cholangitis (PSC) is detected before this time, surveillance should commence at the time of its diagnosis.	**C**

Evidence-based recommendation	Grade
Patients with a strong personal family history of colorectal cancer (CRC) should start surveillance earlier.	**C**

Back to top

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Back to top

4.24.4 Appendices

View body of evidence | View literature search documentation

4.24.5 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

4.25 Surveillance interval for IBD patients

Contents

What is the most appropriate time interval for surveillance in IBD patients (SUR2)?

4.25.1 Risk stratification

With improvement in colonoscopic technology and attention towards high quality procedures, routine one- to two-yearly surveillance colonoscopy surveillance is no longer required for most IBD patients. Current guidelines recommend surveillance colonoscopy intervals to be based on risk stratification and findings on prior surveillance colonoscopies.[1] Stratification according to risk is now incorporated into the MBS reimbursement for the colonoscopy procedure incentivising focus on quality of colonoscopy. High risk patients are with greater risk factors for the development of colorectal dysplasia and require more frequent surveillance procedures. Low risk patients are those whose risk of developing dysplasia is estimated to be similar to that of the general non-IBD population. In the absence of clinical trial data, this strategy is based on expert opinion.

The risk stratification approach is as follows:

1. High risk patients: with PSC, ongoing chronic active inflammation, prior colorectal dysplasia, evidence of intestinal damage with colonic stricture, pseudopolyps or foreshortened tubular colon or family history of CRC at age ≤50 should undergo yearly surveillance colonoscopy

2. Intermediate risk patients: with quiescent disease, no high risk features or lower risk family history of CRC should undergo surveillance every three years

3. Low risk patients: with quiescent disease and no other risk factors with inactive disease on consecutive surveillance colonoscopies may undergo surveillance colonoscopy to every five years

These surveillance intervals are based on the assumption that the examinations are successful, conducted on well prepared uninflamed colons, carried out by physicians trained in the detection of dysplasia, and performed using contemporary techniques for visualisation of dysplasia and mucosal sampling.

There is consistency among guidelines to commence surveillance colonoscopies in both ulcerative colitis where the maximal involvement (endoscopy and histologic) extent is beyond the splenic flexure and Crohn's colitis that involved over a third of the colon length. Commencement of surveillance should be after 8 years of onset of colitis symptoms.

Back to top

4.25.2 Evidence

4.25.2.1 Systematic review evidence

No studies were found since 2010 that directly fit the PICO criteria for this question *What is the most appropriate time interval for surveillance in IBD patients?* (see Technical report).

A total of nine studies from the systematic review to answer the clinical question When should surveillance colonoscopy be initiated for UC and Crohn's patients, for UC and Crohn's patients who have PSC detection, for UC and Crohn's patients with a strong family history? reported long term outcomes (>10 years following IBD diagnosis) were relevant to this clinical question.[2][3][4][5][6][7][8][9][10] A single study was level III-2 evidence[5] and the remaining studies were level III-3 evidence. All studies were at high-risk of bias, except for one study that was at moderate risk of bias[5], and another study that was at low risk of bias.[2] The reported outcomes were colorectal cancer prevalence in those with ulcerative colitis, Crohn's disease, IBD+PSC, and in regards to duration of IBD or extent of Crohn's disease. Also reported was dysplasia prevalence in those with ulcerative colitis, and risk factors (PSC, duration of IBD) for colorectal cancer in IBD patients.

In those with ulcerative colitis, colorectal cancer rates were relatively low for the first decade after ulcerative colitis diagnosis, after which some studies reported significantly higher colorectal cancer rates in ulcerative colitis patients, compared to the general population. The risk of colorectal cancer was still significant 20-30 years after ulcerative colitis diagnosis.[4][7][8][10] Increasing duration of IBD is associated with an increasing risk of colorectal cancer, the magnitude of which is higher in Crohn's disease patients, compared to ulcerative colitis, after IBD diagnosis. The increase in colorectal cancer risk in these patients is substantial after 10 years post diagnosis.[2][6] In those with Crohn's disease, colorectal cancer prevalence reached 7% 30-years post Crohn's disease diagnosis.[7] Only a few studies reported that either those with IBD and primary sclerosing cholangitis are at risk of colorectal cancer from 10-20 years post primary sclerosing cholangitis diagnosis[5], or that individuals with left-sided colitis, or pancolitis had a higher risk of colorectal cancer, and this risk was still presence more than 10 after IBD diagnosis.[2][6] Both PSC and IBD duration are major risk factors for colorectal cancer, both being substantial after 5-10 years.[3] Two studies reported that lengthening duration of ulcerative colitis positively correlated with a greater risk of either any dysplasia or high grade dysplasia.[6][9]

Back to top

4.25.2.2 Evidence summary and recommendations

Evidence summary	Level	References
The cumulative risk of colorectal cancer increases with duration of IBD due to cumulative damage of the mucosa resulting from chronic inflammation. The median time to the development of colorectal cancer was 16-23 years. The need to perform surveillance, therefore, increases over time. The risk in the first decade of symptoms is typically <0.5% and rising to 1% at 10 years of ulcerative colitis.	III-3	[2], [6], [4], [8], [10], [7]
Primary sclerosing cholangitis (PSC) is an additional risk factor for colorectal cancer beyond IBD. The duration of PSC was a risk factor for colorectal cancer after 5 years. However, PSC and the colitis associated with PSC is often subclinical meaning that they are diagnosed many years after disease onset.	III-2, III-3	[5], [3]
The risk of colorectal cancer arising in patients with proctitis or ileitis alone is low.	III-3	[6]

Consensus-based recommendation

Patients with IBD at high risk of colorectal cancer (those with PSC, ongoing chronic active inflammation, prior colorectal dysplasia, evidence of intestinal damage with colonic stricture, pseudopolyps or foreshortened tubular colon or family history of CRC at age ≤50) should undergo yearly surveillance colonoscopy.

Consensus-based recommendation

Patients with IBD at intermediate risk of colorectal cancer (those with quiescent disease, no high risk features or family history of CRC in a first-degree relative) should undergo surveillance every three years.

Consensus-based recommendation

Patients with IBD at low risk of colorectal cancer (those with quiescent disease and no other risk factors with inactive disease on consecutive surveillance colonoscopies) may undergo surveillance colonoscopy every five years.

Practice point

Consider increased frequency of surveillance (intervals less than three years) in patients with a family history of CRC in a first-degree relative <50 years of age because this may be an additional risk factor for CRC.

Back to top

4.25.2.2.1 Notes on the recommendations

There are no prospective controlled studies on surveillance strategy and surveillance intervals. Recommendations are based on risk factors identified on cohort studies and actual findings of dysplasia at the time of surveillance colonoscopy.

Back to top

4.25.2.3 References

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Back to top

4.25.2.4 Appendices

PICO question SUR2 Evidence statement form SUR2 Systematic review report SUR2

Back to top

4.26 Recommended surveillance techniques in IBD patients

Contents

4.26.1 What is the recommended technique for surveillance in IBD patients?

In the past, most cases of dysplasia were thought to be invisible to standard diagnostic instruments, and its detection required extensive mucosal sampling from flat mucosa in each colonic segment, or as targeted biopsies from elevated suspicious lesions. International guidelines have recommended that at least two to four random biopsies should be taken from each colonic segment in order to diagnose dysplasia if it is present.[1] However, clinical evidence shows that random colonic sampling may not necessarily facilitate the detection of all cases of invisible dysplasia. It has been estimated that 64 mucosal biopsies are required to ensure a 95% chance of detecting the highest degree of histological abnormality,[2] but even this approach samples only a very small proportion of total colonic surface, and foci of dysplasia can possibly still escape detection.

During the last decade, studies have shown that most dysplasia in ulcerative colitis is actually visible at colonoscopy, even when standard endoscopic instruments are used. Reports from St Mark's Hospital, Chicago and Pennsylvania have shown that the proportion of dysplastic lesions that are macroscopically visible to an endoscopist were 77.3%, 58.5%, and 87.9% respectively.[3][4][5] When new endoscopic techniques such as chromoendoscopy, endomicroscopy, narrow band imaging or autofluorence imaging are used, the recognition of dysplastic lesions is increased.

Data from expert centres indicate that the diagnostic yield of detecting dysplasia is greatly enhanced if targeted biopsies were obtained from visible lesions using chromoendoscopy. In a study of 100 patients with chronic extensive ulcerative colitis undergoing cancer surveillance, dysplasia was detected in 0 from 2904 random biopsies and 9 from 157 targeted biopsies.[6] These data have prompted many experts to advocate the use of chromoendoscopy and mucosal sampling of visibly abnormal mucosa as standard practice in IBD surveillance, rather than rely on random mucosal biopsies to detect dysplasia.[7][8] Other authors believe it is premature to abandon the role of random biopsies entirely until longer follow-up data are available on using chromoendoscopy. There are important practical limitations of chromoendoscopy that limit its sensitivity. The presence of mucosal inflammation or multiple pseudopolyps may affect the interpretation of chromoendoscopy, and in these circumstances, the need for random surveillance biopsies is still justified. Chromoendoscopy requires specific equipment, training and expertise that are not available at every centre. Alternatively, standard white light colonoscopy remains an acceptable and satisfactory means to conduct IBD surveillance provided the colonic mucosa is carefully inspected, and biopsies obtained from each colonic segment or suspicious lesion.[4]

Back to top

4.26.2 Evidence summary and recommendations

Evidence summary	Level	References
The use of chromoendoscopy enhances the detection of dysplasia in UC patients.	III-2	[3], [6], [9]
The detection of dysplasia using standard white light endoscopy requires targetted	IV	[3], [4], [5]

Evidence summary	Level	References
biopsies to be taken from visibly abnormal sites and at least two to four random biopsies from flat mucosa in each colonic segment.		

Evidence-based recommendation	Grade
If available, the use of chromendoscopy/dye spraying where targeted biopsies are obtained from visibly abnormal lesions or strictures is the preferred means to conduct colonoscopic surveillance in IBD. This is especially true for patients at high risk of colorectal cancer.	**C**

Evidence-based recommendation	Grade
If chromoendoscopy is unavailable, or if an endoscopist lacks sufficient expertise with this technique, or if the presence of inflammation interferes with the interpretation of chromoendoscopy, an acceptable alternative practice is using standard white light endoscopy with random non-targeted biopsies from each colonic segment and from raised lesions.	**D**

Practice point
When chromoendoscopy is used, random biopsies are required from each colonic segment to establish histological extent and severity of disease. More intensive mucosal sampling from each colonic segment is indicated in patients with a suspicious visible lesion or in situations where chromoendoscopic interpretation is compromised by factors such as active inflammation, inflammatory polyps or poor bowel preparation.

Back to top

4.26.3 References

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Back to top

4.26.4 Appendices

View body of evidence | View literature search documentation

4.26.5 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

4.27 Management of elevated dysplasia in IBD

Contents

4.27.1 What should be the protocol to manage elevated dysplasia in IBD?

Historically, elevated lesions containing dysplasia in IBD were referred to as DALM's (dysplasia associated lesion or mass). These lesions are highly significant because they are often associated with established or imminent cancer.[1] However, not all elevated dysplastic lesions in IBD are necessarily DALM's. Raised lesions containing dysplasia in non-inflamed areas are sporadic adenomas that can be managed endoscopically in the same way as in the non-colitis population. Raised lesions containing dysplasia in an area of inflammation may be a sporadic adenoma or dysplastic mass lesion associated with colitis. In the former case, dysplasia is not present elsewhere in the colon. Endoscopically, it can be difficult to distinguish in an inflamed segment a DALM from a sporadic adenoma, or indeed an inflammatory polyp. In practice, all suspicious elevated lesions should be biopsied and if possible removed, and multiple biopsies obtained from flat mucosa in adjacent mucosa and from the other colonic segments. As long as the lesion is entirely removed endoscopically and there is no dysplasia elsewhere in the colon, surgery is not necessarily indicated though close surveillance must be maintained in future.[2][3][4][5][6] Conversely, if dysplasia is detected elsewhere in the colon, or if the endoscopist is not confident the entire lesion has been removed, surgical intervention is strongly recommended.

Back to top

4.27.2 Evidence summary and recommendations

Evidence summary	Level	References
Long-term follow up data are reassuring that localised dysplastic lesions in IBD can be treated effectively endoscopically.	IV	[3], [6]

Evidence-based recommendation	Grade
Raised lesions containing dysplasia may be treated endoscopically provided the entire lesion is removed and there is no dysplasia in flat mucosa elsewhere in the colon.	**D**

Evidence-based recommendation	Grade
If a raised dysplastic lesion cannot be completely removed, or if there is dysplasia elsewhere in the colon, surgical intervention is strongly recommended.	**D**

Back to top

4.27.3 References

1. ↑ Blackstone MO, Riddell RH, Rogers BH, Levin B. *Dysplasia-associated lesion or mass (DALM) detected by colonoscopy in long-standing ulcerative colitis: an indication for colectomy.* Gastroenterology 1981 Feb; 80(2):366-74 Available from: http://www.ncbi.nlm.nih.gov/pubmed/7450425.
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Back to top

4.27.4 Appendices

View body of evidence

View literature search documentation

4.27.5 Appendices

View recommendation components	View pending evidence	View body of evidence	View all comments	View literature search

4.28 High-grade dysplasia in IBD

Contents

4.28.1 What should be the protocol to manage high grade dysplasia in IBD?

If high grade dysplasia (HGD) is diagnosed in flat mucosa and confirmed by a separate pathologist, surgery is usually required. According to a review of 10 dysplasia studies, a finding of high grade dysplasia was accompanied by actual cancer in 42%, and in the rest who underwent surgery, definite dysplasia was usually detected in colectomy specimens.[1] Experience from the 30 year St Mark's Hospital surveillance programme found that 19/600 (3.2%) developed HGD. Of these, 11 underwent immediate colectomy and five (45%) had cancer in the operative specimen. Eight patients refused immediate surgery, of whom two subsequently developed CRC. In total, 37% of all patients with HGD eventually developed CRC.[2]

Back to top

4.28.2 Evidence summary and recommendations

Evidence summary	Level	References
The predictive value of HGD for imminent or established cancer is high.	II	[2], [1]

Evidence-based recommendation	Grade
High grade dysplasia in flat mucosa is a strong risk factor for established or imminent carcinoma, and colectomy is usually recommended.	**B**

Back to top

4.28.3 References

1. ↑ [1.0] [1.1] Bernstein CN, Shanahan F, Weinstein WM. *Are we telling patients the truth about surveillance colonoscopy in ulcerative colitis?* Lancet 1994 Jan 8;343(8889):71-4 Available from: http://www.ncbi.nlm.nih.gov/pubmed/7903776.
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Back to top

4.28.4 Appendices

View body of evidence

View literature search documentation

4.28.5 Appendices

View recommendation components

View pending evidence

View body of evidence

View all comments

View literature search

4.29 Low-grade dysplasia in IBD

Contents

4.29.1 What should be the protocol to manage low grade dysplasia in IBD?

The significance of low grade dysplasia (LGD) in flat mucosa is controversial. Data from tertiary referral centres have generally shown it is associated with progression to high grade dysplasia or cancer.[1][2] Of 47 patients who were diagnosed with LGD at St Mark's Hospital, 20% eventually developed CRC and 39% developed either HGD or cancer.[1] At Mount Sinai Hospital, the rate of progression to higher grades of neoplasia was 53% at five years.[2] These results contrast with other data which show progression from LGD to advanced neoplasia is slow, and is not invariable.[3][4][5] A meta-analysis of 20 surveillance studies involving 508 cases of low grade dysplasia in flat mucosa or dysplastic mass lesions found the cancer incidence to be 14 per 1000 person years duration, and the incidence of any advanced lesion was 30 per 1000 person years duration. The positive predictive value of LGD for concurrent cancer was 25% and for progression to cancer was 8%.[6]

Because of the uncertainty about the predictive value of LGD in flat mucosa, it is recommended that surgery be considered if it is multifocal. However, patients with LGD in flat mucosa who wish to avoid an operation require repeat colonoscopy at three to six months, preferably with chromoendoscopy, and thereafter at yearly intervals. A finding of unifocal low grade dysplasia in flat mucosa is less likely to be associated with imminent cancer, and follow-up colonoscopy is reasonable within six months in these cases.

Back to top

4.29.2 Evidence summary and recommendations

Evidence summary	Level	References
The predictive value of low grade dysplasia in flat mucosa for future cancer is controversial, but probably higher if it is located in multiple synchronous sites.	III-2	[1], [2], [3], [4], [5], [6]

Evidence-based recommendation	Grade
Multifocal low grade dysplasia is associated with a sufficiently high risk of future cancer that colectomy is usually recommended. Patients who elect to avoid surgery require follow up surveillance at three months, preferably with chromoendoscopy, and if this examination is normal, annually.	**C**

Evidence-based recommendation	Grade
Unifocal low grade dysplasia may be followed by ongoing surveillance at six months, and if this examination is normal, annually.	**C**

Back to top

4.29.3 References

1. ↑ 1.0 1.1 1.2 Rutter MD, Saunders BP, Wilkinson KH, Rumbles S, Schofield G, Kamm MA, et al. *Thirty-year analysis of a colonoscopic surveillance program for neoplasia in ulcerative colitis.* Gastroenterology 2006 Apr;130(4):1030-8 Available from: http://www.ncbi.nlm.nih.gov/pubmed/16618396.
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Back to top

4.29.4 Appendices

View body of evidence

View literature search documentation

4.30 Indefinite dysplasia in IBD

Contents

4.30.1 What should be the protocol to manage indefinite dysplasia in IBD?

If Indefinite dysplasia (ID) is diagnosed, the rate of progression to a higher grade of dysplasia or carcinoma is unusual. At St Mark's Hospital, 1/23 patients with ID (4%) eventually developed carcinoma and five (22%) developed LGD after nine years follow-up.[1] In contrast, data from New York showed that the five year rate of progression from indefinite dysplasia to HGD or cancer was 9%.[2] If a biopsy is diagnosed as indefinite for dysplasia by two gastrointestinal pathologists, follow-up surveillance colonoscopy, preferably with chromoendoscopy, at six months is reasonable, and thereafter at annual intervals.

Back to top

4.30.2 Evidence summary and recommendations

Evidence summary	Level	References
The predictive value of indefinite dysplasia in flat mucosa for imminent cancer is low.	II	[1], [2]

Evidence-based recommendation	Grade
Indefinite dysplasia in flat mucosa does not require surgery, but follow-up colonoscopic surveillance is justified, preferably with chromoendoscopy, at more frequent intervals.	**B**

Back to top

4.30.3 References

1. ↑ [1.0] [1.1] Rutter MD, Saunders BP, Wilkinson KH, Rumbles S, Schofield G, Kamm MA, et al. *Thirty-year analysis of a colonoscopic surveillance program for neoplasia in ulcerative colitis.* Gastroenterology 2006 Apr;130(4):1030-8 Available from: http://www.ncbi.nlm.nih.gov/pubmed/16618396.
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Back to top

4.30.4 Appendices

View body of evidence | View literature search documentation

4.30.5 Appendices

View recommendation components | View pending evidence | View body of evidence | View all comments | View literature search

4.31 Discussion

Contents

4.31.1 Discussion

4.31.1.1 Unresolved issues

Elevated dysplasia in IBD

IBD dysplasia nomenclature need to be standardised, allowing physicians to communicate findings effectively. Ongoing use of descriptions such as DALM and ALM is impractical and does not guide management of dysplasia in IBD and should be discouraged.

Long term data is needed to assess the impact of endoscopic resection with close surveillance on the natural history.

High grade dysplasia in IBD

The natural history of high grade dysplasia remains unclear. Overall, all studies that evaluated high grade dysplasia have small numbers or form a small cohort within a much larger study of all patients with dysplasia in IBD. More longitudinal studies are needed to allow for better understanding of high grade dysplasia.

More patient preference studies are needed to understand patient decision making in the setting of dysplasia as the natural history of high grade dysplasia is likely to remain elusive for the foreseeable future. While it is generally perceived that patients may prefer colonoscopic surveillance over colectomy, it is also well known that clinicians are poor patient surrogates. In the absence of robust data about the likelihood of developing colorectal cancer, patient preference data is needed to assist with decision making.

The appropriate frequency of surveillance after complete resection of high grade dysplasia is unclear. More frequent surveillance following resection of high grade dysplasia would seem sensible and is extrapolated from on existing post-polypectomy surveillance recommendations in patients without IBD. While this would seem appropriate, more studies are needed define appropriate surveillance intervals.

Surgical resection for high grade dysplasia or colorectal cancer in Crohn's disease is typically a total proctocolectomy, as segmental resections might encourage the development of Crohn's disease at the anastomosis [1]. However these recommendations are based upon small series [2][3] and in patients with limited Crohn's disease colitis and well controlled disease, the risk of metachronous and synchronous CRC might be low [4].

Low grade dysplasia in IBD

The recommendations for surveillance over colectomy are largely individualised. To date there are no studies comparing surveillance colonoscopy to colectomy for low grade dysplasia, or informing the natural history for visible dysplastic lesions after endoscopic resection.

Indefinite dysplasia in IBD

Histologic features of ID may be present because of ongoing low grade inflammation, and it is important to evaluate ID whilst considering the extent of ongoing inflammation. Repeat examination after treating inflammation can be helpful in this case. The natural history of ID is unknown, and the risk for progression to cancer appears low. Studies on ID do not routinely report the presence of associated inflammation and, in the past, have not used current methods of classifying flat/polypoid dysplasia.

Back to top

4.31.1.2 Studies currently underway

No large prospective trials on indefinite dysplasia are underway. Some larger units periodically report on ulcerative colitis surveillance outcomes that are collected prospectively, and these reports may add insight regarding long term outcomes of indefinite dysplasia.

4.31.1.3 Future research priorities

Future research opportunities include:

- Longitudinal cohort studies with long term outcomes of patients undergoing endoscopic resection and surveillance is required.
- Longitudinal cohort studies of outcomes from surveillance versus colectomy are necessary. The formation of a centralised database could assist in this endeavour.
- Clarification of the long term outcomes for indefinite dysplasia is required. Prospective evidence demonstrating that repeat examination with enhanced imaging techniques improves lesion detection or outcomes (or otherwise) is needed.
- Longitudinal cohort studies of outcomes from surveillance versus colectomy are necessary. The formation of a centralised database could assist in this endeavour.

Back to top

1. ↑ Strong S, Steele SR, Boutrous M, Bordineau L, Chun J, Stewart DB, et al. *Clinical Practice Guideline for the Surgical Management of Crohn's Disease.* Dis Colon Rectum 2015 Nov;58(11):1021-36 Available from: http://www.ncbi.nlm.nih.gov/pubmed/26445174.
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5 Anxiety and colonoscopy: Approaches to minimise anxiety and its adverse effects

Contents

5.1 What approaches can be incorporated successfully into an efficient surveillance colonoscopy program to minimise anxiety and pain fall out?

While the literature on colonoscopy is very extensive, only a very small percentage addresses the association with anxiety.[1] Clearly, patients in the categories addressed in the recommendations will be drawn from all aspects of society.

Low socioeconomic status (SES) is colloquially believed to be associated with discomfort in relation to medical investigations. One study identified sigmoidoscopy screening for colorectal cancer as a potential stressor. The UK Flexible Sigmoidoscopy (FS) Trial was regarded as an appropriate vehicle to test this view. A subgroup of patients (n=3535) from the trial was assessed regarding psychosocial wellbeing by pre- and post-screening questionnaires. All participants in this trial (n=29804) were sent a questionnaire three months after FS that included measures of distress, anxiety and a single item questionnaire of bowel cancer worry. SES status was coded from the Townsend Index.[2] Worry about bowel cancer and anxiety were higher before screening in low SES patients. After screening, there were reductions in the factors studied but no differences due to SES were involved in the change. Lower SES patients did not show greater adverse reactivity to FS examination than higher SES participants. A key factor observed is that those with reduced education and economic resources are not necessarily more adversely affected by moderately stressful experiences.[2]

Back to top

5.1.1 Anxiety level before and during colonoscopy

A cross-sectional study[3] was performed to examine a possible relationship between state anxiety and trait anxiety in endoscopy in an outpatient setting. (Definitions: “Trait Anxiety” indicates the tendency to experience anxiety; it is considered to be a characteristic of personality that endures over time. “State Anxiety” is a temporary uncomfortable experience that occurs when a person feels threatened by a situation.) In effect, trait anxiety is the potential, or tendency to experience state anxiety.[4] These forms of anxiety can be measured by

Charles Speilberger's State-Trait Inventory for Adults. "The use of this inventory clearly differentiates between the temporary condition of "state anxiety" and more general long-standing "trait anxiety".[5] Patient response was rated at initial consultation and immediately prior to endoscopy, using the Speilberger State-Trait Anxiety Inventory.[4][5][6] A distinct increase in state anxiety was observed before endoscopy (upper gastrointestinal and colonoscopy) but no change was observed in trait anxiety. Females had higher anxiety levels. Overall, anxiety levels were not related to type of endoscopic procedure.

An Australian study[1], which recognised anxiety as being common in patients undergoing invasive medical procedures, assessed the relationship between coping style of patients, pre-colonoscopy information, anxiety and pain associated with colonoscopy. Coping style was established and patients codified as either information-seekers or information-avoiders. Provision of congruent information in line with coping style was observed to reduce anxiety and ameliorate the patient's experience of the procedure. There was, however, no effect on dose of sedation or perception of pain.

A questionnaire-based study reviewed the procedural experience of patients undergoing endoscopy.[7] Fifty five (55) consecutive patients undergoing colonoscopy had a three point evaluation of the procedural experience. One week prior to the investigation, they were assessed as to their understanding and their concerns regarding colonoscopy were recorded and rated. The second assessment occurred while awaiting commencement of the procedure and assessed preparation and fasting. The third and final questionnaire was completed 24 to 72 hours after the procedure and after recovery from sedation; it repeated the pre-procedural questionnaire and addressed comfort and social disruption due to the colonoscopy. It was observed that concerns specific to colonoscopy, including anticipation of pain, had impact on acceptance of colonoscopy. This was not improved by experience of the investigation, even if procedural anxiety and pain were reduced. The patient's pre-procedural views of the investigation should be actively addressed to improve participation in colonoscopy.

While colonoscopy is most frequently performed on adults, it may be used in the diagnostic evaluation of children with colonic disease. Teenagers with inflammatory bowel disease (IBD) will usually require colonoscopy from time to time.

A study designed to compare children aged 10-18 years with either IBD or functional gastrointestinal disease (FGID) undergoing their first colonoscopy recorded the levels of pain or anxiety that they experienced. These levels were assessed by means of a questionnaire recorded immediately before the procedure and through a second questionnaire 48 hours later. While no differences in anxiety were reported, it was noted that higher levels of anxiety accompanied by higher pain scores were experienced by children with IBD at the time of colonoscopy. Children with FGID observe common pain symptoms during colonoscopy and may describe more post-conoscopic pain than those with IBD. It was concluded that anxiety is associated with severity of pain after colonoscopy in children with IBD, while not observed to be a factor in children with FGID.[8]

Back to top

5.1.2 Amelioration of anxiety in relation to colonoscopy

State anxiety is moderately increased in patients undergoing outpatient diagnostic endoscopy.[9] This increase is not significantly influenced by age, sex, type of procedure or source of referral. The ability of the endoscopist to estimate patient anxiety is generally poor. It is suggested that this is because the increase in state anxiety is usually at a mild level. An RCT[10] explored the view that information provided before interventional clinical

procedures should improve knowledge of the procedure and reduce anxiety related to it. The study involved approaching patients a week before colonoscopy, providing an information leaflet on the subject and having them complete a Speilberger State Anxiety Inventory (STAI).[6] Patients were randomly assigned to view or not view an information video before colonoscopy, while all patients completed a second STAI and knowledge test. The study involved 150 patients; 72 video-watchers and 78 non-video-watchers. The groups were generally similar in relation to age, sex, socioeconomic status and initial anxiety score, although female patients had higher baseline STAI scores than those with previous experience. Patients who watched the video were less anxious and achieved a higher score on the knowledge questionnaire than those who did not. Understanding the purpose, procedural details and potential complications of colonoscopy better prepared patients for the procedure. This study is supported in a commentary[11] advocating an information video as a better way to convey information about colonoscopy. It is suggested that the technique may be cost-effective in reducing cost of sedation and post-operative recovery time.

A study of 201 patients undergoing colonoscopy randomised patients into three groups,[12] those provided with pre-procedure information by video plus discussion, video alone or discussion only. All patients answered a thirteen item test of knowledge and all underwent State-Trait Anxiety Inventory.[6] Those patients who were exposed to the video had statistically significant better scores ($p<.001$) than patients involved only with discussion, but no difference was observed between the video groups. It was concluded that understanding of colonoscopy and its risks and benefits did not increase anxiety. It was considered that the overall approach may save time for the clinician and provide opportunity for more personalised discussion and reassurance of the patient.

Another randomised study[13] included an information video in the pre-procedural activity. Control patients did not view the video. Situational anxiety was measured using the State-Trait Anxiety Inventory (STAI) questionnaire.[6] Patient satisfaction was rated, as was their experience with pain. The colonoscopist and endoscopy nurse were blinded as to which stream a patient had entered and completed a questionnaire as to medication employed, outcome of procedure, its level of tolerance and level of pain experienced. It was reported that midazolam dosage was the same in all patients, but that those who viewed the video used higher doses of fentanyl ($p <0.2$). Women found the experience to be more painful ($p=0.001$) and expressed less satisfaction with the procedure. It was observed that there was no impact on tolerability or anxiety among video-observers, but it was suggested that gender differences warranted adjustment of information and medication associated with the procedure.

Back to top

5.2 Evidence summary and recommendations

Evidence summary	Level	References
Colonoscopy is generally accepted as a useful and non-threatening procedure. It is still, however, regarded with some suspicion and promotes anxiety in a body of people undergoing the procedure.	II, III-3	[2], [14], [3], [1]
Patients with reduced educational and economic resources are not more adversely	III-3	[2]

Evidence summary	Level	References
affected than those with greater resources by moderately stressful experiences.		
Patients' pre-procedural view of colonoscopy needs to be actively addressed to improve participation in colonoscopy.	III-3	[15], [14]
Previous colonoscopy reduces patient anxiety when the procedure is to be repeated and increases rate of compliance.	II, III-3	[15], [16], [17]
Provision of congruent information in line with coping style has been observed to ameliorate patient's experience of the procedure.	II	[1]
Patients provided with a pre-operative video on colonoscopy were less anxious than those not shown a video.	II	[10], [12], [13]
Understanding the purpose, procedural details and potential complications of colonoscopy can better prepare patients for the procedure.	II	[10]

Evidence-based recommendation	Grade
Pre-colonoscopic advice to patients by means of educational material, video and clinical explanation can assist in improving patient experience with the procedure and in reducing anxiety.	**C**

Back to top

5.3 References

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Back to top

5.4 Appendices

View body of evidence {{{content 2}}}

5.1 Socioeconomic factors - Introduction

Contents

5.1.1 2017 revised content

5.1.1.1 Introduction

A systematic review was undertaken to inform this chapter. Guidance (practice points) is based on selected published evidence. [Guidelines development process chapter here].

Socioeconomic factors that influence health include education, employment, income and wealth, family, neighbours, housing, access to services, migration and refugee status and food security.[1][2][3][4][5][6][7][8][9][10][11][12] These factors are social determinants of health. The National Health and Medical Research Council has recognised these factors in its Handbook, “Using Socioeconomic evidence in clinical practice guidelines”.[2][13] Socioeconomic disadvantage is common in Australia.[13][14]

Social and economic circumstances are recognised determinants of access to health care and of healthcare outcomes, including for CRC.[2][3][4][15] [16][17] Those individuals who are less affluent or socially deprived have shorter lives, during which time they suffer more illness than those who are more economically favoured.{[2][18][5] Between 2009 and 2013 Australians living in the most disadvantaged areas had the highest age-standardised for colorectal cancer.[19] As well as access, cost is an SES related factor in people receiving care. In 2015-16, one in twelve (8%) Australians who needed to see a medical specialist delayed or did not go because of the cost. Those with a long term health condition were more likely to delay seeing or not see a medical specialist due to cost than those without (9% compared with 5%). People living in the areas of most socio-economic disadvantage were more likely to delay seeing or not see a medical specialist due to cost than those living in areas of least disadvantage (9% compared with 6%).[15][20]

Many SES factors are beyond the capacity of individual clinicians to address. The focus of this chapter is on those SES related factors that impact on surveillance in the three groups being considered and in particular, those whose impact can be modified.[2][21][17]

Three key areas linked to SES that clinicians can address to improve the success of surveillance are:

1. consumer health literacy by providing information in a format and at the level patients can comprehend to
2. promote and permit shared decision making and
3. increase their own cultural competency so they can effectively communicate with patients from different cultural groups and different belief systems to increase their active participation in surveillance.

Effective communication between consumers and healthcare providers, and within healthcare teams, has been linked to improved consumer health outcomes.[22] Effective communication is relevant to the four aspects of surveillance discussed below.

5.1.1.2 Health literacy

Literacy is low in Australia. In 2011, only 56% of people had the general literacy needed to cope with everyday life and work.[23]

Health literacy is defined as the skills, knowledge, motivation and capacity of a person to access, understand, appraise and apply information to make effective decisions about health and health care and take appropriate action.[24] Almost 60% of adult Australians have low health literacy.[25]

In 2006, almost 3 million Australians aged 15-74 years spoke English as a second language. Only 25% of this group had achieved a level of health literacy described as adequate or better, compared with 44% of people whose first language was English.[26] Low health literacy is associated with low levels of knowledge and poorer health outcomes.[27] Poor health literacy is associated with low SES.[28][29][30]

Health literacy is relevant to surveillance.[31][32]

Since 2011 all hospitals and day facility services in Australia have been required to meet the National Safety and Quality Health Service Standards for accreditation. A specific standard requires demonstration of actions to improve consumer understanding and participation in decision making about their care.[33]

A number of useful resources are available to assist practitioners working outside the hospital or day facility to develop information to meet the needs of patients with low health literacy.[34][35][36] These resources are readily accessible on their websites.

5.1.1.3 Shared decision making

People who are supported to make an informed decision by a healthcare professional may have better outcomes, better experiences, and less regret about their decisions.[37][38][39] Disadvantaged groups may benefit most.[40]

Patient decision aids and navigation tools have been shown to increase CRC screening participation but not been trialled in the surveillance setting.[41][42][43][44][45][46][47]

Larger studies are needed to evaluate what features of navigation are most effective in patients ongoing participation in CRC surveillance, particularly those from lower SES backgrounds.

5.1.1.4 Cultural competency

Cultural competency is the capacity to interact with people across different cultures and requires cross cultural communication skills. This competency is particularly important in Australia where 1in 4 Australians is born overseas, and just under 3% identify as Indigenous or Torres Strait Islander Australians.[48] Clinician attitudes may play an important role in uptake of CRC surveillance.[49][50] Action at all levels of the health system is required to reduce the health inequalities that exist for many culturally and linguistically diverse (CALD) background communities.[51]

Back to top

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Back to top

5.2 Impact of socioeconomic factors on surveillance colonoscopy

5.2.1 What is the impact and nature of socioeconomic status (SES)?

Patients in the three groups who are the subject of these guidelines regarding surveillance colonoscopy are in a position where they will have already received treatment for their underlying condition (in the case of adenoma follow-up or following resection for colorectal cancer) or had a firm diagnosis of their disease (in the case of inflammatory bowel disease). Clearly, all three groups will have accessed the health system and undergone appropriate treatment or assessment.

For the patients involved in these groups, any barriers to health system access and provision of appropriate care have presumably been addressed in the course of initial management, so allowing them to complete their primary treatment. Surveillance in these patients will in large part be fulfilled by following the recommendations in these guidelines. It is expected that patients of low economic status and/or deprivation would have been identified as they were managed through the clinical and social resources of a multidisciplinary clinic and be assured of the best care available in the Australian universal health care system (Medicare). Although Kelsall et al[1] state “despite a universal healthcare system in Australia socioeconomic inequalities in survival from colorectal cancer exist, and an enduring challenge to ensure that improvements in colorectal cancer survival are shared equally across the population”. Alerting clinicians to SES status at all clinical encounters may assist in meeting this enduring challenge sooner rather than later.

Back to top

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Back to top

5.3 Colonoscopy outcomes in Aboriginal and Torres Strait Islander peoples

5.3.1 What colonoscopic surveillance is available to indigenous people for CRC resection, polyp removal, IBD?

The AIHW report Australia's Health 2008[1] makes several key points in relation to indigenous people. It reflects that they are usually less healthy, die at younger ages, suffer more disability and the quality of their life is lower than other Australians. The report also states that socially and economically disadvantaged groups tend to have worse health across a significant spectrum of conditions, these need to be taken into consideration when addressing indigenous people.

No distinct literature addressing surveillance colonoscopy was located on searching although there have been screening studies in indigenous and ethnic groups.

One publication from North Queensland (Cairns and Townsville Hospitals) addressed colorectal cancer in indigenous people.[2] The study was retrospective and it aimed to better characterise CRC in indigenous people. The authors note difficulties in data collection and report follow-up for a mean of 20.5 months (range 2-51 months). A follow-up programme is reported for the 25 patients treated and it is suggested that approximately 30% of patients estimated to have CRC attended for treatment.

While colonoscopy was offered at one year and at three yearly intervals, compliance is not reported. Authors state the need for difficulty of obtaining accurate information, espouse education of indigenes on CRC and express the opinion that establishing cancer units where there are indigenous liaison officers would facilitate data collection, screening, "family understanding of the disease, increase compliance and ensure more complete follow-up." These surgeons and health workers give a very useful understanding of services needed in areas of socioeconomic and indigenous care.

Back to top

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Back to top

5.4 Impact of socioeconomic factors in treatment groups undergoing surveillance colonoscopy

Contents

5.4.1 Does lower socioeconomic status (SES) have to result in poorer outcome for curative resection for colonic cancer?

There is significant literature in relation to SES and cancer survival after treatment for colorectal cancer[1][2][3][4][5][6][7][8][9] Patients with lower SES have been reported consistently to have shorter survival than those with higher SES.[10][11] The determination of SES has been based on a range of criteria, including census, occupational, domiciliary and education data.[10][11][12]

However, it has been observed in a cohort study that, for patients undergoing consistent type and quality of treatment by the same clinical teams, there is no demonstrable relationship between SES and survival from colorectal cancer[13]. An RCT[14] also noted that, given equal treatment, colorectal cancer outcomes do not appear to depend on SES in England and Wales, the authors suggesting that health system factors may play a part. A cohort study of white and African Americans with advanced lung and colon cancer, who had not had previous chemotherapy, had their socioeconomic and biological data collected prospectively in twelve medical centres in the US Veterans Administration System (1981–1986).[15] The essential finding of the study was that lung and colon cancer outcomes 'may be similar among black and white patients who have equal access to comparable medical care in spite of socioeconomic differences'. This study puts equal access to care as a necessary accompaniment to good clinical care.[2][15] Disparities in treatment and low SES were seen in a case-only study to be a major factor in the explanation of decreased survival of African-Americans.[16]

These observations, which target both lower SES and deprivation as factors in poorer survival after resection of colorectal cancer, found that if the total of factors that surround treatment are equal in all respects, results are similar. Further research remains to be done, but it seems that if practitioners assist their patients to access best care, they could promote more equality of outcomes. These are special studies and their conclusions have not yet necessarily been accepted. It has been observed in the UK that, although the NHS cancer plan has been implemented, there remains a strong influence of social factors with regard to hospital admission and provision of care.[17]

The literature searched has not in general provided significant staging, operative or surveillance information. The areas addressed have related to primary treatment and mortality or survival.

In a retrospective review of a health maintenance group's enrolees who were diagnosed with colorectal cancer between 1993 and 1999, analysis of patients was restricted to those expected to benefit from surveillance for cancer (stages 0, I, II, III AJCC).[18] Follow-up times were found to be variable. Survival analysis was used to estimate the cumulative proportion undergoing surveillance and comparison between groups was based on the log rank test.[19][20][21] Higher SES and being married were associated with greater utilization. Patients over 80 and those with rectal cancer were less likely to undergo surveillance. There was substantial variation of colonic surveillance examination with clinical socio-demographic factors influencing the likelihood of surveillance.

A qualitative study in the French literature[22] evaluated the motivations of people having or not having follow-up after a positive colorectal screening test result. Following semi-directed interviews, it was reported that the doctor-patient relationship had a strong influence on acceptance of colonoscopy. It was also necessary to persuade doctors that colonoscopy and not FOBT was the National Standard.

The frequency of colonoscopy will need to be discussed with all patients, but more specific attention will need to be directed to socio-economically deprived patients. They will benefit by being encouraged to comply with the recommendations of these guidelines.

Back to top

5.4.2 Evidence summary and recommendations

Evidence summary	Level	References
There is a body of literature consistently reporting lower cancer survival in patients with low SES.	III-3, IV	[1], [3], [23], [17], [5], [6], [7], [8], [9]
Lower survival rates associated with disparities in care can be improved by eliminating disparities in the management of colorectal cancer.	II, III-3, IV	[13], [14], [15], [16]

Evidence-based recommendation	Grade
Clinicians may assist in improving survival outcomes in curative resection for colorectal	**B**

Evidence-based recommendation	Grade
cancer patients who are socioeconomically or otherwise disadvantaged by expediting their access to optimal clinical care.	

Back to top

5.4.3 References

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Back to top

5.4.4 Appendices

View body of evidence {{{content 2}}}

5.5 Guideline development process

Contents

5.5.1 Guideline development process

5.5.1.1 Introduction

Preamble

In 2006, the Australian Health Ministers Advisory Council (AHMAC) instructed the National Bowel Cancer Screening Program to review colonoscopy services in Australia. The Quality Working Group (QWG) (chaired by Professor James St John) was commissioned to do this. A draft report was issued in June 2008 for public comment and the final report followed in April 2009. The final report was approved by the Australian Screening Committee and then noted by AHMAC in April and referred to the Australian Commission on Safety and Quality in Healthcare. The Commission stated that there was no clash and AHMAC was reassured. AHMAC endorsed the report in early 2010.

The Australian Cancer Network's "Clinical Practice Guidelines for the prevention, early detection and management of colorectal cancer" 2005 (CPG) included, amongst a large amount of other material, reference to use of colonoscopy and indications for surveillance.

The QWG report recommended that AHMAC endorse guidelines on surveillance colonoscopy as policy and consider linking MBS items to CPG to discourage over-servicing (assuming that the guidelines were contemporary).

It was stressed that guidelines take two to three years to complete and that maintaining the guidelines' contemporary status can be difficult. This might be addressed by review every three to five years. It was noted that there were no current clinical practice guidelines relating to prevention of bowel cancer development in the setting of inflammatory bowel disease.

It was noted that the US Multi-Society Taskforce report on adenoma and cancer surveillance expressed concern about unrewarding surveillance colonoscopy draining procedural resources away from bowel cancer screening and investigation of patients with symptoms.

The Cancer Council Australia (CCA) was commissioned by the Screening Section of the Department of Health and Ageing (DoHA) to review sections of several chapters of the "Clinical Practice Guidelines for the prevention, early detection and management of colorectal cancer" approved by the NHMRC in 2005 with a specific focus on colonoscopic surveillance. Cancer Council Australia then submitted a proposal to the National Health and Medical Research Council (NHMRC) to develop the *Clinical Practice Guidelines for Surveillance Colonoscopy - in adenoma follow-up, following curative resection of colorectal cancer, and for cancer surveillance in inflammatory bowel disease.*

A Working Party composed of clinical specialists, a consumer and a Project Officer carried out the work. The Project Officer conducted literature searches, assisted in the critical evaluation of the literature and extracted the relevant data. Funding was provided by the Screening Section of the Department of Health and Ageing.

The development program was designed to meet the standards of scientific rigour required by the NHMRC guideline development process, which is the subject of a series of handbooks on the main stages involved in the development of clinical practice guidelines.[1][2][3][4][5][6][7][8] The eight NHMRC handbooks have been condensed previously into a single volume—*Development of clinical practice guidelines for the management of cutaneous melanoma and melanoma in special sites: a handbook for chapter leaders and expert working groups* [9]—which outlines the major steps and expectations involved in developing guidelines and provides a clear path for everyone involved in the project. This handbook provides the definitions and protocols for developing research questions and search strategies, conducting searches and critical appraisal, summarising and assessing the relevant literature and, finally, formulating the recommendations. It includes checklists and templates created to meet NHMRC requirements and designated standards of quality and process. This condensation of all the NHMRC handbooks has been a most useful aid in the demanding and, for some, new process of developing guidelines.

At its initial meetings the Guidelines Working Party prepared a table of topics and developed questions to address identified clinical needs. The questions were identified with the specific focus of the revision being the role of surveillance colonoscopy in chapters 8, 9, 17, and 23 of the Clinical Practice Guidelines for the prevention, early detection and management of colorectal cancer 2005 and also in a new chapter dealing with surveillance colonoscopy in the management of patients with inflammatory bowel disease (IBD). Subcommittees of the Guidelines Working Party were formed to address topics in their areas of expertise.

Terms of reference

The following points were then discussed and supported by the Working Party:

- A suggestion was made that consideration be given to use of colonoscopy in population screening. While there are trans-Atlantic differences, American Guidelines address individual and not population screening.
- In a comment on funding, it was noted that NHMRC takes no responsibility for funding the current review of surveillance colonoscopy guidelines. The proposed review is QWG-related (as a fundamental aspect of its brief, in direct response to the request from AHMAC that colonoscopy services be reviewed) and will be funded by Department of Health and Ageing (DoHA).
- NHMRC approval of any revisions to the guidelines was to be sought as it was felt to be highly desirable, adding weight to the resulting guidelines. Endorsement by other responsible organisations was felt to be possible if NHMRC approval were not forthcoming.
- ACN/CCA suggested that, while revisions to the CPG might be achieved by 30 June 2010, this timeline was probably optimistic.
- There was a strong need to stick with evidence-based material throughout the guidelines' development process.
- Relevant new information should be embraced, where possible within the external restrictions imposed, and that new source data that differed from US and European information would need careful review to ensure a good evidence base.
- Areas where evidence was scanty or absent were to be identified.
- Update of research priorities was to be an important part of the development process and funding needs required identification.

Back to top

5.5.1.2 Steps in preparing the guideline

A clear strategy was developed for every topic and each expert group followed the appropriate steps in preparing the guidelines. While each subcommittee received significant assistance from the Project Officer skilled in methodology, the subcommittees themselves oversaw the synthesis of the evidence and formulation of the recommendations for their topics.

The strategic steps followed are outlined below:

1. Structure the research questions
2. Develop a search strategy
3. Search the literature
4. Select, assess and summarise the literature

5. Critically appraise and summarise each selected article

6. Assess the body of evidence and formulate recommendations

Back to top

5.5.1.2.1 Structure the research questions

A wide range of questions was proposed for research. The questions focussed on interventions rather than diagnosis or prognosis. All proposed questions were reviewed on the basis of their purpose, scope and clinical importance to the target audience and were structured according to the PICO (populations, interventions, comparisons, outcomes) formulation.

The Guidelines for all three components are designed to answer the question as to how frequently patients require surveillance colonoscopy to achieve maximal protection against the development of colorectal cancer, in their individual circumstances.

The clinical questions asked:

- What are the appropriate intervals between colonoscopies after polypectomy?
- What are the appropriate intervals between colonoscopies after colorectal cancer resection?
- What are the appropriate intervals between colonoscopies in patients diagnosed with inflammatory bowel disease?

Back to top

5.5.1.2.2 Develop a search strategy

Each research question was submitted to a search strategy based on the PICO formulation.

Most searches were directed to colorectal cancer as a generic base. Searches were limited or widened as necessary, but all maintained the PICO structure. Keywords were selected during the PICO process. Further sources for keywords or MESH and subject terms were derived from evidence-based material, systematically reviewed articles and appropriately relevant literature. A single systematic search strategy was derived from these terms and applied to all included electronic databases.

Back to top

5.5.1.2.3 Search the literature

NHMRC specifies that clinical practice guidelines should be based on systematic identification and synthesis of the best available scientific evidence.[1] All literature searches were conducted systematically using electronic databases concluding 31 December 2009. Examples include:

- *Medline*: bibliographic references and abstracts to articles in a range of languages on topics such as clinical medical information and biomedicine, and including the allied health fields, biological and physical sciences
- *EMBASE*: major pharmacological and biomedical database indexing drug information from 4550 journals published in 70 countries
- *Cinahl*: bibliographic references and abstracts to journal articles, book chapters, pamphlets, audiovisual materials, software, dissertations, critical paths, and research instruments on topics including nursing and allied health, biomedicine, consumer health, health sciences librarianship, behavioural sciences, management, and education
- *Cochrane Library*: regularly updated collection of evidence-based medicine databases, including The Cochrane Database of Systematic Reviews
- *Psychinfo*: Bibliographic references and abstracts to journal articles, book chapters, dissertations and technical reports on psychology; social, clinical, cognitive and neuropsychology; psychiatry, sociology, anthropology and education, with source material from a wide range of languages.

The literature review process of this document includes a systematic search of sites such as PubMed-Medline, Embase, Cinahl and Cochrane to select published guidelines, systematic reviews and primary studies assessing the use of colonoscopy for surveillance after endoscopic resection of colonic polyps and for surveillance after curative-intent resection of colorectal cancer (CRC) for the years 2003–2009 and inflammatory bowel disease (IBD) for the years 1990–2009. An additional search was done for the years 1990–2002 on surveillance after endoscopic resection of colonic polyps and for surveillance after curative-intent resection of colorectal cancer (CRC) to add relevant articles which were not included in the literature included in the Clinical Practice Guidelines for the prevention, early detection and management of colorectal cancer, approved by the NHMRC in 2005.

Dates searches were performed and the results were as follows:

Embase:

3/11/09: adenoma AND surveillance AND colonoscopy – **7**

3/11/09: colorectal cancer AND resection AND surveillance AND colonoscopy – **17**

4/11/09: colonoscopy AND (surveillance OR follow up) and colorectal – **27**

4/11/09: colonoscopy AND (surveillance OR follow up) AND (colorectal OR bowel cancer – **86**

17/11/09: 'inflammatory bowel disease'/exp/mj AND [humans]/lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1-1-1990]/sd NOT [18-11-2009]/sd AND 'cancer'/exp AND colorectal AND [humans] /lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1-1-1990]/sd NOT [18-11-2009]/sd AND surveillance OR 'follow up'/mj AND [1-1-1990]/sd NOT [18-11-2009]/sd AND [humans]/lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1990-2009]/py – **185**

18/11/09: 'inflammatory bowel disease'/exp/mj AND [humans]/lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1-1-1990]/sd NOT [18-11-2009]/sd AND 'cancer'/exp AND colorectal AND [humans] /lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1-1-1990]/sd NOT [18-11-2009]/sd AND surveillance OR 'follow up'/mj AND [1-1-1990]/sd NOT [18-11-2009]/sd AND [humans]/lim AND [English]/lim AND [abstracts]/lim AND [priority journals]/lim AND [1990-2009]/py – **148**

27/1/10: (colorectal OR colon OR rectum) AND (cancer OR neoplasm) AND (surveillance OR follow up) AND (surgery OR resection) – **48**

8/5/10: #4'cancer'/exp/mj OR 'neoplasm'/exp/mj AND (colorectal OR 'colon'/exp/mj OR 'rectum'/exp/mj OR 'bowel'/exp/mj) AND (surveillance OR 'follow up'/mj) AND colonoscopy AND [humans]/lim AND [English]/lim AND [1980-2002]/py – **354**

8/5/10: articles selected for relevance (omitted articles with no abstract, non-studies, screening and familial cancer) #4'cancer'/exp/mj OR 'neoplasm'/exp/mj AND (colorectal OR 'colon'/exp/mj OR 'rectum'/exp/mj OR 'bowel'/exp/mj) AND (surveillance OR 'follow up'/mj) AND colonoscopy AND [humans]/lim AND [English]/lim AND [1980-2002]/py – **88**

17/11/10: 'adenoma'/exp AND ('cost'/exp AND effectiveness OR economic) AND (surveillance OR follow AND up)- **1**

17/11/10: (surveillance OR follow AND up) AND ('cost'/exp AND effectiveness OR costing OR 'economics'/exp) AND ('cancer'/exp OR 'neoplasm'/exp) AND (colorectal OR 'colon'/exp OR 'rectum'/exp OR 'bowel'/exp) AND [humans]/lim AND [english]/lim- **27**

17/11/10: ulcerative AND 'colitis'/exp/mj) AND('cancer'/exp OR 'neoplasm'/exp) AND (surveillance OR follow AND up) AND('cost'/exp AND effectiveness OR economic)- **2**

PubMed:

7/10/09: "Adenoma/diagnosis"[Major]) AND (colonoscopy[Title/Abstract]. visually restricted to 2005 or later. Visually checked for articles relating to rates of diagnosis, failure to diagnose or missed diagnoses – **46**

14/10/09: guidelines[Title/Abstract] AND colorectal[Title/Abstract] AND cancer[Title/Abstract] AND surveillance [Title/Abstract] – **229** articles, restricted to **59**

21/10/09: colorectal neoplasms AND diagnosis AND colonoscopy AND (surveillance OR follow-up) for 2003 and 2004. This yielded **226** articles, which were visually reduced to **11** by checking title and/or abstract

21/10/09: chronic inflammatory bowel disease AND colonoscopy AND (surveillance OR follow up) 2003-2009 – **52** articles visually restricted to **8**

3/11/09: ("2003"[Publication Date] : "3000"[Publication Date]) AND (((colonoscopy [MeSH Major Topic]) AND colorectal cancer[MeSH Major Topic]) AND (surveillance OR follow-up[MeSH Major Topic])) Limits: Humans, English, Core clinical journals – **102**

3/11/09: Search: ("2003"[Publication Date] : "3000"[Publication Date]) AND ((((cancer[Title/Abstract]) AND colorectal[Title/Abstract]) AND surveillance[Title/Abstract]) AND "resection"[Title/Abstract]) Limits: Humans, English, Core clinical journals – **13**

3/11/09: "2003"[Publication Date}: "3000"[Publication Date]) AND ((polypectomy[Title/Abstract]) AND surveillance[Title/Abstract]) Limits: Humans, English, Core clinical journals – **21**

3/11/09: ((("2003"[Publication Date] : "3000"[Publication Date]) AND (adenoma[MeSH Major Topic])) AND surveillance) AND colonoscopy[MeSH Major Topic] Limits: Humans, English, Core clinical journals – **28**

19/11/09: (Inflammatory Bowel Disease) AND neoplasm (Mesh) AND (surveillance OR follow-up) 1990-2009 Humans, English, Clinical journals Original unsorted search which yielded **147** articles

7/1/10: ("barium"[MeSH Terms] OR "barium"[All Fields]) AND ("enema"[MeSH Terms] OR "enema"[All Fields])) AND ("neoplasms"[MeSH Terms] 2004-presentVisually restricted to studies examining methods. Excluded articles dealing with screening only **5**

29/12/09: ("2003"[Publication Date] : "3000"[Publication Date]) AND (sessile adenomas and colorectal cancer) Limits: Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Comparative Study, Controlled Clinical Trial, Government Publications, Guideline, Journal Article, English – **124**

31/12/09: ("2003/01/01"[Publication Date] : "3000"[Publication Date]) AND (Colorectal cancer and multiple adenomas) Limits: Humans, Male, Female, Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Comparative Study, Controlled Clinical Trial, Multicenter Study, English, MEDLINE, PubMed Central, All Adult: 19+ years **– 81**

4/1/10: MYH-associated polyposis and surveillance – **11**

4/1/10: Familial adenomatous polyposis (FAP) and polypectomy – **19**

4/1/10: ("2003/01/01"[Publication Date] : "3000"[Publication Date]) AND (("2003/01/01"[Publication Date] : "3000"[Publication Date]) AND (Surveillance in patients with FAP)) Limits: only items with links to full text, Humans, Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Case Reports, Comparative Study, Controlled Clinical Trial, Guideline, English, MEDLINE, PubMed Central, All Child: 0-18 years, All Adult: 19+ years – **32**

5/1/10: FAP guidelines – **1**

7/1/10: ("colonoscopy"[MeSH Terms] OR "colonoscopy"[All Fields]) AND ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) AND (colorectal[All Fields] OR ("intestines"[MeSH Terms] OR "intestines"[All Fields] OR "bowel"[All Fields])) AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp]) AND English[lang]) 2004-present Visually restricted to studies examining methods of investigation – **86**

7/1/10: ("colonography, computed tomographic"[MeSH Terms] OR ("colonography"[All Fields] AND "computed" [All Fields] AND "tomographic"[All Fields]) OR "computed tomographic colonography"[All Fields] OR ("ct"[All Fields] AND "colonography"[All Fields]) OR "ct colonography"[All Fields]) AND ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] OR "neoplasm"[All Fields]) AND (colorectal[All Fields] OR ("intestines"[MeSH Terms] OR "intestines"[All Fields] OR "bowel"[All Fields])) AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp]) AND English[lang])- 2004-present Visually restricted to studies examining method of investigation – **39**

7/1/10: ("sigmoidoscopy"[MeSH Terms] OR "sigmoidoscopy"[All Fields]) AND ("neoplasms"[MeSH Terms] OR "neoplasms"[All Fields] 2004-present. Visually restricted to exclude screening and articles that were not reviews or studies – **1**

29/1/10: (("2004"[Publication Date] : "3000"[Publication Date]) OR ("cancer "[Title/Abstract])) OR ("neoplasm" [Title/Abstract]) AND ("colorectal"[Title/Abstract] OR "bowel"[Title/Abstract] OR "colon"[Title/Abstract] OR "rectum"[Title/Abstract]) AND ("surveillance"[Title/Abstract] OR "follow up"[Title/Abstract]) AND ("surgery"[Title /Abstract] OR "resection"[Title/Abstract])) AND colonoscopy Limits: Humans, English, Core clinical journals, Cancer, MEDLINE, PubMed Central – **85**

1/5/10: Search strategy: colorectal neoplasms (MESH term) AND diagnosis (MESH term) AND (surveillance OR follow up) (Title/abstract) with limits as below. ((#2 AND #3) AND #6) AND #7 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #2 "colorectal neoplasms"[MeSH Terms] AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #3 "diagnosis"[MeSH Terms] AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #6 surveillance[Title/Abstract] AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial [ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #7 follow up[Title /Abstract] AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) – **17**

1/5/10: ((surveillance) OR (follow[Title/Abstract] AND up[Title/Abstract])) AND (colorectal neoplasm AND colonoscopy) AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) – **50**

1/5/10: (polypectomy) AND (surveillance OR follow up) AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT] – **20**

1/5/10: (#23) AND #18 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial [ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT]))- #23 = ("neoplasms" [MeSH Major Topic] AND colorectal[Title/Abstract] OR colon[Title/Abstract] OR rectum[Title/Abstract] OR bowel [Title/Abstract]) AND resection[Title/Abstract] #18 = surveillance[Title/Abstract] OR follow up[Title/Abstract] – **116**

1/5/10: (#18) AND #27 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial [ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #18 = surveillance[Title /Abstract] OR follow up[Title/Abstract] #27 = adenoma[Title/Abstract] AND colonoscopy[Title/Abstract] – **16**

1/5/10: (((#29) AND #30) AND #31) AND #32 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #29 = cancer[Title/Abstract] OR neoplasm[Title/Abstract] 30 = ((colorectal[Title/Abstract] OR bowel[Title /Abstract]) OR colon[Title/Abstract]) OR rectum[Title/Abstract] 31 = surveillance[Title/Abstract] OR (follow[Title /Abstract] AND up[Title/Abstract]) 32 = surgery[Title/Abstract] OR resection[Title/Abstract] – **109**

1/5/10: (((#29) AND #30) AND #31) AND #34 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp]) AND English[lang] AND jsubsetaim[text] AND ("1980"[PDAT] : "2002"[PDAT])) #29 = cancer[Title/Abstract] OR neoplasm[Title/Abstract] #30 = ((colorectal[Title/Abstract] OR bowel[Title /Abstract]) OR colon[Title/Abstract]) OR rectum[Title/Abstract] #31 = surveillance[Title/Abstract] OR (follow[Title /Abstract] AND up[Title/Abstract]) #34 = colonoscopy[Title/Abstract] – **43**

13/11/2010: (((((#3) AND #4) AND #5) AND #6) AND #7) #3 Limits: Humans, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Clinical Trial, Phase I, Clinical Trial, Phase II, Clinical Trial, Phase III, Clinical Trial, Phase IV, Comparative Study, Controlled Clinical Trial, Multicenter Study, English, Core clinical journals, Cancer, MEDLINE, PubMed Central.#4 colorectal OR colon OR rectum OR bowel[Title/Abstract] #5 cancer OR neoplasm[Title/Abstract] #6 surveillance OR follow up[Title/Abstract] #7 economics (Mesh term, includes cost effectiveness)- **41** selected out of **277**

13/11/2010 (adenoma[Title/Abstract] AND #6) AND #7 AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial[ptyp] OR Review[ptyp] OR Clinical Trial, Phase I[ptyp] OR Clinical Trial, Phase II[ptyp] OR Clinical Trial, Phase III[ptyp] OR Clinical Trial, Phase IV[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp] OR Multicenter Study[ptyp]) AND English[lang] AND (jsubsetaim [text] OR cancer[sb] OR medline[sb] OR pubmed pmc[sb])) #6 surveillance OR follow up[Title/Abstract] #7 economics (Mesh term, includes cost effectiveness)- **3**

13/11/2010: ulcerative colitis[Title/Abstract] AND "neoplasms"[MeSH Terms]) AND "economics"[MeSH Terms] AND ("humans"[MeSH Terms] AND (Clinical Trial[ptyp] OR Meta-Analysis[ptyp] OR Randomized Controlled Trial [ptyp] OR Review[ptyp] OR Clinical Trial, Phase I[ptyp] OR Clinical Trial, Phase II[ptyp] OR Clinical Trial, Phase III [ptyp] OR Clinical Trial, Phase IV[ptyp] OR Comparative Study[ptyp] OR Controlled Clinical Trial[ptyp] OR Multicenter Study[ptyp]) AND English[lang] AND (jsubsetaim[text] OR cancer[sb] OR medline[sb] OR pubmed pmc[sb]))- **1**

Searching on Inflammatory bowel disease instead of ulcerative colitis yielded the same one article.

CINAHL:

18/11/09: Inflammatory bowel disease AND colorectal cancer AND surveillance 4 records selected out of – **13**

7/5/10: (AB cancer or AB neoplasm) AND (AB colorectal or AB bowel or AB rectum or AB colon) AND (AB surveillance or AB follow up) 1980-2002 Only found one study that seemed useful out of **102** articles

7/5/10: colonoscopy AND (colorectal OR bowel OR colon OR rectum) AND (surveillance OR follow up) 1980-2002 articles selected visually (most on screening, family history or prevention) – **3**

Cochrane Library:

18/11/09: Inflammatory bowel disease AND colorectal cancer AND surveillance – **3**

1/1/10: colonoscopy – **11**

1/1/10: CT colonography – **4**

7/5/10: (colorectal OR bowel cancer) AND colonoscopy before 2002-24 articles reduces to 4 (most to do with screening and methods of colonoscopy) – **4**

13/11/2010: colorectal cancer in Economic evaluations database **12** out of **142- 12**

Additional search was using PubMed which included the following:

Sessile adenomas and colorectal cancer Limits: Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Comparative Study, Controlled Clinical Trial, Government Publications, Guideline, Journal Article, English resulting in **124** records

Colorectal cancer and multiple adenomas Limits: Humans, Male, Female, Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Comparative Study, Controlled Clinical Trial, Multicenter Study, English, MEDLINE, PubMed Central, All Adult: 19+ years resulting in **81** records

MYH-associated polyposis and surveillance resulting in **11** records

Surveillance in patients with FAP) Limits: only items with links to full text, Humans, Clinical Trial, Meta-Analysis, Practice Guideline, Randomized Controlled Trial, Review, Case Reports, Comparative Study, Controlled Clinical Trial, Guideline, English, MEDLINE, PubMed Central, All Child: 0-18 years, All Adult: 19+ years resulting in **32** records

Familial adenomatous polyposis (FAP) and polypectomy resulting in **19** records

For each search, the following details were provided in topic- or question-specific reports (available on request from the Cancer Council Australia):

- electronic databases searched
- terms used to search the databases
- search inclusion or exclusion criteria
- language
- study type.

Studies published before 31 December 2009 could be included in the systematic reviews. Studies published after this date could not be included in the evidence base for the recommendations but could be referred to in the text and were described in the Appendices to the topic- or question-specific reports (available on request from the Cancer Council Australia). The project team also hand-searched the reference lists of the relevant articles to identify additional articles that had not been detected through searches of the electronic databases. Bi-annual meetings of the guidelines Working Party provided a forum for discussing and sharing overlapping evidence, the discovery of unpublished literature and information from other key organisations or individuals.

Back to top

5.5.1.2.4 Select, assess and summarise the literature

The literature identified by the electronic database searches was assessed for relevance to each question. The following steps were taken to select and sort the literature, with the details and results summarised in topic- or question-specific reports (available on request from the Australian Cancer Network):

1. Define the inclusion criteria:

    The search was limited to English language and to the heading appearing in the title and abstract of articles. Reviews, instructive guidelines, comments and letters are not referred to when critical analyses of the data is performed. These were used to refer the reader to further information and for comparative analyses (for example, international view of guidelines for adenoma and colorectal cancer surveillance). The literature search focussed on diagnoses of colorectal lesions and inflammatory bowel disease at the time of baseline examination and during surveillance colonoscopy. Also, in PubMed searches (dated 1 May 2010), several search strategies were combined to one single search.

    No limitation on date was used when searching data bases for articles on cost effectiveness related to colonoscopy surveillance following adenoma resection, CRC resection and IBD diagnosis. Studies for cost effectiveness were selected based on titles and abstracts and omitting any studies that did not deal directly with the topic (eg screening rather than surveillance after cancer, other cancers with colorectal cancer mentioned incidentally, treatment rather than surveillance).

2. Review titles and abstracts of retrieved citations to identify potentially relevant articles

3. Obtain the full text of potentially relevant articles

4. Determine whether the study described in each collected article met the pre-defined inclusion criteria

5. Determine whether systematic reviews accounted for all preceding literature

6. Prepare folders to file searches, background papers and reviewed articles for each question addressed

Two independent assessors then assessed the quality of each of the included studies according to pre-defined criteria for the various study types. Any disagreements were adjudicated by a third reviewer. The quality criteria were:

- *randomised controlled trials (RCTs):* blinding, allocation concealment, follow up and intention-to-treat analysis and mode of randomisation
- *systematic reviews:* search strategy used, the inclusion criteria and their application, study quality assessment, summary descriptive tables, pooling methods and examination of heterogeneity
- *quasi-randomised and cohort studies:* subject selection, group comparability, comparability of outcome measurement, blinding and completeness of follow up.

Criteria for the critical appraisal process are available on the Cancer Council Australia website (www.cancer.org.au).

Summaries of the studies were tabulated in PICO format and the relevant data extracted and summarised in tables. The data extraction was checked by a second assessor. These tables of study characteristics and evidence are included in the topic- or question-specific reports (available on request from the Cancer Council Australia). The reports also contain lists of collected studies that did not meet the inclusion criteria and the reason for their exclusion.

Back to top

5.5.1.2.5 Critical appraisal and summary

For each clinical question, the included studies and their results were summarised in a template (Template 1 in the Handbook[9]). Each study was submitted to further critical appraisal. The level of the evidence, the quality of evidence as determined above, the size of effect and relevance of the evidence of each included study was documented.

Details of the templates, rating systems, and criteria for the critical appraisal process are available on the Cancer Council Australia website (http://www.cancer.org.au). Levels of evidence are outlined below.

Designations of levels of evidence for intervention research questions (NHMRC, 2009)[10]

Level	Intervention
I	A systematic review of level II studies
II	A randomised controlled trial
III-1	A pseudo-randomised controlled trial (ie alternate allocation or some other method)
III-2	A comparative study with concurrent controls: • non-randomised, experimental trial • cohort study • case-control study • interrupted time series with a control group
III-3	A comparative study without concurrent controls: • historical control study • two or more single-arm studies • interrupted time series without a parallel control group
IV	Case series with either post-test or pre-test/post-test outcomes

Source: National Health and Medical Research Council. NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra: NHMRC; 2009. (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf)

Back to top

5.5.1.2.6 Assess the body of evidence and formulate recommendations

The body of literature was assessed by each expert sub-committee in regard to the volume of the evidence, its consistency, clinical impact, generalisability and applicability. These aspects were graded and documented in a second template (Template 2 in the Handbook[9]).

Following grading of the body of evidence, expert sub-committees were asked to formulate a recommendation that related to the summarised body of evidence. This recommendation also had to be graded as follows:

Grade of Recommendation	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations

Grade of Recommendation	Description
C	Body of evidence provides some support for recommendations but care should be taken in its application.
D	Body of evidence is weak and recommendation must be applied with caution

Source: National Health and Medical Research Council. NHMRC levels of evidence and grades for recommendations for developers of guidelines. Canberra: NHMRC; 2009. (https://www.nhmrc.gov.au/_files_nhmrc/file/guidelines/developers/nhmrc_levels_grades_evidence_120423.pdf)

When no Level I or II evidence was available but there was consensus among the working party members, recommended best practice points have been provided, and can be identified throughout the guideline with the following: Practice Point (PP).

Back to top

5.5.1.3 Writing the chapter

All the expert sub-committees were asked to write their guidelines chapter using the following format:

- background
- review of the evidence
- evidence summary with levels of evidence and numbered references
- recommendation(s) and corresponding grade(s)
- references

Back to top

5.5.1.4 Review of the chapters

The body of evidence and recommendations for each chapter were reviewed by the Guidelines Working Party and final recommendations agreed to, based on the evidence.

Back to top

5.5.1.5 Public consultation

A complete draft of the guidelines was sent out for public consultation in Australia from the period of 21 May to 21 June 2011. The consultation process included soliciting public review of the document through advertisement in a national newspaper, and alerting professional societies and groups and sponsors.

All feedback on the draft received during the consultation period in Australia was reviewed by the Guidelines Working Party. Subsequent changes to the draft were agreed by consensus, based on consideration of the evidence. A final independent review of experts in their fields was conducted before the final draft was submitted to NHMRC.

Back to top

5.5.1.6 Dissemination and implementation

The Cancer Council Australia will take the lead in disseminating the guidelines in Australia. This will include a campaign to raise awareness of the new guidelines that incorporates organised media coverage through multiple outlets and an official launch. Cancer Council Australia will distribute the Guidelines directly to relevant professional and other interested groups and through meetings, national conferences, and other CME events. Cancer Council Australia also plans to upload the Guidelines to its Cancer Guideline portal, which is a website using wiki technology. The link to the Cancer Guideline Portal will be available from the Cancer Council Australia website where viewers visiting the website for guidelines will be encouraged to access the wiki site also.

A significant effort will be made to have the Guidelines introduced to senior undergraduate medical students via Cancer Council Australia's Oncology Education Committee, which has representatives from all the medical schools around Australia. Use of the Guidelines as part of core curriculum in specialty exams will be encouraged as well as the encouragement of the relevant learned Colleges (surgeons, radiation oncologists and pathologists), to support the Guidelines and to foster their integration into hospital and community practice through resident and registrar education activities.

The scope of implementation activities will depend on the availability of funding. It is recognised that a planned approach is necessary to overcome specific barriers to implementation in particular settings and to identify appropriate incentives to encourage uptake of guideline recommendations. Implementation of the Guidelines will require a combination of effective strategies and may include further CME initiatives and interactive learning, the development and promotion of computer-assisted decision aids and electronic decision-support systems, and the creation of audit and other clinical tools.

Back to top

5.5.2 References

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Back to top

5.6 Clinical question list

References

5.7 Journal articles

Contents

2.2 Melanoma

5.7.1 Bowel cancer

Journal articles developed out of the Australian *Clinical practice guidelines for the prevention, early detection and management of colorectal cancer* and *Clinical practice guidelines for surveillance colonoscopy*.

As part of the dissemination and implementation plans for these guidelines, lead authors were encouraged to develop articles to submit to journals for publication in order to further promote the updated Australian guidance on surveillance colonoscopy and the prevention, early detection and management of colorectal cancer.

Dissemination and implementation plans:

- Clinical practice guidelines for the prevention, early detection and management of colorectal cancer
- Clinical practice guidelines for surveillance colonoscopy.

5.7.1.1 Colorectal cancer

Journal articles published or accepted for publication:

Revised Australian national guidelines for colorectal cancer screening: family history *Mark A Jenkins, Driss Ait Ouakrim, Alex Boussioutas, John L Hopper, Hooi C Ee, Jon D Emery, Finlay A Macrae, Albert Chetcuti, Laura Wuellner and James B St John* (29 October 2018)

The National Bowel Cancer Screening Program: time to achieve its potential to save lives *Hooi C Ee, James St John* (31 July 2019)

5.7.1.2 Surveillance colonoscopy

Journal articles published or accepted for publication:

TBC

5.7.2 Skin cancer

5.7.2.1 Keratinocyte cancer

Journal articles published or accepted for publication:

TBC

5.7.2.2 Melanoma

Journal articles developed out of the Australian *Clinical practice guidelines for the diagnosis and management of melanoma*.

As part of the dissemination and implementation plan for the guideline, lead authors were encouraged to develop articles to submit to journals for publication in order to further promote the updated Australian guidance on the diagnosis and management of melanoma.

Journal articles published or accepted for publication:

When is a sentinel node biopsy indicated for patients with primary melanoma? An update of the 'Australian guidelines for the management of cutaneous melanoma' *David E Gyorki, Andrew Barbour, Mark Hanikeri, Victoria Mar, Shahneen Sandhu and John F Thompson*

Clinical practice guidelines for the diagnosis and management of melanoma: melanomas that lack classical clinical features *Victoria J Mar, Alex J Chamberlain, John W Kelly, William K Murray and John F Thompson*

Updated evidence-based clinical practice guidelines for the diagnosis and management of melanoma: definitive excision margins for primary cutaneous melanoma *Michael J Sladden, Omgo E Nieweg, Julie Howle, Brendon J Coventry and John F Thompson*

Methods of melanoma detection and of skin monitoring for individuals at high risk of melanoma: new Australian clinical practice *Nikki R Adler, John W Kelly, Pascale Guitera, Scott W Menzies, Alex J Chamberlain, Paul Fishburn, Alison E Button-Sloan, Clinton Heal, H Peter Soyer and John F Thompson*

Multidisciplinary care of cancer patients – a passing fad or here to stay? *John F Thompson and Gabrielle J Williams*

Improving diagnostic accuracy for suspicious melanocytic skin lesions: new Australian melanoma clinical practice guidelines stress the importance of clinician/pathologist communication *Richard A Scolyer, H Peter Soyer, John W Kelly, Craig James, Catriona A McLean, Brendon J Coventry, Peter M Ferguson, Robert V Rawson, Victoria J Mar, Sara L de Menezes, Paul Fishburn, Jonathan R Stretch, Stephen Lee and John F Thompson*

New treatment paradigms for clinically-apparent metastatic melanoma in regional lymph nodes *Michael A. Henderson, John Spillane, T. Michael Hughes, Andrew J. Spillane, B. Mark Smithers and John F. Thompson*

Evidence-based clinical practice guidelines for the management of patients with lentigo maligna *Mitchell Robinson, Clare Primiero, Pascale Guitera, Angela Hong, Richard A. Scolyer, Jonathan R. Stretch, Geoffrey Strutton, John F. Thompson and H. Peter Soyer*

Diagnosis and Management of Cutaneous Melanoma *Victoria Mar (20-4-2020: accepted for publication AJGP)*

New Australian melanoma management guidelines – the patient perspective *J F Thompson & Alison Button-Sloan (27-May-2020: accepted for publication MJA)*

Last updated: 6 July 2020

5.8 Technical report

References

5.9 Working party members and contributors

Contents

5.9.1 Working party members and contributors

Surveillance Colonoscopy Working Party to develop Clinical Practice Guidelines for Surveillance Colonoscopy - in adenoma follow-up, following curative resection of colorectal cancer, and for cancer surveillance in inflammatory bowel disease

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Dr Andrew Clouston	Anatomical Pathologist - Envoi Specialist Pathologists, Brisbane QLD
Dr William Connell	Gastroenterologist - Chairman, Gastroenterological Society of Australia IBD section, Melbourne VIC

Dr Katie Ellard	Gastroenterologist - Royal North Shore Hospital, Sydney NSW
Professor James Kench (NSW)	Anatomical Pathologist - Royal Prince Alfred Hospital, Sydney NSW
Dr Orly Lacham Kaplan	Project Officer, Working Party, Melbourne VIC
Dr Andrew Luck	Colorectal surgeon; President, Colorectal Surgical Society of Australia and New Zealand – Adelaide SA
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A/Professor James St John AM	Gastroenterologist – Honorary Senior Associate, Cancer Council Victoria; Chair - Quality Working Group, National Bowel Cancer Screening Program, Melbourne VIC
Mr John Stubbs	Consumer – Executive Officer, Cancer Voices Australia, Sydney NSW
Ms Christine Vuletich	Manager, Clinical Guidelines Network - Cancer Council Australia, Sydney NSW

Algorithms for Colonoscopic Surveillance Intervals – Adenomas; Colonoscopic Surveillance Intervals – Following Surgery for Colorectal Cancer and for Colorectal Cancer Screening – Family History

Dr Karen Barclay - Colorectal Surgeon and Lecturer in Surgery, The Northern Hospital and the University of Melbourne, VIC

5.9.1.1 Chapter subcommittees

5.9.1.1.1 1. Advances in colonoscopy, CT colonography and other methods of investigations

James St John AM (chapter leader) – Gastroenterologist, VIC

Gregor Brown – Gastroenterologist, VIC

5.9.1.1.2 2. Management of epithelial polyps: colonoscopic surveillance after polypectomy

Finlay Macrae (chapter leader) – Gastroenterologist, VIC

Peter Bampton – Gastroenterologist, SA

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Gregor Brown – Gastroenterologist, VIC

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5.9.1.1.3 3. The role of surveillance colonoscopy after curative resection for colorectal cancer

Cameron Platell (chapter leader) – Colorectal Surgeon, WA

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5.9.1.1.4 4. Colonoscopic surveillance and management of dysplasia in inflammatory bowel disease (IBD)

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James Kench - Anatomical Pathologist, NSW

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Alissa Walsh – Gastroenterologist, NSW

5.9.1.1.5 5. Psychosocial aspects of surveillance colonoscopy after colorectal cancer, polyps and inflammatory bowel disease (IBD)

Emeritus Professor Tom Reeve AC CBE

5.9.1.1.6 6. Socio-economic factors

Emeritus Professor Tom Reeve AC CBE

5.9.1.1.7 7. Cost effectiveness

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Dr Andrea Curtis - Epidemiologist, Monash University, VIC

Dr Lisa Demos - Epidemiologist, Monash University, VIC

5.9.1.1.8 Appendix 1 - Guidelines development process

Dr Cameron Bell

Dr Orly Lacham Kaplan

Ms Christine Vuletich

5.9.1.1.9 Review panel

Professor Michael Solomon – (Chair) – Colorectal surgeon,

Associate Professor Robert Eckstein – Anatomical pathologist

Associate Professor David Hewett – Gastroenterologist

Dr Paul McMurrick - Colorectal surgeon

Professor Graeme Young – Gastroenterologist, Chair, World Endoscopy Organization Colorectal Cancer Screening Committee

Dr Cameron Bell – (Chair, Colonoscopy Surveillance Guidelines Working Party)

Professor Ian Olver AM – (CEO, Cancer Council Australia/Convenor)

5.9.1.1.10 Public consultation from 21 May to 21 June 2011

Consultation submissions received:

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5.9.1.2 Acknowledgments

These Guidelines would not have arisen without several driving forces. Many contributors may not have been so willing to participate had the tap on the shoulder not come from Emeritus Professor Tom Reeve AC CBE. The literature search and organisation of material performed by Dr Orly Lacham Kaplan was invaluable as was the continuing encouragement and guidance of Professor Ian Olver AM and the co-ordinating and secretarial support of Ms Christine Vuletich, Cancer Council Australia. The chapter leaders, Professor Finlay Macrae, Professor Cameron Platell, Dr Bill Connell, Associate Professor James St John AM, Emeritus Professor Tom Reeve AC CBE and Professor John McNeil, Andrea Curtis and Lisa Demos, deserve enormous gratitude for the considerable time and effort they invested in developing their respective chapters, as do all of the individual members of the working party and chapter subcommittees, listed in Appendix 2.

Special thanks to:

Ms Philippa Thomson for assisting with the literature searches and the referencing of the chapters.

Professor Jane Young, Professor in Cancer Epidemiology, Public Health, School of Public Health, The University of Sydney, for reviewing evidence summaries in each chapter prior to public consultation.

5.10 Conflict of interest register

Conflict of interest register and management

Working Party Members were asked to declare in writing, any interests relevant to the guideline development, prior to commencement. Members were asked to update their information if they became aware of any changes to their interests.

All declarations were added to a register of interests as listed below. The register was made available to the Working Party throughout the development of the guideline, allowing members to take any potential conflicts of interest into consideration during discussions, decision making and formulation of recommendations.

If Working Party Members were identified as having a significant real or perceived conflict of interest, the Chair could decide that the member either leave the discussion whilst the specific area they were conflicted in was discussed or the member could remain present but not participate in the discussion, or decision making on the specific area where they were conflicted. There were no instances where this occurred during the development of this guideline.

Dr Cameron Bell Chair Gastroenterologist – Royal North Shore Hospital, Sydney NSW	No conflict of interest to declare

Dr Karen Barclay Colorectal Surgeon and Lecturer in Surgery, The Northern Hospital and the University of Melbourne, Melbourne VIC	No conflict of interest to declare
A/Professor Terry Bolin Gastroenterologist - A /Professor Medicine UNSW, Emeritus Consultant - Prince of Wales Hospital, President – Gut Foundation, Sydney NSW	No conflict of interest to declare
Dr Andrew Clouston Anatomical Pathologist - Envoi Specialist Pathologists, Brisbane QLD	No conflict of interest to declare
Dr William Connell Gastroenterologist – Chairman, Gastroenterological Society of Australia IBD section	No conflict of interest to declare
Dr Katie Ellard Gastroenterologist - Royal North Shore Hospital, Sydney NSW	No conflict of interest to declare
Professor James Kench (NSW) Anatomical Pathologist – Royal Prince Alfred Hospital, Sydney NSW	No conflict of interest to declare
Dr Orly Lacham Kaplan Project Officer	No conflict of interest to declare
Dr Andrew Luck	

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Professor Finlay Macrae Gastroenterologist – Royal Melbourne Hospital, Melbourne VIC	Professor Macrae is a Board member of Genetic Health Services Victoria, and the Human Variome Project International Pty Ltd and is a Director for the International Society for Gastrointestinal Hereditary Tumours. He is a Consultant for CSIRO (Australia), S.L.A. Pharmac AG and Endogen Pty and an international advisory faculty consultant to Given Imaging. He is involved in clinical trials with • Abbott Australasia • Centocor • ChemoCentryx • Endogene Pty Ltd • Given Imaging • Glutenon Pty Ltd • MerckSharpe Dohme • Optiscan • Pentax • Shire • UCB • Bristol Myer
Professor Ian Olver AM Convenor, Working Party/ CEO, Cancer Council Australia, Sydney NSW	No conflict of interest to declare
Professor Cameron Platell Colorectal surgeon – Winthrop Professor of Surgery, University of Western Australia, Perth WA	No conflict of interest to declare
Emeritus Professor Tom Reeve AC CBE Convenor Working Party until 2 July 2010	No conflict of interest to declare
A/Professor James St John AM	

Gastroenterologist – Cancer Council Victoria, Melbourne VIC	No conflict of interest to declare
Mr John Stubbs Consumer - Cancer Voices Australia, Sydney NSW	No conflict of interest to declare
Ms Christine Vuletich Manager, Clinical Guidelines Network - Cancer Council Australia, Sydney NSW	No conflict of interest to declare

Back to top

5.11 Glossary and abbreviations

Abbreviations

ADRs	Adenoma detection rates
AJCC	American Joint Committee on Cancer
APC	Adenomatous polyposis coli
BMI	Body mass index
C	Chromoendoscopy
CAM	Complementary and alternative therapies
CCD	Charge-coupled device
CD	Crohn's disease
CCFA	Crohn's and Colitis Foundation of America
CEA	Carcinoembryonic antigen
CI	Confidence interval
CLE	Confocal laser endomicroscopy
CRC	Colorectal cancer
CT	Computer tomography
CTC	Computerised tomographic colonagraphy
DALM	Dysplasia associated lesion or mass

DCBE	Double contrast barium enema
EMR	Endoscopic mucosal resection
EPAGE	European Panel on Appropriateness of Gastrointestinal Endoscopy
ESD	Endoscopic submucosal dissection
FAP	Familial adenomatous polyposis
FGID	Functional gastrointestinal disease
FOBT	Faecal occult blood test
FS	Flexible sigmoidoscopy
GI	Gastrointestinal
HD	High definition
HGD	High grade disease
HNPCC	Hereditary non-polyposis colorectal cancer
IBD	Inflammatory bowel disease
ID	Indefinate dysplasia
LGD	Low grade dysplasia
MRI	Magnetic resonance imaging
MUTYH	mutY Homolog (*E.coli*)
MYH	See "MUTYH"
NBCSP	National Bowel Screening Program
NBI	Narrow Band Imaging
OR	Odds Ratio
PSC	Primary sclerosing cholangitis
RCT	Randomised controlled trial
SA	Serrated adenomas
SES	Socioeconomic status
SSAs	Sessile serrated adenomas
STAI	State-Trait Anxiety Inventory
TSAs	Traditional serrated adenomas
UC	Ulcerative Colitis
WHO	World Health Organisation

Back to top