JGH Journal of Gastroenterology and Hepatology

JGHF

doi:10.1111/jgh.16157

SYSTEMATIC REVIEW

Comparison of recommendations for surveillance of advanced colorectal polyps: A systematic review of guidelines

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Key words
Advanced colorectal polyp, Guidelines, Surveillance.

Accepted for publication 17 February 2023.

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Financial support: J. Parker holds the Royal College of Surgeons of England Moondance Research Fellowship.
Category in which manuscript is being submitted: Systematic review.

Abstract

Background and Aim: Patients diagnosed with advanced colorectal lesions have a higher risk of developing colorectal cancer. International polyp surveillance guidelines have recently been updated. The aim of this systematic review was to assess surveillance recommendations for advanced colorectal polyps and compare the patient, polyp, and colonoscopy quality factors considered in their recommendations.
Methods: Guidelines with surveillance recommendations for colorectal polyps were identified. Databases searched included PubMed, Web of Science, Scopus, TripPro, and guidelines identified by two blinded reviewers. The review protocol was registered on PROSPERO and performed in line with PRISMA guidelines.
Results: Six guidelines from the US Multi-Society Task Force, British Society of Gastroenterology, Cancer Council Australia, European Society of Gastrointestinal Endoscopy, Japan Gastroenterological Endoscopy Society, and Asia-Pacific Working Group on Colorectal Cancer Screening were included. The recommended surveillance interval of 3 years was consistent, but the criteria used for advanced polyps were variable. Polyp factors were the key determinant for when surveillance should be performed. Although all guidelines recognized their importance, the application of and evidence underlying patient characteristics and the quality of baseline colonoscopy were limited. All included guidelines were rated of average to high quality by the AGREE II instrument.
Conclusion: Surveillance guidelines for advanced colorectal polyps are of good quality but limited by their underlying evidence. Standardization of definitions would be valuable for both research and clinical application. Better knowledge of colonoscopist quality indicators and patient factors is recommended to further economize surveillance recommendations, minimize patient risk, and achieve optimal outcomes without increasing pressure on services.

Introduction

The surveillance of patients diagnosed with colorectal polyps aims to identify and treat new, missed, or recurrent lesions to reduce the chance of developing colorectal cancer.[1] The spectrum in polyp morphology affects the level of this risk, and factors include number, size and location of polyps, gender, and age.[2]

The risk of recurrent or metachronous disease is higher after identification of advanced colorectal lesions. The British Society of Gastroenterology (BSG) define these as sessile serrated lesions or adenomas at least 10 mm in size, sessile serrated lesions with dysplasia or adenomas with evidence of high-grade dysplasia.[3] Due to their increasing detection,[4] surveillance frequency should balance the need for timely diagnosis and optimal outcomes against the risks of colonoscopy and its burden on the patient and health service. Guidelines are decision-making tools helping clinicians provide evidence-based patient management, and several international polyp surveillance guidelines have recently been updated.[3,5,6] Recommendations for timing of surveillance should account for polyp features but also patient characteristics including overall health and their own preferences. Factors related to the index colonoscopy may also be important,[7] with poor quality colonoscopy associated with a higher future risk of colorectal cancer.[8,9]

The aim of this systematic guideline review was to assess the surveillance recommendations and definitions specifically for advanced colorectal polyps and compare the patient, polyp, and colonoscopy quality factors at index examination considered in their development.

Methods

Guidelines with surveillance recommendations for colorectal polyps were systematically identified from the literature. The methodology was created in line with recent guidance.[10] Relevant full-text articles were considered for full analysis and data

extraction based on the inclusion and exclusion criteria. The study protocol was registered on PROSPERO[11] and performed according to the PRISMA guidelines for systematic reviews.[12]

Literature search and search terms. A systematic literature search was performed to identify all potential guidelines. Updates to identify new articles were used. Databases searched included PubMed, Web of Science, Scopus, and TripPro. Other resources as shown in Supporting information Table S1, were hand searched for further guidance and to ensure the most up to date versions had been identified.

The search terms were developed with input from specialists in the field of gastroenterology, colorectal surgery and systematic literature review. Search strategies from published guidelines were also utilized to guide the selection of terms.[3] Search terms included "guideline or practice guideline," "recommendation," "surveillance," "intestinal polyps," "colonic polyps," "colorectal neoplasm," "adenoma or adenomatous polyps," and "polypectomy." The full strategy is shown in Table S2.

Inclusion criteria. Evidence based national or international guidelines describing surveillance recommendations after colorectal polyp diagnosis in adults were considered. Those guidelines with specific recommendations regarding advanced polyps or an equivalent definition were included for full-text review. The guidelines were deemed appropriate if exclusively describing advanced polyp surveillance or if the subject was part of a defined section in wider recommendations. If multiple guidelines were produced by the same group, the most recent was used for the analysis. No journals or countries of publication were excluded. All articles were initially considered regardless of the year of publication or language.

Exclusion criteria. Local or departmental guidelines were excluded from the review. Guidance exclusively for malignant or hereditary polyps were excluded due the specific considerations required for their surveillance. All articles were initially considered regardless of language but were excluded later if translation was not feasible. Guidelines published in draft form or as conference papers were not included due to the lack of peer review and unavailability of the full guideline respectively.

Guideline identification. Databases were searched with the previously described terms and downloaded into EndNote to identify duplicates. Abstracts were then exported to the Rayyan Systematic Review Web Application.[13] Two independent, blinded researchers screened abstracts using the described inclusion and exclusion criteria. The researchers met to resolve decision conflicts at this stage and to finalize the guidelines for full-text review. Conflicts at any stage were referred to the senior researcher for resolution.

Full-text guidelines were assessed by the same blinded reviewers. This was managed on separate EndNote files, and reasons for exclusion were classified. Decision conflicts were resolved at this stage and the final articles confirmed. Any supplementary materials for the included guidelines were also obtained. Identified guidelines, article abstracts referring to a guideline, and systematic review articles were cross referenced to find other relevant articles. The identified articles were reviewed as above for inclusion or exclusion.

Data extraction and analysis. Data extraction was performed by the same two blinded researchers onto separate, standardized spreadsheets, and variations were resolved as previously described. Information was collected and narrative descriptions and comparisons performed on the guideline characteristics, advanced polyp definitions, surveillance timings, levels of evidence, strength of recommendations, and the polyp, patient, and colonoscopy quality factors at index examination on which the recommendations were based. Data analysis was performed by one researcher and cross checked by a second using Microsoft Excel.

Assessment of guideline quality. The Appraisal of Guidelines for Research and Evaluation, 2nd Edition (AGREE II) instrument,[14] is a validated tool designed to assess the quality of guideline development and methodology. As shown in Table 1, it contains 23 items within six domains including scope and purpose, stakeholder involvement, rigor of development, clarity of presentation, applicability, and editorial independence. Each item is scored out of 7 (1 = *strongly disagree*, 7 = *strongly agree*) to give a total across the domains. The final evaluation is an overall recommendation of the guideline for future use. Interpretation is determined by the users and the context of the review.

Guidelines were scored using the AGREE II criteria by two reviewers. Both reviewers completed the tutorials on the use of the instrument and utilized the handbook during the assessments. Each guideline was assigned a score for each item by the researchers allowing a scaled domain score to be calculated based on the AGREE II formula. Guidelines were included regardless of score, and comparisons were made between them. The guidelines were classified based on the scaled domains scores into high quality (5 or more domains scoring 60% or more), average quality (3 to 4 domains scoring 60% or more), or poor quality (2 domains or less scoring 60% or more). A similar system has been used by other guideline reviews.[15–17]

Results

Guideline selection. The PRISMA flowchart is shown in Figure 1. A total of 6536 articles were identified, and 73 guidelines concerning the surveillance of colorectal polyps were identified within these. Five of these fulfilled the inclusion criteria for full assessment, and data extraction with a further guideline was identified through citation updates. These included guidance from the US Multi-Society Task Force (USMSTF),[6] British Society of Gastroenterology (BSG),[3] Cancer Council Australia (CCA),[18] European Society of Gastrointestinal Endoscopy (ESGE),[5] Japan Gastroenterological Endoscopy Society (JGES),[19] and Asia-Pacific Working Group on Colorectal Cancer Screening.[20]

The classification of excluded articles is shown in Table S3. There were several guidelines that considered to have been replaced by more recent documents. The National Institute for Health and Clinical Excellence (NICE)[21] and Scottish Intercollegiate

Table 1 Scoring criteria for the AGREE II instrument

Domain	Item
Scope and purpose	**1.** The overall objective(s) of the guideline is (are) specifically designed.
	2. The health question(s) covered by the guideline is (are) specifically described.
	3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.
Stakeholder involvement	**4.** The guideline development group includes individuals from all the relevant professional groups.
	5. The views and preferences of the target population (patients, public, etc.) have been sought.
	6. The target users of the guideline are clearly described.
Rigor of development	**7.** Systematic methods were used to search for evidence.
	8. The criteria for selecting the evidence are clearly described.
	9. The strengths and limitations of the body of evidence are clearly described.
	10. The methods for formulating the recommendations are clearly described.
	11. The health benefits, side effects, and risks have been considered in formulating the recommendations.
	12. There is an explicit link between the recommendations and the supporting evidence.
	13. The guideline has been externally reviewed by experts prior to its publication.
	14. A procedure for updating the guideline is provided.
Clarity of presentation	**15.** The recommendations are specific and unambiguous.
	16. The different options for management of the condition or health issue are clearly presented.
	17. Key recommendations are easily identifiable.
Applicability	**18.** The guideline describes facilitators and barriers to its application.
	19. The guideline provides advice and/or tools on how the recommendations can be put into practice.
	20. The potential resource implications of applying the recommendations have been considered.
	21. The guideline presents monitoring and/or auditing criteria.
Editorial independence	**22.** The views of the funding body have not influenced the content of the guideline.
	23. Competing interests of guideline development group members have been recorded and addressed.

Guidelines Network (SIGN)[22] from 2011 and 2016, respectively, were deemed to have been succeeded by the BSG guidance. Guidance from the Canadian Association of Gastroenterology[23] was excluded as they were based on the 2012 USMSTF recommendations and had not been modified since the American guidelines more recent update. The ESGE guidelines were utilized instead of several identified European documents as they were all outdated by this. They included French,[24] Norwegian,[25] Swiss,[26] Spanish,[27] German,[28] and Dutch publications.[29]

Guideline characteristics. An overview of guideline development method, assessment of evidence, and recommendation gradings is given in Table 2. All have been published within the last 3 years and are updated versions of previous guidance. A systematic literature review was performed by all during their development. Most used the Grading of Recommendations, Assessment, Development and Evaluations (GRADE) system for their evidence assessment and recommendations, but the Australian, Japanese, and Asia-Pacific guidelines used different standards.

Terminology and criteria for advanced polyps

Advanced adenomas. A summary of the advanced polyp definitions and surveillance recommendations for each guideline is shown in Table 3. The JGES and USMSTF guidelines used the same term of advanced adenoma with the CCA and Asia-Pacific Working Group using high-risk adenoma. The BSG used advanced colorectal polyp. The ESGE guidelines did not use a definition for an advanced polyp but classified patients into those requiring surveillance or not. Criteria of size (≥ 10 mm) and inclusion of polyps with high-grade dysplasia to meet the definition of an advanced polyp were unanimous between all guidelines. Unlike the ESGE and BSG guidelines, the USMSTF, CCA, JGES, and Asia-Pacific Working Group recommendations also included adenomas with villosity as part of their definition. Multiple lesions were included under the heading of advanced polyps in the CCA, Asia-Pacific Working Group, and ESGE recommendations but with different criteria of 3 to 4, ≥ 3 lesions and ≥ 5 lesions, respectively.

Advanced serrated lesions. A summary of the advanced serrated lesion definitions and surveillance recommendations for each guideline is shown in Table 4. Polyps with serrated histology were inclusive of the advanced polyp definition provided by the BSG and ESGE guidelines. They both described these as lesions ≥ 10 mm in size or with any grade of dysplasia. The JGES guidelines did not give a definition for an advanced serrated polyp. The USMSTF and Asia-Pacific Working Group recommendations provided separate surveillance recommendations for sessile serrated polyps ≥ 10 mm or with dysplasia but did not provide terminology for these. The Australian recommendations concerning serrated polyps were complex. They did not define an advanced serrated polyp and recommendations regarding surveillance depend on the size, number, presence of dysplasia, and synchronous adenomas.

Large or complex polyps. The BSG and CCA guidelines also considered larger lesions separately within their recommendations. The definition of these were the same (size ≥ 20 mm) but with different terminology. The British guidelines referred to these as large non-pedunculated colorectal polyps (LNPCP) while the Australian used large sessile or laterally spreading lesions.

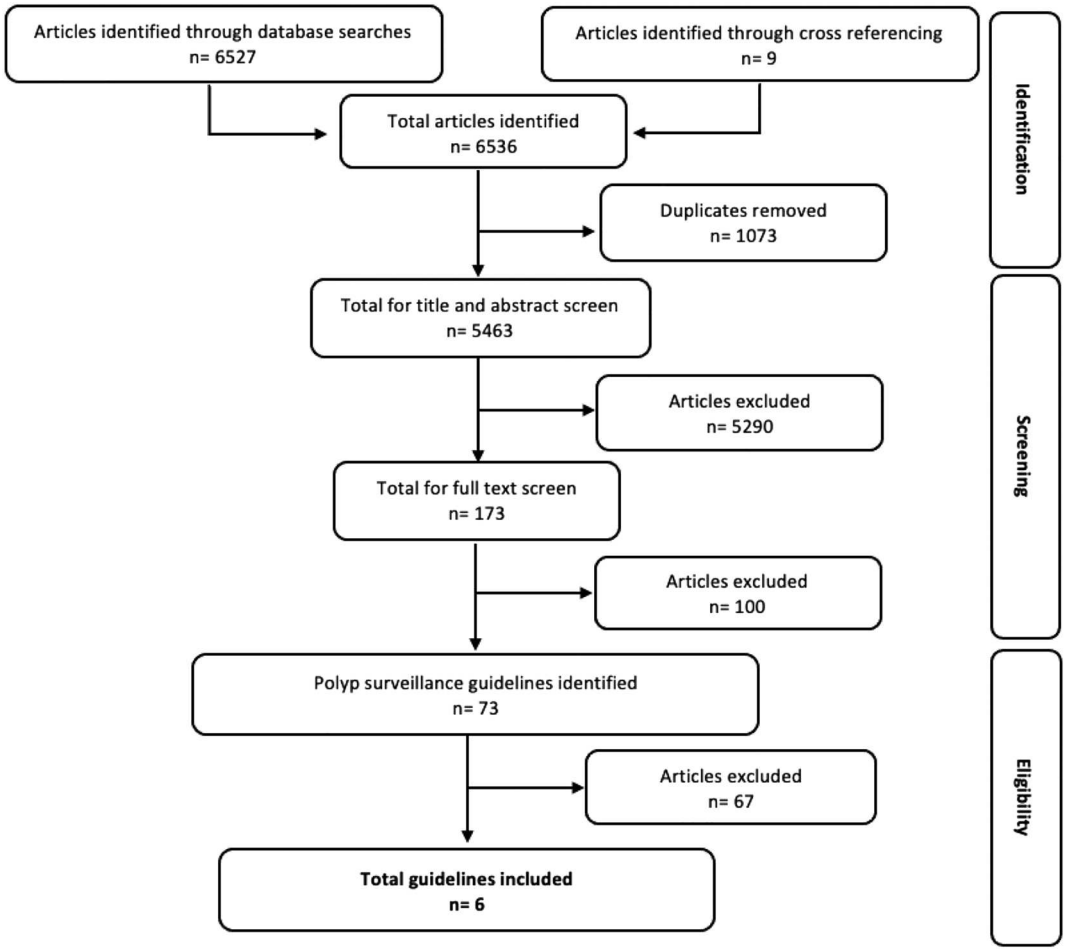

Figure 1 PRISMA flow chart.

Table 2 Guideline characteristics

	Country	Year	Development method	Evidence assessment and recommendation grading
USMSTF	USA	2020	Recommendations produced through consensus discussion among authors	GRADE system: *Strength of recommendation*—rated strong or weak *Quality of evidence*—rated very low, low, moderate, or high
BSG	UK	2020	Recommendations produced according to BSG guideline development process utilizing Delphi consensus	GRADE system
CCA	Australia	2019	Recommendations produced according to 2011 NHMRC[†] standard for clinical practice guidelines utilizing consensus voting	NHMRC levels of evidence and grades for recommendations for developers of guidelines: *Type of recommendation*—evidence based, consensus based or practice point *Grade of recommendation*—A: evidence trusted to guide practice; B: evidence trusted to guide practice in most situations; C: evidence provides some support but care should be taken in its application; D: evidence is weak and recommendation must be applied with caution
ESGE	Europe	2020	Recommendations produced by consensus	GRADE system

(Continues)

	Country	Year	Development method	Evidence assessment and recommendation grading
JGES	Japan	2021	Recommendations produced through modified Delphi consensus	2014 Minds Guide for Developing Clinical Practice Guidelines: *Recommendation strength*—1: highly; 2: weakly; none: cannot make a clear recommendation *Evidence level*—A: strong evidence; B: moderate evidence; C: weak evidence; D: minimal evidence
Asia-Pacific Working Group	Asia	2022	Recommendations produced through modified Delphi consensus	Voting, quality of evidence and classification of recommendations *Likert scale level of agreement*—A: accept completely; B: accept with some reservation; C: accept with major reservation; D: reject with some reservation; E: reject completely *Classification of recommendations*—A: good evidence to support the statement; B: fair evidence to support the statement; C: poor evidence to support the statement; D: fair evidence to refute the statement; E: good evidence to refute the statement *Quality of evidence*—I: evidence obtained from at least one RCT[‡]; II-1: evidence obtained from well-designed control trials without randomization; II-2: evidence obtained from well-designed cohort or case–control study; II-3: evidence obtained from comparison between time or places with or without intervention; III: opinion of respected authorities, based on clinical experience and expert committees

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force.
[†]National Health and Medical Research Council.
[‡]Randomized controlled trial.

Table 3 Definitions and recommendations for surveillance of advanced adenomas

	Terminology and criteria	Surveillance recommendations	Recommendations for piecemeal excisions
USMSTF	Advanced adenoma: Size ≥ 10 mm, tubulovillous/villous histology or HGD	3 years (Strong recommendation, moderate to high GRADE evidence)	6 months for lesions ≥ 20 mm (Strong recommendation, moderate GRADE evidence)
BSG	Advanced colorectal polyp: • Advanced adenomatous polyp—size ≥ 10 mm or HGD • Advanced serrated polyp—size ≥ 10 mm or any grade of dysplasia Large non-pedunculated colorectal polyp (LNPCP): Size ≥ 20 mm	3 years if ≥ 2 pre-malignant polyps including ≥ 1 advanced polyp or one LNPCP[†] (strong recommendation, low GRADE evidence)	2–6 months in piecemeal excisions of LNPCP's[§] or where excision completeness cannot be determined in advanced polyps[¶] ([§]strong and[¶] weak recommendations, low GRADE evidence)
CCA	High-risk adenoma: Size ≥ 10 mm, HGD, villosity or 3–4 adenomas Large sessile/laterally spreading lesion: Size > 20 mm	3 years for high-risk adenomas (consensus-based recommendation[‡]) 12 months for large sessile or laterally spreading lesion (consensus-based recommendation)	6 months for large sessile or laterally spreading lesions (consensus based recommendation)
ESGE	Patients requiring surveillance: 1 adenoma ≥ 10 mm or HGD Serrated polyp ≥ 10 mm or with dysplasia ≥ 5 adenomas	3 years (strong recommendation, moderate GRADE evidence)	3–6-months for lesions ≥20 mm (strong recommendation, moderate GRADE evidence)
JGES	Advanced adenoma: Size ≥ 10 mm Tubulovillous/villous histology or HGD	3 years for advanced adenoma reduced to 1 for lesions ≥ 20 mm (strength of recommendation 2, evidence level B)	6 months

(Continues)

	Terminology and criteria	Surveillance recommendations	Recommendations for piecemeal excisions
Asia-Pacific Working Group	High-risk adenoma Three or more adenomas Size > 10 mm Villous or high-grade dysplasia	3 years (classification of recommendation A, quality of evidence II-2)	No recommendation

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; HGD, high-grade dysplasia; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force.
[†]If under 75 years.
[‡]A recommendation formulated in the absence of quality evidence, after a systematic review of the evidence was conducted and failed to identify admissible evidence on the clinical question.
[§]refers to '2–6 months in piecemeal excisions of LNPCP's' being based on strong evidence.
[¶]refers to 'where excision completeness cannot be determined in advanced polyps' being based on weak evidence.

Table 4 Definitions and recommendations for surveillance of advanced serrated lesions

	Terminology and criteria	Surveillance recommendations
USMSTF	Not defined: Sessile serrated polyp ≥ 10 mm or with dysplasia	3 years (weak recommendation, very low quality of evidence)
BSG	Advanced serrated polyp: Size ≥ 10 mm or any grade of dysplasia	3 years if ≥ 2 pre-malignant polyps including ≥ 1 advanced polyp or one LNPCP[†] (strong recommendation, low GRADE evidence)
CCA	Not defined: Various criteria	1 to 5 years[†]
ESGE	Patients requiring surveillance: Serrated polyp ≥ 10 mm or with dysplasia	3 years (strong recommendation, moderate GRADE evidence)
JGES	Not defined	—
Asia-Pacific Working Group	Not defined: Sessile serrated lesion > 10 mm or with cytological dysplasia	3 years (classification of recommendation B, quality of evidence III)

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force.
[†]Full details can be seen in Table S4.

Recommendations for surveillance. All guidelines recommended colonoscopy as the primary method of surveillance with the BSG and Australian guidelines accepting CT colonography as an alternative where colonoscopy was not appropriate. The USMSTF, CCA, ESGE, JGES, and Asia-Pacific Working Group recommendations all advised a standard surveillance timing of 3 years after the diagnosis and removal of an advanced colorectal polyp. Although surveillance at 3 years is still recommended, the BSG guidance differs as at least two polyps, with one meeting the requirements of an advanced polyp or a single LNPCP must be identified. A shorter surveillance interval of 12 months is recommended by the CCA for large sessile or laterally spreading lesions and JGES for lesions ≥ 20 mm.

For serrated lesions, the surveillance interval was 3 years for the USMSTF, BSG, ESGE, and Asia-Pacific Working Group. The JGES did not provide specific recommendations for serrated lesions. The CCA recommendations for serrated lesions were complex with intervals ranging from 1 to 3 years depending on lesion characteristics. A comprehensive overview of these is provided in Table S4.

Shorter surveillance intervals for piecemeal polyp removal in all guidelines were recommended for lesions meeting certain criteria. Similar to the ESGE recommendation of 3 to 6 months for piecemeal excisions of lesions greater than 20 mm, the USMTF also suggested a 6-month follow-up in polyps of this size. The BSG recommended that surveillance should be performed in 2 to 6 months where the excision completeness of advanced polyps cannot be determined or in piecemeal excisions of LNPCPs. The suggested interval by the CCA of 12 months for large sessile or laterally spreading lesions is reduced to 6 months in the case of piecemeal removal. The JGES state that a 6-month surveillance should be performed if any advanced adenomas are excised in a piecemeal nature. The Asia-Pacific Working Group did not provide specific recommendations for piecemeal excisions.

Most of the evidence regarding surveillance timings was assessed as low to moderate quality, but despite this, the recommendations were mostly strong for those using the GRADE system. In contrast, the JGES recommendations were classified as level 2 (weak). The CCA recommendations were consensus based, which means that admissible evidence on the clinical question was not found.

Factors at index colonoscopy guiding surveillance recommendations

Polyp factors. As all six guidelines based their surveillance recommendations predominantly on the polyp features at index

examination, they are already described in detail above in the terminology and criteria for advanced polyps, recommendations for surveillance, and in Table 3.

Patient factors. The consideration of patient factors at index examination in the recommendations of surveillance intervals was varied between the included guidelines. A summary is shown in Table 5. The American, Japanese, and Asia-Pacific Working Group guidelines did not document any patient factors at index examination to be used in influencing surveillance timings for advanced polyps. The BSG, ESGE, and CCA guidelines, which did identify such factors, recognized that this was based on limited evidence or opinion only.

The commonest patient factors considered were regarding the parameters where surveillance should not be performed. BSG guidance suggested that surveillance should only be performed in those with a life expectancy greater than 10 years and in general, not in those older than 75 years. The ESGE recommendations are similar suggesting stopping follow-up at the age of 80 years, or earlier if comorbidities are thought to limit life expectancy. These were both weak recommendations based on a low grade of evidence. The Australian guidelines are more complex. They promote the utilization of shared decision making in the elderly when considering surveillance. They advise the use of an objective method of assessing life expectancy such as the Charlson score.[30] With an age of 75 to 80 years and score of four or less, then surveillance should be considered, but not if greater than 4. Surveillance is not recommended in those over 80 years. The USMSTF or JGES guidelines did not provide recommendations for surveillance cessation. In addition, the BSG guidelines recommended balancing benefits of surveillance against its risk and cost to both patient and health services. They stated that this should be explained to patients as part of shared decision making regarding follow-up.

Colonoscopy quality factors. A summary of the factors considered by the guidelines regarding the quality of baseline colonoscopy is shown in Table 6. All guidelines recognized the importance of quality in index colonoscopy in the applicability of their surveillance recommendations with the USMSTF, BSG, CCA, and Asia-Pacific Working Group suggesting further research or benchmarking concerning this. The parameters required for quality colonoscopy were variable. The USMTF, CCA, and BSG all provided advice regarding completeness of examination with overall rates of $> 95\%$ and $> 90\%$ quoted for the USMSTF and CCA guidelines, respectively. The BSG stated that the individual colonoscopy should be complete to the caecum with an early repeat procedure if not, which is also advised in the case of poor bowel preparation. This advice is also given by the ESGE guidance. The USMSTF guidance advises overall adequate bowel preparation rates of $> 85\%$ to reliably detect lesions over 5 mm.

Both the CCA and USMSTF quote required adenoma detection rates (ADR) for colonoscopists performing the index examination. The USMSTF guidelines advise an ADR of $> 30\%$ and $> 20\%$ in men and women, respectively, but this rate is $> 25\%$ in the Australian document. No reference to ADR requirements were made in the remaining guidelines. The USMSTF, BSG, CCA, and ESGE documents agree that the colon should also be completely cleared of identified polyps. The JGES provide some background relating to quality indicators for colonoscopy, but without relation to their surveillance recommendations. They do suggest a withdrawal time of at least 6 min for baseline colonoscopy, which is mirrored in the CCA document. Accepted withdrawal times are not given in the other three guidelines.

The ESGE guidelines quote recommendations from their own organization and the World Endoscopy Organization (WEO) regarding quality requisites for baseline colonoscopy.[31,32] Consensus was reached in the WEO recommendations regarding completeness of examination, quality of bowel preparation, and completeness of polyp excision. The ESGE performance measures for lower gastrointestinal endoscopy included key performance measures of adequate bowel preparation rate ($\geq 90\%$), caecal intubation rate ($\geq 90\%$), and ADR of at least 25%.

Table 5 Patient factors at index colonoscopy

USMSTF	None described
BSG	1. The benefits and risks of surveillance should be explained to patients, who should be involved in shared decision-making. The risks and benefits of non-adherence to surveillance should also be explained. 2. The impact of surveillance in terms of CRC risk reduction should be balanced with the risks of harm (e.g., colonoscopy complications or psychological distress) and the costs to both the health service and patients. 3. Patients should be made aware of other evidence-based interventions that could reduce their risk of CRC and/or polyp recurrence. These could include lifestyle and behavioral modifications (e.g., stopping smoking and reducing red meat consumption) as well as medications (e.g., aspirin). 4. Age and life expectancy.
CCA	1. Patients with large sessile and laterally spreading lesions should be informed of the requirement for scheduled surveillance before proceeding to EMR (practice point). 2. Clinicians should advise patients that modification of lifestyle factors can reduce their risk of polyp recurrence (practice point).
ESGE	1. ESGE suggests that individuals with symptoms in the surveillance interval should be managed as clinically indicated (weak recommendation, low-quality evidence).
JGES	None described
Asia-Pacific Working Group	None described

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force.

Table 6 Quality factors of index colonoscopy

	Colonoscopy quality factors	Standard of evidence
USMSTF	High-quality colonoscopic examination: • Adequate bowel preparation rates > 85% (to reliably detect lesions > 5 mm) • Colonoscopists with adequate adenoma detection rate (ADR) of > 30% in men and > 20% in women • Completion rates to caecum > 95% • Attention to complete polyp excision • Parameters outlined above should be monitored as quality metrics in practice	Formal assessment of evidence not performed
BSG	Acceptable minimum quality colonoscopy: • At least adequate bowel preparation • Complete colonoscopy to the caecum • Clearance of all identified premalignant polyps • Early re-examination if bowel preparation is poor or colonoscopy incomplete	Low GRADE evidence for bowel preparation and completion of examination
CCA	High-quality colonoscopy: • Colonoscopists should maintain ADR > 25% (patients > 50 without diagnosis of inflammatory bowel disease) • Unadjusted rates for caecal intubation ≥ 90% • Withdrawal time of > 6 min (without polypectomy) • Colon has been cleared of all significant neoplasia • Colonoscopists should be certified, undergo regular recertification and have training to increase polyp detection rates	Practice point[†]
ESGE	High-quality colonoscopy based on ESGE and WEO guidance: • Repeat colonoscopy in 1 year if bowel preparation inadequate • Polyps completely removed	Strong recommendation, Moderate GRADE evidence
JGES	Withdrawal time of at least 6 min (if no lesions)	Strength of recommendation 2, evidence level C
Asia-Pacific Working Group	Quality control of colonoscopy is mandatory for colorectal cancer screening programs and benchmarks should be determined	Classification of recommendation A, quality of evidence II-2

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force; WEO, World Endoscopy Organization.
[†]A recommendation on a subject that is outside the scope of the search strategy for the systematic review, based on expert opinion and formulated by a consensus process.

The assessment of evidence regarding colonoscopy quality varied between the guidance. For the USMSTF, a formal assessment of evidence was not performed, and the BSG assessed the evidence as low regarding bowel preparation and completion of examination. As the ESGE statements were based on preceding review documents, they gave strong recommendations regarding this as based on a moderate level of evidence. The CCA's statements regarding colonoscopy quality were given as practice points, which are based on expert opinion and consensus only. The JGES was similar in assessing the level of evidence as weak. The USMSTF, BSG, and CCA all recognized the importance of understanding colonoscopy quality factors through research in the improvement of surveillance recommendations. This included the effect of incomplete examination, poor bowel preparation, incomplete polyp removal, and ADRs.

Assessment of guideline quality. The AGREE II instrument was used to assess the quality of the guidelines by two reviewers. An overview of the scores is shown in Table 7. The BSG and CCA guidelines were rated as high quality with a scaled domain score of over 60% in all categories. The remaining guidelines were all rated as of average quality with scores less than 60% for all these guidelines in the stakeholder development and applicability domains. These low scores were explained in all guidelines by an absence in involvement of patient or public representatives in the stakeholder development domain. There were also low scores for resource implications of the recommendations and monitoring or auditing criteria in the applicability domains. Both reviewers felt that all guidelines could be recommended for use despite the limitations in some areas of guideline quality.

Discussion

This review demonstrates that international surveillance guidelines for advanced colorectal polyps are of good quality but limited by their underlying evidence. The consistency in recommendations regarding surveillance timings is reassuring, but the terminology

Table 7 AGREE II scaled domain scores

	Domain 1 Scope and purpose	Domain 2 Stakeholder involvement	Domain 3 Rigor of development	Domain 4 Clarity of presentation	Domain 5 Applicability	Domain 6 Editorial independence	Overall quality
USMSTF	97.2%	52.8%	74.0%	96.4%	29.2%	95.8%	Average
BSG	100%	97.2%	96.9%	100%	95.8%	91.7%	High
CCA	97.2%	94.4%	99%	97.2%	97.9%	100%	High
ESGE	97.2%	58.3%	75.0%	96.4%	31.3%	95.8%	Average
JGES	83.3%	50%	77.1%	88.9%	45.8%	91.7%	Average
Asia-Pacific Working Group	97.2%	41.7%	67.7%	88.9%	20.8%	91.7%	Average

Scaled domain scores were calculated using the formula: (obtained score − minimum possible score)/(maximum possible score − minimum possible score) × 100.

BSG, British Society of Gastroenterology; CCA, Cancer Council Australia; ESGE, European Society of Gastrointestinal Endoscopy; JGES, Japan Gastroenterological Endoscopy Society; USMSTF, US Multi-Society Task Force.

and criteria used for advanced polyps was variable. The emphasis on polyp factors as the key determinant for when surveillance should be performed was the same among all guidelines. Given the increasing detection of advanced polyps and a significant number of surveillance examinations in screening being inappropriate,[33] improvement of the evidence base and guidance implementation is warranted.

The authors feel that the limited application of evidence regarding the influence of patient characteristics and the quality of baseline colonoscopy should be addressed as a significant area for improvement. The principles of informed choice and shared decision making with patients should be applied when offering surveillance and be accounted for in recommendations. Three of the included guidelines discussed patient factors regarding surveillance timings but only the BSG and CCA involved representatives in their development process. Recommendations for when surveillance should not be performed were variable in the three documents discussing it, reflecting the low quality of underlying evidence. The USMSTF and BSG both acknowledge that further evidence is required for surveillance at the extremes of age with research concerning comorbidities also recommended by the USMSTF. The BSG stated the need to develop evidence in personalized surveillance algorithms, patient experience, preferences, and compliance. The research gap regarding patient opinion and experience of endoscopy is significant[34] with knowledge in this field potentially having significant effects on future recommendations provided. Individual patient assessment in terms of age, comorbidities, and life expectancy should also be standardized. Based on the above, a proportion of patients will not develop clinically significant new or recurrent disease and should not be exposed to the risks of further examinations. This could economize surveillance further but must be evidence based.

The quality of baseline colonoscopy may be the keystone to economizing surveillance recommendations. If the risk of missed lesions is negligible after a high-quality colonoscopy and complete polyp removal, the need for further examination may be considerably reduced or not required at all. By not identifying lesions, low-quality examinations may also underestimate the surveillance required. All guidelines recognized the importance of this but differed in their criteria for quality examination. Parameters such as ADR, completion rate, satisfactory bowel preparation, and withdrawal time were not standard between the guidelines, and their applicability will vary depending on whether performed in a screening or symptomatic cohort. The association between ADR and risk of subsequent cancer or advanced adenomas has been reported.[8,9,35] Efforts improving colonoscopy quality standards and key performance indicators may be challenging and have considerable effects on surveillance resources. It should be noted that quality indicators for colonoscopy may also be provided through separate guidelines such as those provided by the Joint Advisory Group on Gastrointestinal Endoscopy (JAG) in the UK. The implementation and assurance of these are crucial with accountability needed to maintain quality both in screening and symptomatic services. This has been the focus of a recent American Gastroenterological Association review on strategies to improve quality of screening and surveillance colonoscopy.[36] This provides standards and highlights the importance of measuring, tracking and providing feedback of colonoscopist specific quality measures including caecal intubation rate (≥ 90%), withdrawal time (≥ 6 min), ADR (≥ 30%), and serrated lesion detection rate (≥ 7%).

A recent narrative review comparing surveillance recommendations of the USMTF, ESGE, and BSG guidance for all colorectal polyps has been performed.[37] This identified variability in surveillance recommendations for certain lesions but like our findings found intervals specific for advanced lesions to be consistent. A challenge of these reviews has been the synthesis and comparison of guidelines due to inconsistent polyp terminology and classifications. The JGES and USMSTF guidelines and the CCA and Asia-Pacific Working Group were the only ones using the same term of advanced adenoma and high-risk adenoma respectively. The subclassification of larger polyps (≥ 20 mm) was only performed by the BSG and CCA and inclusion of advanced serrated polyps, multiple lesions, or villous features in advanced polyp definitions was different between all guidelines. This may result in challenges with interpretation and application to research and clinical practice. Gaps in knowledge of surveillance recommendations have been identified as a reason for non-compliance,[38,39] and the variability and complexity of definitions may explain this. Provisions to make recommendations user friendly should be implemented, and feedback regarding the ease of guideline use may be beneficial.

All guidelines were assessed as being average to high quality based on the AGREE II instrument. Limitations identified included the involvement of patient representatives, guideline implementation, and variation in evidence assessment. Given the paucity of evidence on patient experience in surveillance, all guidelines should mandate the involvement of patient representatives during their development. Guidance on implementation and adherence is also crucial. A systematic review identified that international adherence to surveillance guidelines was remarkably low with over 50% of patients not receiving surveillance at an appropriate time.[40] Implementation advice produced by guidelines may help this. The variability in the assessment of evidence by different guidelines also highlights potential inconsistencies in interpretation of data or impact of different rating systems. A standard instrument such as the GRADE system, which is an international applicable and endorsed method, may be beneficial.

Limitations of this study included the review of only the most current international guidelines. Others may have been inappropriately excluded on the assumption that there were no longer widely utilized. Given that the guidelines included covered a wide geographical area, we believe our review should be representative. Our review did not cover the recommendations for serrated or multiple lesions in detail, but these have been assessed recently elsewhere.[37] The focus on advanced lesions was due to complexities of their management and higher risk of recurrent disease. It also provides a more detailed insight into the factors considered in the recommended timings to identify areas where improvement or future research is needed.

International surveillance guidelines for advanced colorectal polyps can be recommended for use. All had merits and can be safely utilized given consistency in recommended surveillance timings. Overall, we would recommend the use of the BSG guidance given the high quality of methodology, ease of use, and patient involvement during development. Standardization in definitions would be valuable and potentially improve understanding and adherence by users. Better knowledge of patient experience and clinical factors in the identification of those who will never come to harm by future pathology is of great importance. Research into colonoscopist-specific quality indicators is also highly recommended to further economize surveillance recommendations, minimize patient risk, and reduce pressure on services and resources.

Data availability statement. Data available on request to the lead (J. P.) and senior author (S. D.).

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Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Other sources searched.
Table S2. Full search strategy.
Table S3. Classification of excluded articles.
Table S4. CCA guidance for surveillance intervals of sessile and traditional serrated adenomas.