Supporting Information 1

Summary documents of detailed literature searches for ESGE QIC Lower GI working group performed by:

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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

ADEQUATE BOWEL PREPARATION

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Clinical questions:

1.1. In patients undergoing screening or diagnostic colonoscopy what is the preferred measure of adequate bowel preparation?

P: Patients undergoing screening or diagnostic colonoscopy

I: Adequate bowel preparation using Aronchick, Ottawa, general scales (other scales)

C: Adequate bowel preparation using Boston Bowel Preparation Scale (each segment at least 2 points)

O: Adenoma detection rate\ proximal Polyps DR

1.2. In patients undergoing screening or diagnostic colonoscopy what is the minimum rate of adequate bowel preparation?

P: Patients undergoing screening or diagnostic colonoscopy

I: Adequate bowel preparation <95 (80%) % of cases (using BBPS; depends on 1.1)

C: Adequate bowel preparation ≥95% (80%) of cases(using BBPSdepends on 1.1)

O: Adenoma detection rate\ proximal PDR

Bibliographic searches

Bibliographic searches were performed on Cochrane library, Pubmed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Cathartics"[Mesh] OR "Administration, Oral"[Mesh] OR (("intestines"[MeSH Terms] OR intestin*[Title/Abstract] OR bowel[Text Word] OR quality [Text Word] OR colon[Title/Abstract]) AND (preparation[Text Word] OR lavage[Text Word] OR Cleansing[Text Word]))) **AND** ("Colonic Polyps"[Mesh] OR "Colorectal Neoplasms"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ADR[Title/Abstract] OR PDR[Title/Abstract] OR ((Adenoma[Text Word] OR proximal[Title/Abstract] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word]) AND (detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word])) OR ((Colon[Text Word] OR Colorectal[Text Word] OR "Colo-rectal"[Text Word] OR Rect*[Text Word] OR Sigmoid[Text Word] OR Cec*[Text Word]) AND (Adenoma[Text Word] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word]))) **AND** ("Boston Bowel Preparation Scale"[Title/Abstract] OR boston[Title/Abstract] OR BBPS[Title/Abstract] OR Ottawa[Title/Abstract] OR Aronchick[Title/Abstract] OR scale[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscopy*:ti,ab) **AND** ('intestine preparation'/exp OR 'laxative'/exp OR 'colon lavage'/exp OR ((intestin*:ti,ab OR bowel:ti,ab OR quality:ti,ab OR colon:ti,ab) AND (preparation:ti,ab OR Cleansing:ti,ab OR lavage:ti,ab))) **AND** ('colorectal tumor'/exp OR 'colon polyp'/exp OR 'colon adenoma'/exp OR 'rectum adenoma'/exp OR ADR:ti,ab OR PDR:ti,ab OR ((Adenoma:ti,ab OR proximal:ti,ab OR polyp:ti,ab OR polyps:ti,ab OR neoplasm:ti,ab OR neoplasms:ti,ab) AND (detect*:ti,ab OR prevalence:ti,ab OR presence:ti,ab OR rate:ti,ab OR rates:ti,ab OR diagnos*:ti,ab OR predict*:ti,ab)) OR ((Colon:ti,ab OR Colorectal:ti,ab OR 'Colo-rectal':ti,ab OR Rect*:ti,ab OR Sigmoid:ti,ab OR Cec*:ti,ab) AND (Adenoma:ti,ab OR polyp:ti,ab OR polyps:ti,ab OR neoplasm:ti,ab OR neoplasms:ti,ab OR cancer:ti,ab OR cancers:ti,ab OR tumor:ti,ab OR tumour:ti,ab OR tumors:ti,ab OR tumours:ti,ab OR carcinoma:ti,ab))) **AND** ('Boston Bowel Preparation Scale':ti,ab OR Boston:ti,ab OR BBPS:ti,ab OR Ottawa:ti,ab OR Aronchick:ti,ab OR scale:ti,ab) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Cathartics] explode all trees

#5 MeSH descriptor: [Administration, Oral] explode all trees
#6 MeSH descriptor: [Intestines] explode all trees
#7 intestine or bowel or quality or colon:ti,ab,kw (Word variations have been searched)
#8 preparation or cleansing or lavage:ti,ab,kw (Word variations have been searched)
#9 #7 or #6
#10 #8 and #9
#11 #5 or #4 or #10
#12 MeSH descriptor: [Colonic Polyps] explode all trees
#13 MeSH descriptor: [Colorectal Neoplasms] explode all trees
#14 MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
#15 (Adenoma or proximal or polyp or neoplasm) and (detection or prevalence or presence or rate or diagnosis):ti,ab,kw (Word variations have been searched)
#16 (Colon or colorectal) and (Adenoma or polyp or neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#17 ADR or PDR:ti,ab,kw (Word variations have been searched)
#18 #12 or #17 or #16 or #15 or #14 or #13
#19 Boston Bowel Preparation Scale or boston or BBPS or Ottawa or Aronchick or bowel preparation scale:ti,ab,kw (Word variations have been searched)
#19 #3 and #11 and #18 and #19 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Cathartics"[Mesh] OR "Administration, Oral"[Mesh] OR (("intestines"[MeSH Terms] OR intestin*[Title/Abstract] OR bowel[Text Word] OR quality [Text Word] OR colon[Title/Abstract]) AND (preparation[Text Word] OR lavage[Text Word] OR Cleansing[Text Word]))) **AND** ("Colonic Polyps"[Mesh] OR "Colorectal Neoplasms"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ADR[Title/Abstract] OR PDR[Title/Abstract] OR ((Adenoma[Text Word] OR proximal[Title/Abstract] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word]) AND (detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word])) OR ((Colon[Text Word] OR Colorectal[Text Word] OR "Colo-rectal"[Text Word] OR Rect*[Text Word] OR Sigmoid[Text Word] OR Cec*[Text Word]) AND (Adenoma[Text Word] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word]))) **AND** ("Boston Bowel Preparation Scale"[Title/Abstract] OR boston[Title/Abstract] OR BBPS[Title/Abstract] OR Ottawa[Title/Abstract] OR Aronchick[Title/Abstract] OR scale[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscopy*:ti,ab) **AND** ('intestine preparation'/exp OR 'laxative'/exp OR 'colon lavage'/exp OR ((intestin*:ti,ab OR bowel:ti,ab OR quality:ti,ab OR colon:ti,ab) AND (preparation:ti,ab OR Cleansing:ti,ab OR lavage:ti,ab))) **AND** ('colorectal tumor'/exp OR 'colon polyp'/exp OR 'colon adenoma'/exp OR 'rectum adenoma'/exp OR ADR:ti,ab OR PDR:ti,ab OR ((Adenoma:ti,ab OR proximal:ti,ab OR polyp:ti,ab OR polyps:ti,ab OR neoplasm:ti,ab OR

neoplasms:ti,ab) AND (detect*:ti,ab OR prevalence:ti,ab OR presence:ti,ab OR rate:ti,ab OR rates:ti,ab OR diagnos*:ti,ab OR predict*:ti,ab)) OR ((Colon:ti,ab OR Colorectal:ti,ab OR 'Colorectal':ti,ab OR Rect*:ti,ab OR Sigmoid:ti,ab OR Cec*:ti,ab) AND (Adenoma:ti,ab OR polyp:ti,ab OR polyps:ti,ab OR neoplasm:ti,ab OR neoplasms:ti,ab OR cancer:ti,ab OR cancers:ti,ab OR tumor:ti,ab OR tumour:ti,ab OR tumors:ti,ab OR tumours:ti,ab OR carcinoma:ti,ab))) **AND** ('Boston Bowel Preparation Scale':ti,ab OR Boston:ti,ab OR BBPS:ti,ab OR Ottawa:ti,ab OR Aronchick:ti,ab OR scale:ti,ab) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
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#3 #2 or #1
#4 MeSH descriptor: [Cathartics] explode all trees
#5 MeSH descriptor: [Administration, Oral] explode all trees
#6 MeSH descriptor: [Intestines] explode all trees
#7 intestine or bowel or quality or colon:ti,ab,kw (Word variations have been searched)
#8 preparation or cleansing or lavage:ti,ab,kw (Word variations have been searched)
#9 #7 or #6
#10 #8 and #9
#11 #5 or #4 or #10
#12 MeSH descriptor: [Colonic Polyps] explode all trees
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#14 MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
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#17 ADR or PDR:ti,ab,kw (Word variations have been searched)
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#19 Boston Bowel Preparation Scale or boston or BBPS or Ottawa or Aronchick or bowel preparation scale:ti,ab,kw (Word variations have been searched)
#19 #3 and #11 and #18 and #19 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches
After removing duplicates, 3 systematic reviews and 317 primary studies were found: 5 studies (1 systematic review and 4 primary studies) were judged as potentially relevant and acquired in full text for more detailed evaluation.

Excluded studies:
There were no excluded studies

Studies awaiting assessment:
There were no studies awaiting assessment

Included studies
5 studies were finally included (Anderson 2014, Calderwood 2015,Clark 2014, Jain 2015, Kim 2014)

Question 1.1: preferred measure of adequate bowel preparation

No relevant studies were found addressing this clinical question.

CONCLUSIONS
No conclusion can be drawn about preferred measure of adequate bowel preparation relating to the comparison Boston Bowel Preparation Scale (BBPS) and Aronchick, Ottawa, or other scales because no evidence was found.

Question 1. 2: minimum rate of adequate bowel preparation

5 studies were found addressing this clinical question (See flow chart).

One (Cark 2014) was a systematic reviews including 11 studies assessing 55213 colonoscopies. The others were cross sectional studies enrolling a total of 23105 patients.
All the studies had the aim to assess whether different levels of bowel preparation quality were associated with differences in adenoma detection rate, advanced adenoma detection rate, polyp detection rate. All but one of the studies included only screening colonoscopies: Anderson (2014) included also diagnostic and surveillance colonoscopies. The quality of bowel preparation was defined according the Aronchick scale in the review by Clark, according to the BBPS in 3 primary studies, while one (Anderson 2014) used the New Hampshire Colonoscopy Registry procedure form (1= excellent: only scattered, tiny particles and/or clear liquid, 100% visualization possible throughout colon; 2= good: easily removable small amounts of particles and/or liquid very unlikely to impair visualization throughout colon; 3=fair: residual faeces and/or non-transparent fluid possibly impairing visualization; 4=poor: faeces and/or non-transparent fluid definitely impairing visualization.

RESULTS

	N of colonoscopies	Scale used	Polyp detection rate	Adenoma detection rate	Advanced adenoma detection rate
Anderson 2014	13022	NHCR procedure form		Optimal (excellent/good): 26.3% (95%CI 25.6-27.2) Fair: 27.1% (95%CI 24.6-30.0) Poor: 20.9 (95%CI 15.5-27.2) p=ns	
Calderwood 2015	9245	BBPS	BMC dataset. 8 vs 9: OR: 1.2 (95%CI 1.0-1.5) 7 vs 9: OR: 1.3 (95%CI 1.0-1.5) 6 vs 9: OR 1.1 (95%CI 0.9-1.4) CORI dataset 8 vs 9:OR: 1.2 (95%CI 1.0-1.4) 7vs 9:OR: 1.4 (95%CI 1.2-1.6) 6 vs 9: OR 1.5 (95%CI 1.3-1.7)	BMC dataset 8 vs 9: OR: 1.1 (95%CI 0.96-1.4) 7 vs 9: OR: 1.1 (95%CI 1.0-1.5) 6 vs 9: OR 1.2 (95%CI 0.99-1.5)	BMC dataset 8 vs 9: OR: 1.6 (95%CI 1.1-2.3) 7 vs 9: OR: 1.7 (95%CI 1.1-2.5) 6 vs 9: OR 1.8 (95%CI 1.2-2.7) CORI dataset 8 vs 9: OR: 0.88 (95%CI 0.6-1.2) 7 vs 9: OR: 0.85 (95%CI 0.6-1.2) 6 vs 9: OR 1.6 (95%CI 1.2-2.0))
Clark 2014	55213	Aronchick scale		Intermediate vs. high: OR 0.94 (95%CI 0.80-1.10) Intermediate vs. low: OR: 1.39 (95%CI 1.08-1.79) High vs. low: OR: 1.41 (95%CI 1.21-1.64) Excellent vs. good OR: 1.04 (95%CI 0.90-1.21) Adequate vs. inadequate OR: 1.30 (95%CI 1.19-1.42)	Intermediate vs. high OR : 0.89 (95%CI 0.69-1.14) Intermediate vs. low OR: 1.18 (95%CI 0.70, 1.98) High vs. low OR: 1.21 (95%CI 0.98-1.50) Adequate vs. inadequate OR: 1.30 (95%CI 1.02-1.67)
Jain 2015	356	BBPS			0-3 :3.8% 4-6:14.8% 7-9:16.7% 0-3 vs 4-6:p<0.05 0-3 vs 7-9:p<0.05 4-6 vs 7-9:p<0.05
Kim 2014	482	BBPS	<8: 32/97 (33.0%) ≥8:171/385 (44.4%) p: 0.04	<8: 26/97 (26.8%) ≥8: 110/385 (28.6) p=ns	<8: 1/97 (1.0%) ≥8: 22/385 (5.7%) p= 0.05

Quality of evidence

Study limitations (risk of bias): no major limitation.
Inconsistency of results: no for ADR and AADR, yes for PDR
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as low because it comes from cross sectional studies without serious limitation.

CONCLUSIONS

Adenoma detection rate: no significant difference were found in adenoma detection rate between different level of adequate preparation (between BBPS of 6,7,or 8 as compared to 9, between <8 and ≥8, or between Aronchick scale of excellent, good or fair). A significant increase was found for adequate (excellent, good, and fair) compared with inadequate preparation (poor and insufficient) **(LOW QUALITY OF EVIDENCE).**

Polyps detection rate: one study a significant increase in PDR with a PPBS ≥8 compared to <6 whereas the others found a decrease of PDR at the highest levels of bowel cleanliness
(VERY LOW QUALITY OF EVIDENCE).

Advanced adenoma detection rate: a significant increase in AADR were found as the BBPS score increased (between 6 and 9, between < 8 and ≥8) A significant increase was found for Aronchick criteria of adequate (excellent, good, and fair) compared with inadequate preparation (poor and insufficient)
(LOW QUALITY OF EVIDENCE).

References

Included

1. Anderson J.C.; Butterly L.F.; Robinson C.M.; Goodrich M., and Weiss J.E. Impact of fair bowel preparation quality on adenoma and serrated polyp detection: Data from the New Hampshire Colonoscopy Registry by using a standardized preparation-quality rating. Gastrointest. Endosc. 2014; 80(3):463-470; ISSN: 1097-6779. 0016-5107.

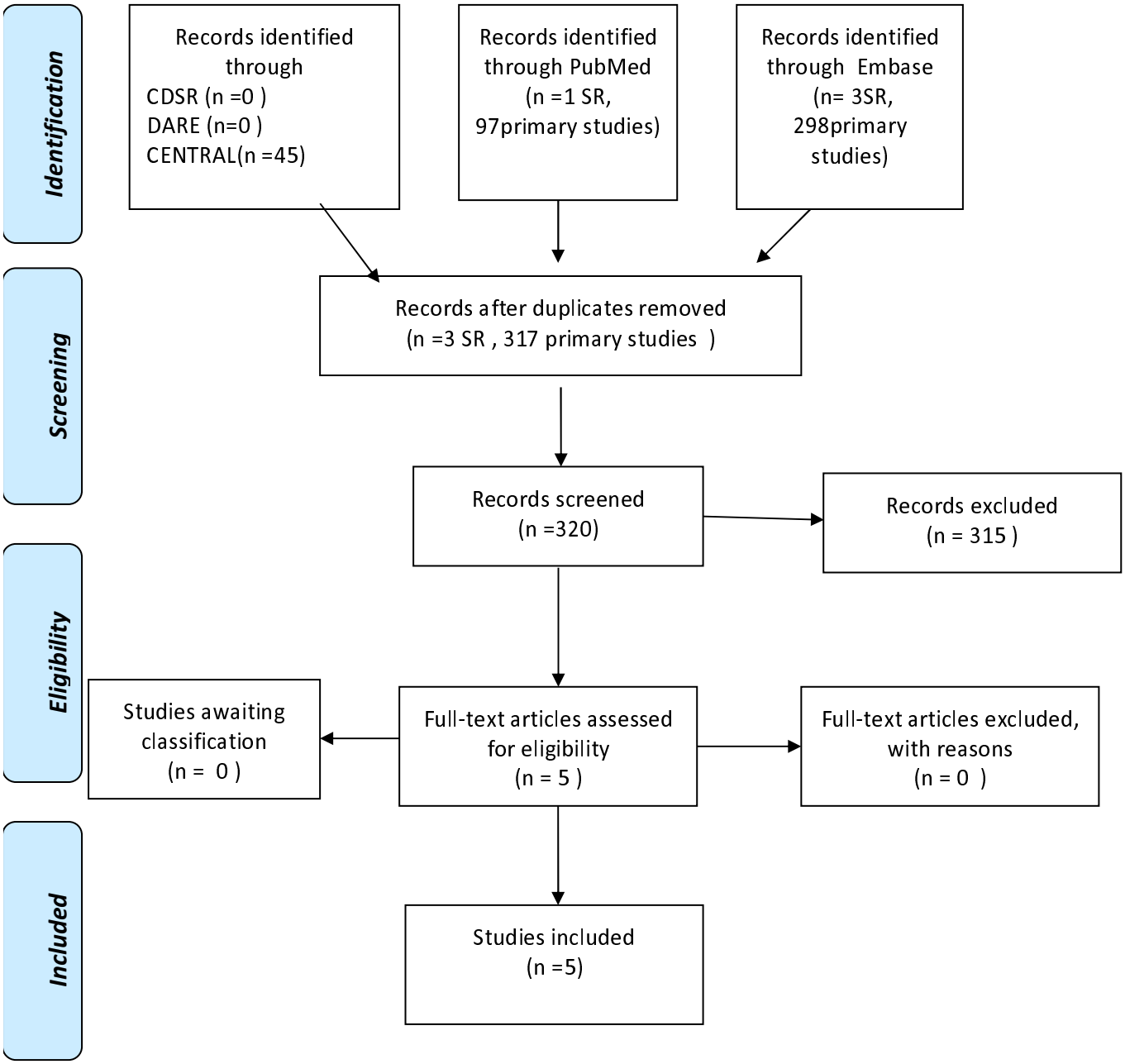
2. Calderwood A.H.; Thompson K.D.; Schroy P.C.; Lieberman D.A., and Jacobson B.C. Good is better than excellent: Bowel preparation quality and adenoma detection rates. Gastrointest. Endosc. 2015; 81(3):691-699; ISSN: 1097-6779. 0016-5107.

3. Clark, B. T.; Rustagi, T., and Laine, L. What level of bowel prep quality requires early repeat colonoscopy: systematic review and meta-analysis of the impact of preparation quality on adenoma detection rate. Am J Gastroenterol. 2014 Nov; 109(11):1714-23 SR inclusa

4. Jain D.; Momeni M.; Krishnaiah M.; Anand S., and Singhal S. Importance of reporting segmental bowel preparation scores during colonoscopy in clinical practice. World J. Gastroenterol. 2015; 21(13):3994-3999; ISSN: 2219-2840. 1007-9327.

5. Kim E.-J.; Park Y.-I.; Kim Y.-S.; Park W.-W.; Kwon S.-O.; Park K.-S.; Kwak C.-H.; Kim J.-N., and Moon J.-S. A Korean experience of the use of Boston bowel preparation scale: A valid and reliable instrument for colonoscopy-oriented research. Saudi J. Gastroenterol. 2014; 20(4):219-224; ISSN: 1998-4049. 1319-3767.

PRISMA 2009 Flow Diagram



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TIME SLOT

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Clinical question

1.3 In patients undergoing screening or diagnostic colonoscopy what is the minimum time slot for the procedure?

P: Patients undergoing screening or diagnostic colonoscopy

I: More than 30 minutes (45min/ 1 hour)

C: 30 minutes (45min)

O: Caecal intubation rate/ Adenoma detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Time slot"[Text Word] OR "Time slots"[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('time slot':ab,ti OR 'time slots':ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR

'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 time slot:ti,ab,kw (Word variations have been searched)
#4 #1 or #2
#5 #4 and #3

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Time slot"[Text Word] OR "Time slots"[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('time slot':ab,ti OR 'time slots':ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 time slot:ti,ab,kw (Word variations have been searched)
#4 #1 or #2
#5 #4 and #3

RESULTS

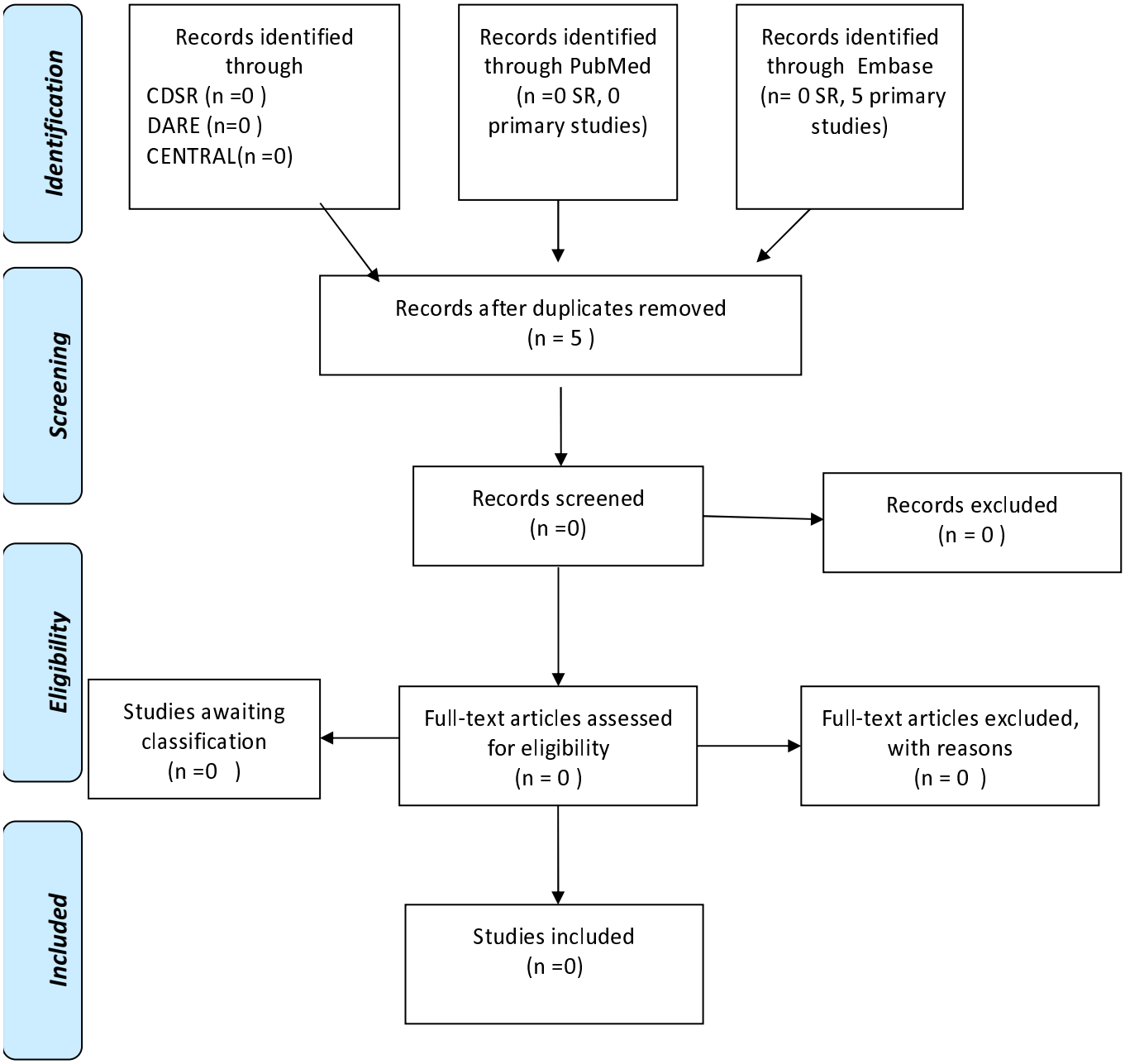
Results of the bibliographic searches

No relevant studies were found addressing this question.

CONCLUSIONS

No conclusion can be drawn about the minimum time slot for the colonoscopy because no evidence was found.

PRISMA 2009 Flow Diagram



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APPROPRIATE INDICATION

Silvia Minozzi, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

1 In patients undergoing colonoscopy what is the most accurate measure of appropriate indication?

P: Patients undergoing colonoscopy

I: Audit using EPAGEII guidelines

C: Audit using ASGE guidelines

O: Diagnostic yield of colonoscopy

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (ASGE[Title/Abstract] OR EPAGE [Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** (ASGE:ti,ab OR EPAGE:ti,ab) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

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#4 #1 or #2
#5 #4 and #3 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (ASGE[Title/Abstract] OR EPAGE [Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** (ASGE:ti,ab OR EPAGE:ti,ab) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

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#4 #1 or #2
#5 #4 and #3 Publication Year from 2000 to 2015

Results

Results of bibliographic search

After removing duplicates, 211 articles (15 reviews and 196 primary studies) were found. One systematic review which systematically searched articles up to 2009 was found; so we considered only primary studies published since 2010 and 7 primary studies were considered potentially relevant and acquired in full text (See flow chart).

Excluded studies

Three studies were excluded: one because it is a protocol (Puente 2012); one because upper endoscopy and colonoscopy were considered together and no separate data for colonoscopy which represented only the 9% of the examination were provided (Lee 2013); one because it assessed the appropriateness criteria according to the EPAGE I guideline (Hellara 2014).

Awaiting assessment

One study is awaiting assessment because we were unable to retrieve the full text (Andujar 2015).

Included

We included one systematic review (Hassan 2011) which systematically searched articles up to 2009 and 3 primary studies (Carrion 2010, Gimeno Garcia 2012, Mangualde 2011).

None of the included studies directly compared the appropriateness of the ASGE and of the EPAGE II criteria.

Hassan 2011 assess the accuracy of ASGE and EPAGE guidelines in selecting patients referred for colonoscopy (OC) measured as prevalence of relevant endoscopic findings, and, in particular, of adenomatous polyps and CRC. It included 12 studies with a total of 14,160 patients of which 8 studies adopted ASGE GL and 4 studies adopted EPAGE GL. The studies on EPAGE concerned the EPAGE I criteria, so they were not further considered in the present review.

Two primary studies (Carrion 2010, Gimeno Garcia 2012) assessed the appropriateness criteria according to the EPAGE II guidelines. They included 1623 patients referred for colonoscopy.

One primary study (Mangualde 2011) assessed the appropriateness criteria according to the ASGE guideline. It included 408 outpatients referred for colonoscopy.

In all studies sensitivity and specificity were computed as follow:

- for example sensitivity for cancer as

  Cancer in appropriate colonoscopy/ All cancer found in appropriate, inappropriate and uncertain colonoscopy;

- for example specificity for cancer as

  Non cancer in inappropriate and uncertain colonoscopies/ All non cancer in appropriate, inappropriate and uncertain colonoscopies.

Sensitivity, specificity, PPV and NPV of Carrion 2010 were recalculated using raw data to make these measures homogeneous to the ones of the other studies for what concern the way to compute accuracy.

	Appropriate, inappropriate, uncertain indication				**findings (including colorectal neoplasia (either adenoma or cancer), inflammatory bowel diseases, and colonic strictures or angiodysplasias)**	
Hassan 2011	8 studies with a total of 6892 patients Inappropriate rate Froelich 1998: 28% Morini 2001: 29% Siddique 2005: 24% Jabar 2004: 16% Bersani 2005: 37% Adler 2007 :14% Grassini 2007: 15% Chan 2006 : 18%	ASGE	**appropriate colonoscopies vs inappropriate colonoscopies, n(%)** Froelich 1998: 19(7) vs 0(0) Morini 2001: 48(7) vs 1(0) Siddique 2005: 21(4) vs 0(0) Jabar 2004: 18(8) vs 0(0) Bersani 2005: 84(6) vs 12(1) Adler 2007 :10(2) vs 0(0) Grassini 2007: 71(8) vs 0(0) Chan 2006 : 24(11) vs5(10 **Accuracy of appropriate Sensitivity (95%CI)** Froelich 1998: 1.00(0.82-1.00)	**appropriate colonoscopies *vs* inappropriate colonoscopies, n(%)** Froelich 1998: 77(27) *vs* 20(18) Morini 2001: 189(28) *vs* 34(12) Siddique 2005: 54(12) *vs* 1(1) Bersani 2005: 201(14) *vs* 122(15) Grassini 2007: 117(14) *vs* 11(7) **Accuracy of appropriate Sensitivity (95%CI)** Froelich 1998: 0.79(0.70-0.87)	**appropriate colonoscopies *vs* in inappropriate colonoscopies, n(%)** Froelich 1998: 132(46) *vs* 6(5) Morini 2001: 295(43) *vs* 45(16) Siddique 2005: 177(38) *vs* 7(5) Jabar 2004: 103(48) *vs* 8(20) Bersani 2005: 401(29) *vs* 168(20) Adler 2007 : 130(25) *vs* 12(14) Grassini 2007: 233(27) *vs* 16(11) Chan 2006 : 80(36) *vs* 17 (35) **Accuracy of appropriate Sensitivity (95%CI)** Froelich 1998: 0.96(0.91-0.98)	**appropriate colonoscopies *vs* inappropriate colonoscopies, n(%)** Froelich 1998: 28% Morini 2001: 29% Siddique 2005: 24% Jabar 2004: 16% Bersani 2005: 37% Adler 2007 :14% Grassini 2007: 15% Chan 2006 : 18%

			Morini 2001: 0.98(0.89-1.00) Siddique 2005: 1.00(0.84-1.00) Jabar 2004: 1.00(0.81-1.00) Bersani 2005: : 0.88(0.79-0.93) Adler 2007 1.00 (0.69-1.0) Grassini 2007: 1.00(0.95-1.00) Chan 2006: 0.83 (0.63-0.94) **Specificity (95%C)** Froelich 1998: 0.29(0.25-0.34) Morini 2001: 0.30(0.27-0.34) Siddique 2005: 0.25(0.22-0.29) Jabar 2004: 0.17(0.13-0.23) Bersani 2005: : 0.29(0.36-0.41) Adler 2007: 0.15 (0.12-0.18) Grassini 2007: 0.16(0.14-0.24) Chan 2006: 0.18 (0.14-0.24)	Morini 2001: 0.85(0.79-0.89) Siddique 2005: 0.98(0.90-1.00) Bersani 2005: 0.62(0.57-0.68) Grassini 2007: 0.91(0.85-0.95) **Specificity (95%CI)** Froelich 1998: 0.30(0.25-0.36) Morini 2001: 0.33(0.30-0.37) Siddique 2005: 0.26(0.23-0.30) Bersani 2005: : 0.37(0.35-0.40) Grassini 2007: 0.16(0.13-0.18)	Morini 2001: 0.87(0.83-0.90) Siddique 2005: 0.96(0.92-0.98) Jabar 2004: 0.93(0.85-0.97) Bersani 2005: 0.70(0.67-0.74) Adler 2007: 0.91(0.85-0.96) Grassini 2007: 0.94(0.90-0.96) Chan 2006: 0.82(0.73-0.89) **Specificity (95%CI)** Froelich 1998: 0.40(0.34-0.47) Morini 2001: 0.38(0.34-0.41) Siddique 2005: 0.33(0.28-0.37) Jabar 2004: 0.23(0.16-0.30) Bersani 2005: : 0.40(0.38-0.43) Adler 2007: 0.16(0.13-0.20) Grassini 2007: 0.18(0.15-0.20) Chan 2006: 0.19(0.13-0.25)	

Gimeno Garcia 2012	968 appropriate indication: 778 (80.4%) inappropriate: 102 (10.5%) uncertain : 88 (9.1%)	EPAGE II	<u>Advanced adenomas and CRC</u> Appropriate or uncertain=97/866 (11.2%) Inappropriate=2/102 (2.0%) OR (95%CI)=6.31 (1.53-25.98) **Accuracy of appropriate** Sensitivity =98.0% (95%CI 95%–100%) Specificity=11.5% (95%CI 9%–14%), PPV=11.2% (95%CI 9%–13%), NPV= 98% (95%CI 95%–100%), <u>CRC</u> Appropriate or uncertain=33/866 (3.8%) Inappropriate=1/102 (1.0%) OR (95%CI)=4.00 (0.54-29.57) p=0.248		Appropriate or uncertain=336/866 (38.8%) Inappropriate=25/102 (24.5%) OR (95%CI)=1.95 (1.22-3.13) p=0.005 **Accuracy of appropriate** Sensitivity =93.1% (95%CI 90%–96%) Specificity=12.7% (95%CI 10%–15%) PPV=38.8% (95%CI 36%–42%) NPV=75.5% (95%CI 67%–84%)	Normal exam: Appropriate or uncertain : 530/866 (61%) Inappropriate: 77/102 (75%)
Mangualde 2011	408	ASGE	<u>CRC :</u>15 Appropriate =12/337 (3.6%)	<u>Adenoma=69</u> Appropriate=15.7% Uncertain= 0.0	<u>Total relevant endoscopic findings =</u>86/408 (21.1%)	Normal exam: Appropriate: 31.5% Inappropriate : 45.9%

	<u>appropriate</u> indication: 337 (82.6%) <u>not-appropriate</u>: 61 (15%) <u>uncertain</u>: 10(2.4%)		Uncertain= 2/61 (20.0%) Not appropriate= 1/10 1.6% P=0.755	Not appropriate,=1.6% P=0.005	Appropriate, =24.3% Uncertain,= 20.0% Not appropriate =3.3% P=0.001	Uncertain: 40% p:0.007
Carrion 2010	655 appropriate: 459 (70%) inappropriate: 115(18%) uncertain: 81(12%)	EPAGE II	<u>CRC n=24</u> Appropriate= 21/459 (4.5%) Inappropriate= 1/115(0.9%) uncertain=2/81(2.5%) **Accuracy of appropriate** Sensitivity=21/24 (87.5%) Specificity=193/631 (30.6%) PPV=21/459 (4.6%) NPV=193/196 (98.5%)		<u>Relevant diagnostic findings n=167</u> Appropriate=112/459 (24.4%) Inappropriate=33/115 (28.7%) uncertain=22/81 (27.2%) **Accuracy of appropriate** Sensitivity=112/167 (67 %) Specificity=11/488 (29 %) PPV=112/459 (24.4% %) NPV=141/196 (72%)	Normal exam: 488 Appropriate: 347/459 (76)% Inappropriate: 82/115 (71%) Uncertain: 59/81 (73%)

Quality of evidence

Performance of appropriateness criteria of ASGE guidelines

Cancer detection

Study limitations (risk of bias): no relevant limitation
Inconsistency of results: no (sensitivity ranged between 83% and 100%; specificity ranged between 15% and 30%)
Indirectness of evidence: no
Imprecision: no
Publication bias: no

Overall quality of evidence
The overall quality of evidence was judged as high.

Adenoma detection

Study limitations (risk of bias): no relevant limitation
Inconsistency of results: yes (sensitivity ranged between 62% and 98%; specificity ranged between 16% and 37%)
Indirectness of evidence: no
Imprecision: no
Publication bias: no

Overall quality of evidence
The overall quality of evidence was judged as moderate because of inconsistency

Relevant endoscopic findings detection

Study limitations (risk of bias): no relevant limitation
Inconsistency of results: yes (sensitivity ranged between 70% and 96% specificity ranged between 16% and 40%)
Indirectness of evidence: no
Imprecision: no
Publication bias: no

Overall quality of evidence
The overall quality of evidence was judged as moderate because of inconsistency.

Performance of appropriateness criteria of EPAGE II guidelines

Cancer detection

Study limitations (risk of bias): no relevant limitation
Inconsistency of results: no (sensitivity ranged between 87.5% and 98% specificity ranged between 11.5% and 30%)
Indirectness of evidence: no
Imprecision: yes only two studies with 1623 participants
Publication bias: no

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision

Relevant endoscopic findings detection
Study limitations (risk of bias): no relevant limitation
Inconsistency of results: yes (sensitivity ranged between 67% and 93% specificity ranged between 12.7% and 29%)
Indirectness of evidence: no
Imprecision: yes (only two studies with 1623 participants)
Publication bias: no

Overall quality of evidence
The overall quality of evidence was judged as low because of imprecision and inconsistency

Conclusions

No significant differences in performance between ASGE and EPAGE II appropriateness criteria in detecting cancer or relevant endoscopic findings were found , but conclusion are based on indirect comparison and only from two studies for the EPAGE II guidelines.
(MODERATE QUALITY OF EVIDENCE)

References

Included

1.Hassan, C.; Di Giulio, E.; Marmo, R.; Zullo, A., and Annibale, B. Appropriateness of the indication for colonoscopy: systematic review and meta-analysis. J Gastrointestin Liver Dis. 2011 Sep; 20(3):279-86.

2. Gimeno Garcia A.Z.; Gonzalez Y.; Quintero E.; Nicolas-Perez D.; Adrian Z.; Romero R.; Alarcn Fernandez O.; Hernandez M.; Carrillo M.; Felipe V.; Diaz J.; Ramos L.; Moreno M., and Jimenez-Sosa A. Clinical validation of the European Panel on the Appropriateness of Gastrointestinal Endoscopy (EPAGE) II criteria in an open-access unit: A prospective study. Endoscopy. 2012; 44(1):32-37;

3. Mangualde, J.; Cremers, M. I.; Vieira, A. M.; Freire, R.; Gamito, E.; Lobato, C.; Alves, A. L.; Augusto, F., and Oliveira, A. P. Appropriateness of outpatient gastrointestinal endoscopy in a non-academic hospital. World J Gastrointest Endosc. 2011 Oct 16; 3(10):195-200.

4.Carrion, S.; Marin, I.; Lorenzo-Zuniga, V.; Moreno De Vega, V., and Boix, J. [Appropriateness of colonoscopy indications according to the new EPAGE II criteria]. Gastroenterol Hepatol. 2010 Aug-2010 Sep 30; 33(7):484-9.

Excluded studies

1. Hellara O.; Debbabi A.; Ben Chaabene N.; Ben Mansour W.; Loghmari H.; Melki W.; Bdioui F.; Safer L., and Saffar H. Appropiateness of colonoscopy in the university hospital center of monastir. Interest and applicability of criteria established by the European panel on the appropriateness of gastrointestinal endoscopy. Tunis Med. 2014; 92(2):135-140; ISSN: 0041-4131.

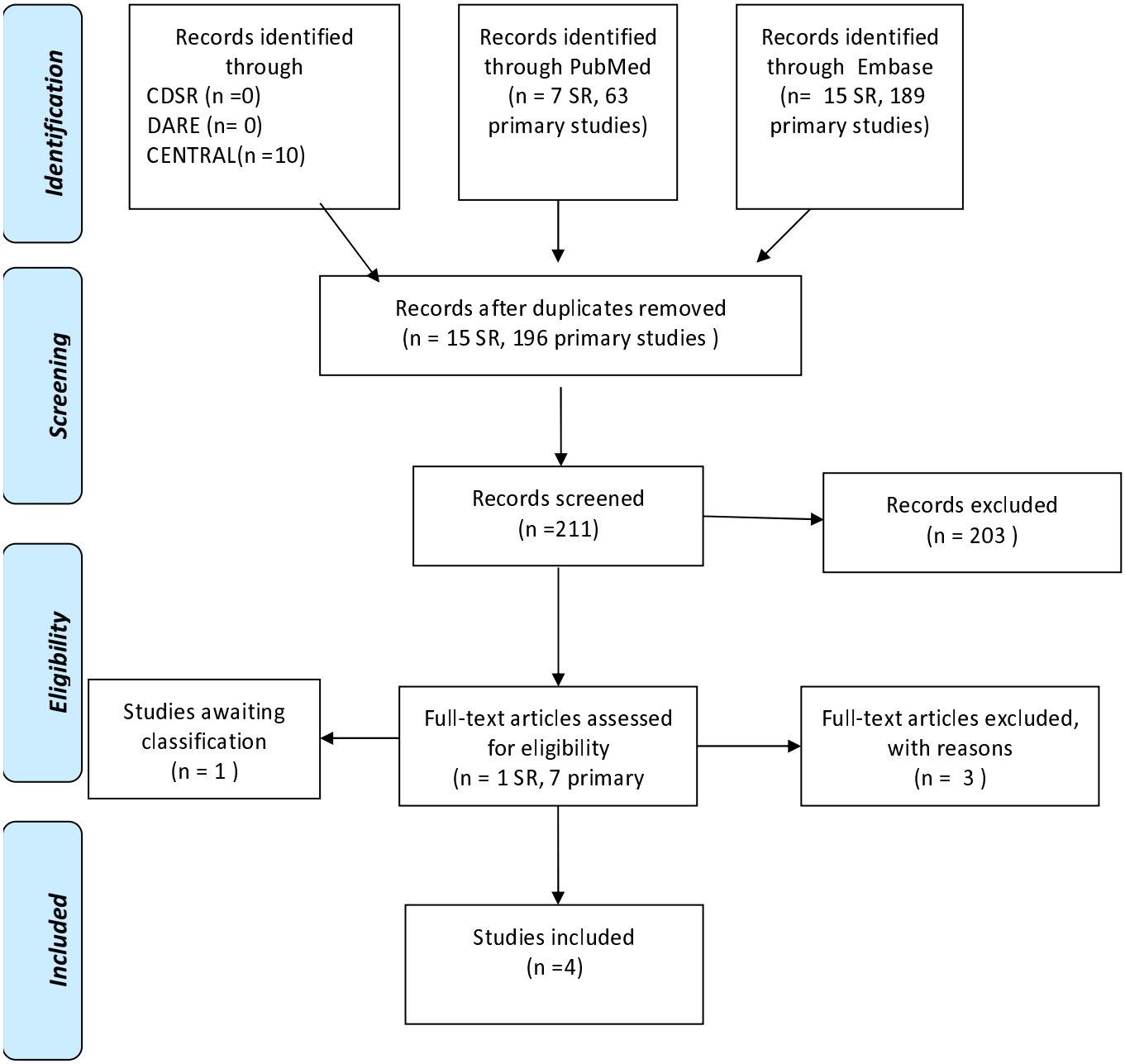
2. Lee W.S.; Zainuddin H.; Boey C.C.M., and Chai P.F. Appropriateness, endoscopic findings and contributive yield of pediatric gastrointestinal endoscopy. World J. Gastroenterol. 2013; 19(47):9077-9083

3. Puente D.; Cantero F.X.; Llagostera M.; Pineiro P.; Nieto R.; Saladich R.; Mascort J.; Marzo M.; Almeda J., and Segarra M. A cross-sectional study of the appropriateness of colonoscopy requests in the Spanish region of Catalonia. BMJ Open. 2012; 2(6):

Awaiting classification

1. Andujar X.; Sainz E.; Gali A.; Loras C.; Aceituno M.; Espinos J.C.; Viver J.M.; Esteve M., and Fernandez-Banares F. Inappropriateness rate for colonoscopy indications in an open access unit: Grado de adecuacion de las indicaciones de la colonoscopia en una unidad de acceso abierto. Gastroenterol. Hepatol. 2015; 38(5):313-319

PRISMA 2009 Flow Diagram



AZIENDA OSPEDALIERO - UNIVERSITARIA
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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

COMPLETENESS (written report +Photo vs written report)

Silvia Minozzi, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

2.1 In patients undergoing screening or diagnostic colonoscopy how do we define complete examination?

P: Patients undergoing screening or diagnostic colonoscopy

I: Photo documented caecal intubation + written report (+ what photographed)

C: Documentation of caecal intubation included only in written report

O: Interval colorectal cancer and/or need for repeat procedure\proximal polyp detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Caecal intubation rate"[Text Word] OR "Cecum"[Mesh] OR "Cecal intubation rate"[Text Word]) **AND** (picture[Title/Abstract] OR pictures[Title/Abstract] OR documentation[Title/Abstract] OR report[Text Word] OR reports[Text Word] OR photo[Text Word] OR photographed[Title/Abstract] OR imaging[Text Word] OR image[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('Cecal intubation rate':ti,ab OR 'Caecal intubation rate':ti,ab) **AND** (picture:ab,ti OR pictures:ab,ti OR documentation:ab,ti OR report:ab,ti OR reports:ab,ti OR photo:ab,ti OR imaging:ab,ti OR image:ab,ti OR photographed:ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Cecum] explode all trees
#5 caecal intubation:ti,ab,kw (Word variations have been searched)
#6 #4 or #5
#7 picture or documentation or report or photo or image:ti,ab,kw (Word variations have been searched)
#8 #7 and #6 and #3 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Caecal intubation rate"[Text Word] OR "Cecum"[Mesh] OR "Cecal intubation rate"[Text Word]) **AND** (picture[Title/Abstract] OR pictures[Title/Abstract] OR documentation[Title/Abstract] OR report[Text Word] OR reports[Text Word] OR photo[Text Word] OR photographed[Title/Abstract] OR imaging[Text Word] OR image[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('Cecal intubation rate':ti,ab OR 'Caecal intubation rate':ti,ab) **AND** (picture:ab,ti OR pictures:ab,ti OR documentation:ab,ti OR report:ab,ti OR reports:ab,ti OR photo:ab,ti OR imaging:ab,ti OR image:ab,ti OR photographed:ab,ti) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

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#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Cecum] explode all trees
#5 caecal intubation:ti,ab,kw (Word variations have been searched)
#6 #4 or #5
#7 picture or documentation or report or photo or image:ti,ab,kw (Word variations have been searched)
#8 #7 and #6 and #3 Publication Year from 2000 to 2015

RESULTS

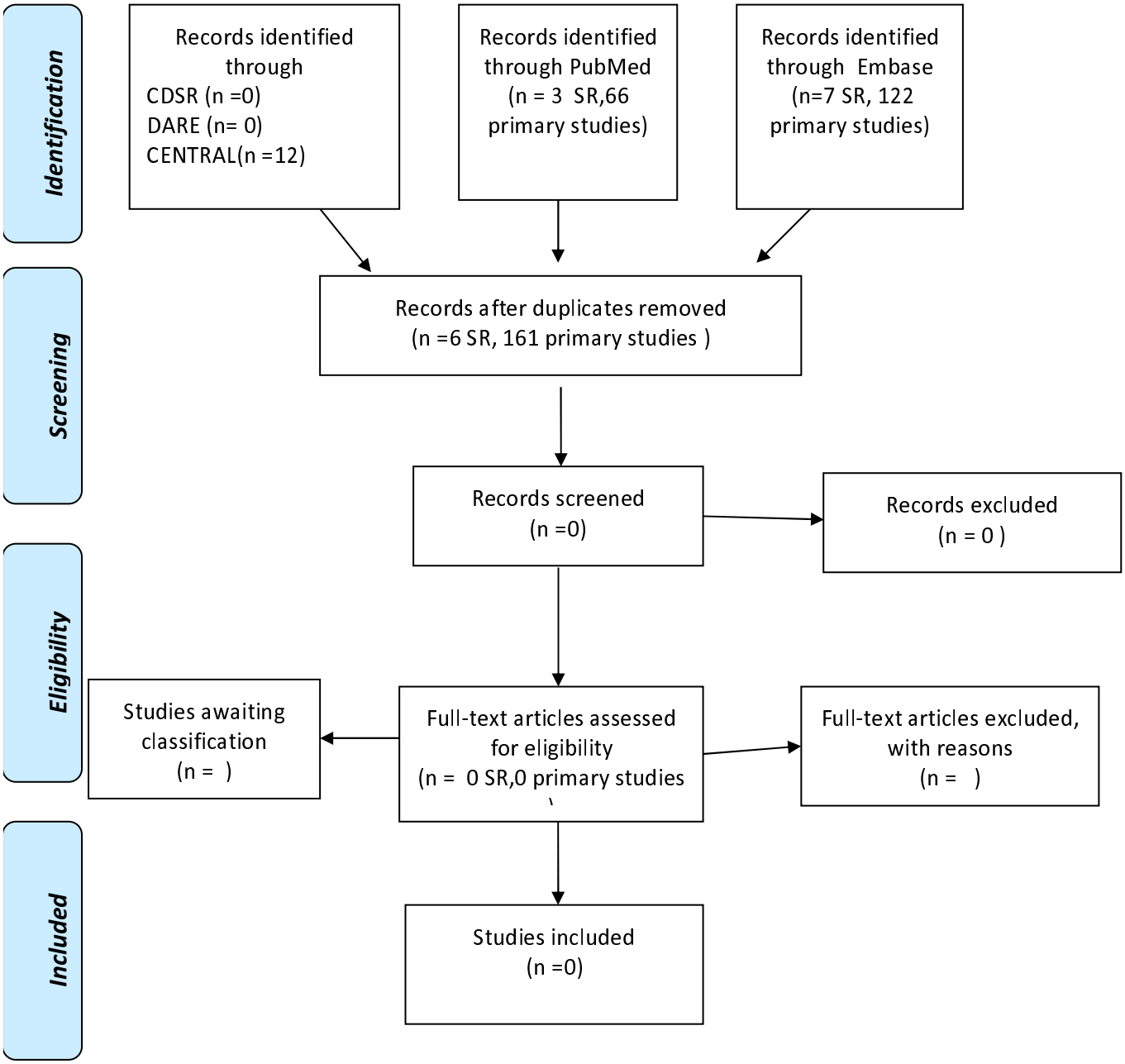
Results of bibliographic search

After removing duplicates, 167 articles (6 reviews and 161 primary studies) were found. No potentially relevant systematic reviews or primary studies addressing the comparison of interest were found (See flow chart).

CONCLUSIONS

No conclusion can be drawn relating the comparison photo documented caecal intubation + written report and documentation of caecal intubation included only in written report, because no evidence was found.

PRISMA 2009 Flow Diagram



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COMPLETENESS (Caecal intubation rate)

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

2.2 In patients undergoing screening or diagnostic colonoscopy how do we define complete examination?

P: Patients undergoing screening or diagnostic colonoscopy

I: Caecal intubation rate adjusted for obstructing tumors and poor bowel prep

C: Caecal intubation not adjusted for obstructing tumors and poor bowel prep

O: Interval colorectal cancer and/or need for repeat procedure

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Cathartics"[Mesh] OR "Administration, Oral"[Mesh] OR (("intestines"[MeSH Terms] OR intestin*[Title/Abstract] OR bowel[Text Word] OR quality [Text Word] OR colon[Title/Abstract]) AND (preparation[Text Word] OR lavage[Text Word] OR Cleansing[Text Word])) OR ("Colorectal Neoplasms"[Mesh] OR ((Colon[Text Word] OR Colorectal[Text Word] OR "Colo-rectal"[Text Word] OR Rect*[Text Word] OR Sigmoid[Text Word] OR Cecum[Text Word] OR Caecal[Text Word] OR Cecal[Text Word]) AND (neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word])) AND (obstruct*[Title/Abstract] OR

occlu*[Title/Abstract]))) **AND** ("Caecal intubation rate"[Text Word] OR "Cecum"[Mesh] OR "Cecal intubation rate"[Text Word] OR "Cecal intubation rate"[Text Word]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscopy:ab,ti) **AND** ('intestine preparation'/exp OR 'laxative'/exp OR 'colon lavage'/exp OR ((intestin*:ti,ab OR bowel:ti,ab OR quality:ti,ab OR colon:ti,ab) AND (preparation:ti,ab OR Cleansing:ti,ab OR lavage:ti,ab)) OR ('colorectal tumor'/exp OR ((Colon:ti,ab OR Colorectal:ti,ab OR 'Colo-rectal':ti,ab OR Rect*:ti,ab OR Sigmoid:ti,ab OR Cec*:ti,ab) AND (neoplasm:ti,ab OR neoplasms:ti,ab OR cancer:ti,ab OR cancers:ti,ab OR tumor:ti,ab OR tumour:ti,ab OR tumors:ti,ab OR tumours:ti,ab OR carcinoma:ti,ab)) AND (obstructing:ti,ab OR obstruct:ti,ab OR obstructed:ti,ab OR occluded:ti,ab OR occlusion:ti,ab))) **AND** ('Cecal intubation rate':ti,ab OR 'Caecal intubation rate':ti,ab) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Cathartics] explode all trees
#5 MeSH descriptor: [Administration, Oral] explode all trees
#6 MeSH descriptor: [Intestines] explode all trees
#7 intestine or bowel or quality or colon:ti,ab,kw (Word variations have been searched)
#8 preparation or cleansing or lavage:ti,ab,kw (Word variations have been searched)
#9 #6 or #7
#10 #9and #9
#11 MeSH descriptor: [Colorectal Neoplasms] explode all trees
#12 (Colon or colorectal) and (neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#13 occlusion or obstruction:ti,ab,kw (Word variations have been searched)
#14 (#11 or #12) and #13
#15 #4 or #5 or #10 or #14
#16 MeSH descriptor: [Cecum] explode all trees
#17 caecal intubation:ti,ab,kw (Word variations have been searched)
#18 #16 or #17
#19 #3and #15 and #18 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Cathartics"[Mesh] OR "Administration, Oral"[Mesh] OR (("intestines"[MeSH Terms] OR intestin*[Title/Abstract] OR bowel[Text Word] OR quality [Text Word] OR colon[Title/Abstract]) AND (preparation[Text Word] OR lavage[Text Word] OR Cleansing[Text Word])) OR ("Colorectal Neoplasms"[Mesh] OR ((Colon[Text Word] OR Colorectal[Text Word] OR "Colo-rectal"[Text Word] OR Rect*[Text

Word] OR Sigmoid[Text Word] OR Cecum[Text Word] OR Caecal[Text Word] OR Cecal[Text Word]) AND (neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word])) AND (obstruct*[Title/Abstract] OR occlu*[Title/Abstract]))) **AND** ("Caecal intubation rate"[Text Word] OR "Cecum"[Mesh] OR "Cecal intubation rate"[Text Word] OR "Cecal intubation rate"[Text Word]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscopy:ab,ti) **AND** ('intestine preparation'/exp OR 'laxative'/exp OR 'colon lavage'/exp OR ((intestin*:ti,ab OR bowel:ti,ab OR quality:ti,ab OR colon:ti,ab) AND (preparation:ti,ab OR Cleansing:ti,ab OR lavage:ti,ab)) OR ('colorectal tumor'/exp OR ((Colon:ti,ab OR Colorectal:ti,ab OR 'Colo-rectal':ti,ab OR Rect*:ti,ab OR Sigmoid:ti,ab OR Cec*:ti,ab) AND (neoplasm:ti,ab OR neoplasms:ti,ab OR cancer:ti,ab OR cancers:ti,ab OR tumor:ti,ab OR tumour:ti,ab OR tumors:ti,ab OR tumours:ti,ab OR carcinoma:ti,ab)) AND (obstructing:ti,ab OR obstruct:ti,ab OR obstructed:ti,ab OR occluded:ti,ab OR occlusion:ti,ab))) **AND** ('Cecal intubation rate':ti,ab OR 'Caecal intubation rate':ti,ab) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

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#8 preparation or cleansing or lavage:ti,ab,kw (Word variations have been searched)
#9 #6 or #7
#10 #9and #9
#11 MeSH descriptor: [Colorectal Neoplasms] explode all trees
#12 (Colon or colorectal) and (neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#13 occlusion or obstruction:ti,ab,kw (Word variations have been searched)
#14 (#11 or #12) and #13
#15 #4 or #5 or #10 or #14
#16 MeSH descriptor: [Cecum] explode all trees
#17 caecal intubation:ti,ab,kw (Word variations have been searched)
#18 #16 or #17
#19 #3and #15 and #18 Publication Year from 2000 to 2015

RESULTS

Results of bibliographic search

After removing duplicates, 202 articles (2 reviews and 200 primary studies) were found. No potentially relevant systematic reviews were found; 6 primary studies were considered potentially relevant and acquired in full text (See flow chart).

Excluded studies

All the primary studies acquired in full text were further excluded. Reason for exclusion were: no outcome of interest reported (Aslinia 2006, Koido 2014); no comparison and no outcome of interest (De Jonge 2012, Park 2013); no comparison of interest (Gavin 2013, Jover 2013).

CONCLUSIONS

No conclusion can be drawn about the best definition of complete colonoscopy examination because no evidence was found.

References

Excluded studies

1. Aslinia F.; Uradomo L.; Steele A.; Greenwald B.D., and Raufman J.-P. Quality assessment of colonoscopic cecal intubation: An analysis of 6 years of continuous practice at a University hospital. Am. J. Gastroenterol. 2006; 101(4):721-731; ISSN: 0002-9270. 1572-0241.
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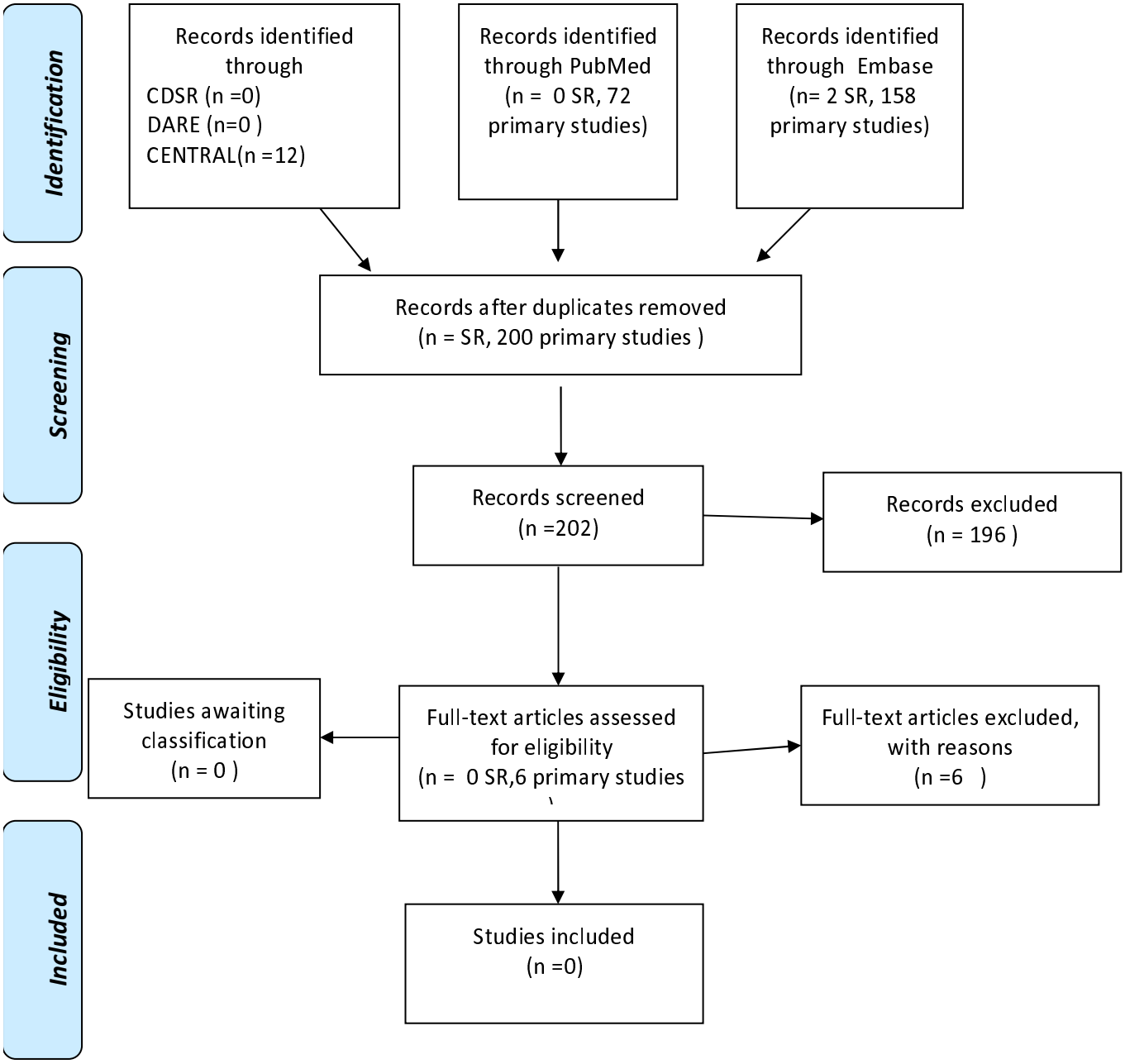
3. Gavin D.R.; Valori R.M.; Anderson J.T.; Donnelly M.T.; Williams J.G., and Swarbrick E.T. The national colonoscopy audit: A nationwide assessment of the quality and safety of colonoscopy in the UK. Gut. 2013; 62(2):242-249; ISSN: 0017-5749. 1468-3288.
4. Koido S.; Ohkusa T.; Nakae K.; Yokoyama T.; Shibuya T.; Sakamoto N.; Uchiyama K.; Arakawa H.; Osada T.; Nagahara A.; Watanabe S., and Tajiri H. Factors associated with incomplete colonoscopy at a Japanese academic hospital. World J. Gastroenterol. 2014; 20(22):6961-6967; ISSN: 2219-2840. 1007-9327.
5. Jover, R.; Zapater, P.; Polania, E.; Bujanda, L.; Lanas, A.; Hermo, J. A.; Cubiella, J.; Ono, A.; Gonzalez-Mendez, Y.; Peris, A.; Pellise, M.; Seoane, A.; Herreros-de-Tejada, A.; Ponce, M.; Marin-Gabriel, J. C.; Chaparro, M.; Cacho, G.; Fernandez-Diez, S.; Arenas, J.; Sopena, F.; de-Castro, L.; Vega-Villaamil, P.; Rodriguez-Soler, M.; Carballo, F.; Salas, D.; Morillas, J. D.; Andreu, M.; Quintero, E., and Castells, A. Modifiable endoscopic factors that influence the adenoma detection rate in colorectal cancer screening colonoscopies. Gastrointest Endosc. 2013 Mar; 77(3):381-389.e1.
6. Park, H. J.; Hong, J. H.; Kim, H. S.; Kim, B. R.; Park, S. Y.; Jo, K. W., and Kim, J. W. Predictive factors affecting cecal intubation failure in colonoscopy trainees. BMC Med Educ. 2013; 13:5.

PRISMA 2009 Flow Diagram



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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

COMPLETENESS (Length of the scope inserted vs reach of the splenic flexure)

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

2.3 **In patients undergoing screening sigmoidoscopy how do we define complete examination?**

P: Patients undergoing screening or diagnostic sigmoidoscopy

I: Length of the scope inserted (60cm?)

C: Estimated reach of the splenic flexure

O: Interval colorectal cancer / polyp detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscope Length"[Text Word] OR (Length[Title/Abstract] AND (scope[Title/Abstract] OR colonoscope[Title/Abstract])) OR "Splenic Flexure" [Text Word] OR "Left Colic Flexure" [Text Word]) **AND** ("Sigmoidoscopy"[Mesh] OR sigmoidoscop*[Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) **AND** ('Splenic Flexure':ab,ti OR 'Left Colic Flexure':ab,ti OR 'Colonoscope Length':ab,ti OR (Length:ab,ti AND (scope:ab,ti OR colonoscope:ab,ti))) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Sigmoidoscopy] explode all trees
#3 #1 or #2
#4 (scope or colonoscope) and lenght:ti,ab,kw (Word variations have been searched)
#5 splenic flexure:ti,ab,kw (Word variations have been searched)
#6 left colic flexure:ti,ab,kw (Word variations have been searched)
#7 #6 or #4 or #5
#8 #3 and #7 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscope Length"[Text Word] OR (Length[Title/Abstract] AND (scope[Title/Abstract] OR colonoscope[Title/Abstract])) OR "Splenic Flexure" [Text Word] OR "Left Colic Flexure" [Text Word]) **AND** ("Sigmoidoscopy"[Mesh] OR sigmoidoscop*[Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) **AND** ('Splenic Flexure':ab,ti OR 'Left Colic Flexure':ab,ti OR 'Colonoscope Length':ab,ti OR (Length:ab,ti AND (scope:ab,ti OR colonoscope:ab,ti))) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Sigmoidoscopy] explode all trees
#3 #1 or #2
#4 (scope or colonoscope) and lenght:ti,ab,kw (Word variations have been searched)
#5 splenic flexure:ti,ab,kw (Word variations have been searched)
#6 left colic flexure:ti,ab,kw (Word variations have been searched)
#7 #6 or #4 or #5
#8 #3 and #7 Publication Year from 2000 to 2015

RESULTS

Results of bibliographic search

After removing duplicates, 114 articles (1 review and 113 primary studies) were found.
No potentially relevant systematic reviews were found; 1 primary study was considered potentially relevant and acquired in full text (See flow chart)

Included studies

One study was included (Adam 2000). The study aimed to compare the endoscopist's assessment of adequacy of the examination with the `real' proportion of left colon seen by the application of a novel electromagnetic imaging (EMI) device that records the three-dimensional position of the scope within a magnetic field pervading the patient's abdomen. 100 patients with rectal bleeding undergoing flexible sigmoidscopy performed by 3 endoscopists were included. Analysis restricted to 94 subjects with adequate examination (either the splenic flexure had been reached or the full 60 cm of the scope had been inserted) according to the according to the endoscopist feeling. Overall, the clinical assessment of the proportion of left colon assessed in this series was correct in only 47 of the 94 examinations (50.0%). Overestimation and underestimation were equally common.

Quality of evidence

Study limitations (risk of bias): yes (no adjustment for confounding factor; no statistical analysis performed)
Inconsistency of results: no
Indirectness of evidence: yes (only adequacy of endoscopist perception of length of colon visualized reported. Interval colon cancer or polyps detection rate not assessed)
Imprecision: yes (only one study with 94 patients)
Publication bias: not assessed

Overall quality of evidence

The overall quality of evidence was judged as very low because of study limitation, imprecision and indirectness.

CONCLUSIONS:

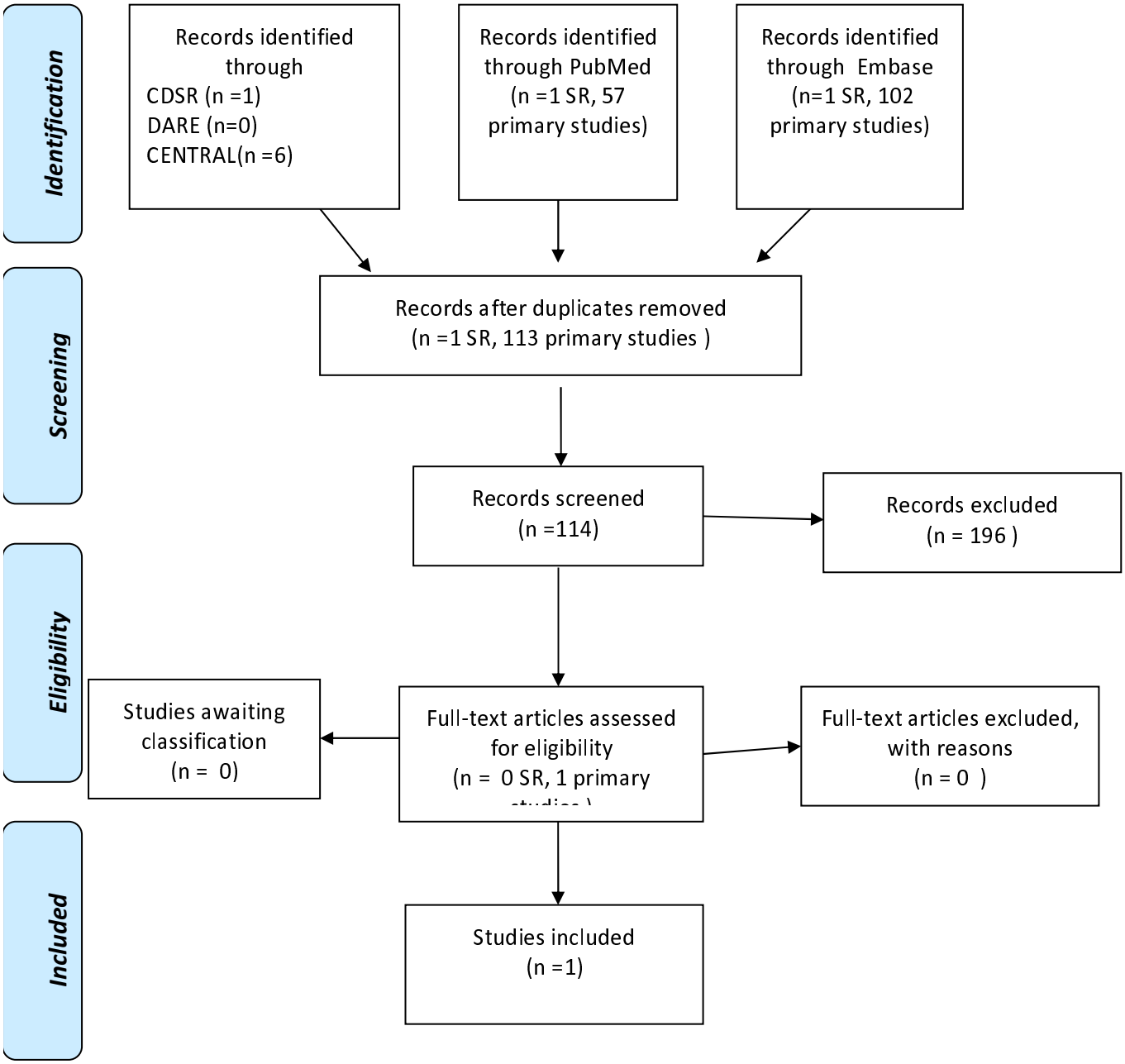
No conclusion can be drawn relating to the best definition of complete examination measured by the rate of interval colon cancer or by the polyp detection rate.
The endoscopist's assessment of the exact position of the end of the scope within the left colon during flexible sigmoidoscopy was unsatisfactory when compared with an electromagnetic imaging (EMI) device
(VERY LOW QUALITY OF EVIDENCE)

References

Included studies

Adam IJ, Ali z, and Shorthouse AJ. How accurate is the endoscopist's assessment of visualization of the left colon seen at flexible sigmoidoscopy? Colorectal Dis. 2000 Jan; 2(1):41-4.

PRISMA 2009 Flow Diagram



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COMPLETE EXAMINATION FOR CHRONIC DIARRHEA PATIENTS

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Clinical question

2.4 In patients with chronic diarrhea undergoing diagnostic colonoscopy how do we define complete examination?

P: Patients with diarrhea undergoing diagnostic colonoscopy

I: Terminal ileum intubation rate

C: Caecal intubation rate

O: Need for repeat procedure (because of lack of biopsies\photo-documentation – second outcome)

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Diarrhea"[Mesh] OR Diarrhea[Title/Abstract] OR diarrhoea[Title/Abstract]) **AND** ("intubation rate"[Text Word] OR intubation[Title/Abstract]) **AND** ("Cecum"[Mesh] OR Caecal[Title/Abstract] OR Cecal[Title/Abstract] OR ileum[Title/Abstract] OR ileal[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ti,ab) **AND** (Diarrhea:ti,ab OR 'diarrhea'/exp OR Diarrhoea:ti,ab) **AND** ('intubation rate':ti,ab OR intubation:ti,ab) **AND** (Cecum:ti,ab OR

Caecal:ti,ab OR Cecal:ti,ab OR ileum:ti,ab OR ileal:ti,ab) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #1 or #2
#4 MeSH descriptor: [Diarrhea] explode all trees
#5 diarrhea:ti,ab,kw (Word variations have been searched)
#6 #4 or #5
#7 intubation rate:ti,ab,kw (Word variations have been searched)
#8 MeSH descriptor: [Cecum] explode all trees
#9 cecum or Caecal or ileum:ti,ab,kw (Word variations have been searched)
#10 #8 or #9
#11 #3 and #6 and #7 and #10

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Diarrhea"[Mesh] OR Diarrhea[Title/Abstract] OR diarrhoea[Title/Abstract]) **AND** ("intubation rate"[Text Word] OR intubation[Title/Abstract]) **AND** ("Cecum"[Mesh] OR Caecal[Title/Abstract] OR Cecal[Title/Abstract] OR ileum[Title/Abstract] OR ileal[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ti,ab) **AND** (Diarrhea:ti,ab OR 'diarrhea'/exp OR Diarrhoea:ti,ab) **AND** ('intubation rate':ti,ab OR intubation:ti,ab) **AND** (Cecum:ti,ab OR Caecal:ti,ab OR Cecal:ti,ab OR ileum:ti,ab OR ileal:ti,ab) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #1 or #2
#4 MeSH descriptor: [Diarrhea] explode all trees
#5 diarrhea:ti,ab,kw (Word variations have been searched)
#6 #4 or #5
#7 intubation rate:ti,ab,kw (Word variations have been searched)
#8 MeSH descriptor: [Cecum] explode all trees
#9 cecum or Caecal or ileum:ti,ab,kw (Word variations have been searched)

#10 #8 or #9
#11 #3 and #6 and #7 and #10

RESULTS

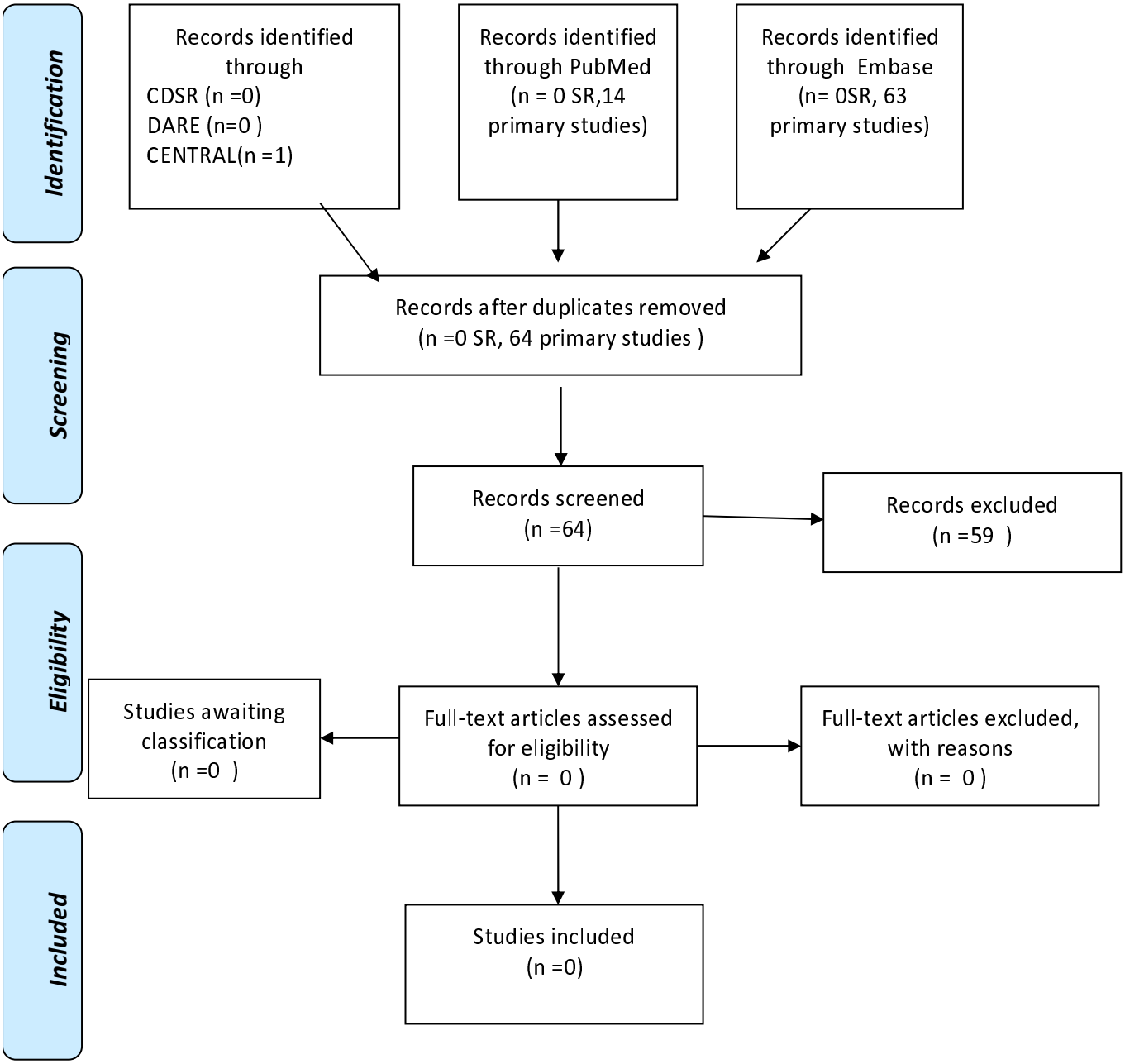
Results of bibliographic search

After removing duplicates, 64 articles (0 reviews and 64 primary studies) were found. No relevant studies were found addressing this question.

CONCLUSIONS

No conclusion can be drawn about the best definition of complete colonoscopy examination for patients with chronic diarrhea because no evidence was found.

PRISMA 2009 Flow Diagram



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CPO
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MEASURE OF ACCURATE IDENTIFICATION OF PATHOLOGY

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical questions

3.1 In patients undergoing screening or diagnostic colonoscopy or screening sigmoidoscopy what is the measure of accurate identification of pathology?

P: Patients undergoing screening or diagnostic LGI endoscopy

I: Polyp detection rate (overall or only for >=5mm polyps)

C: Adenoma detection rate

O: Interval colorectal cancer/ CRC death

3.2 In patients undergoing screening or diagnostic colonoscopy what is the measure of accurate identification of pathology?

P: Patients undergoing screening or diagnostic LGI endoscopy

I: Proximal adenoma detection rate

C: Adenoma detection rate

O: Interval colorectal cancer/ CRC death

3.3 In patients undergoing screening or diagnostic colonoscopy or sigmoidoscopy what is the measure of accurate identification of pathology?

P: Patients undergoing screening or diagnostic LGI endoscopy

I: Advanced adenoma detection rate (>=10mm, or HGD, or villous component)

C: Adenoma detection rate

O: Interval colorectal cancer/ CRC death

3.4 In patients undergoing screening or diagnostic colonoscopy or sigmoidoscopy what is the measure of accurate identification of pathology?

P: Patients undergoing screening or diagnostic LGI endoscopy

I: Serrated polyp detection rate

C: Adenoma detection rate

O: Interval colorectal cancer/ CRC death

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Title/Abstract] OR "Sigmoidoscopy"[Mesh] OR sigmoidoscop*[Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) **AND** ("interval cancer"[Text Word] OR "interval CRC"[Text Word] OR "interval colorectal"[Text Word] OR "mortality"[Subheading] OR "mortality"[Text Word]) **AND** ("Colonic Polyps"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ADR[Title/Abstract] OR PDR[Title/Abstract] OR ((Adenoma[Text Word] OR proximal[Title/Abstract] OR polyp[Text Word] OR polyps[Text Word]) AND (detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word]))) **AND** ("Colorectal Neoplasms"[Mesh] OR ((colorectal[Title/Abstract] OR CRC [Title/Abstract] OR colon [Title/Abstract] OR "colo-rectal" [Title/Abstract] OR rectal Title/Abstract] OR rectum [Title/Abstract] OR sigmoid [Title/Abstract] OR anal[Title/Abstract] OR anus[Title/Abstract]) AND (cancer[Title/Abstract] OR cancers[Title/Abstract] OR neoplasm[Title/Abstract] OR malign*[Title/Abstract] OR tumor[Title/Abstract] OR tumour [Title/Abstract] OR tumors [Title/Abstract] OR tumours [Title/Abstract] OR carcinoma [Title/Abstract]))) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) **AND** ("interval cancer":ab,ti OR "interval CRC":ab,ti OR "interval colorectal":ab,ti OR 'cancer mortality'/exp) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR ADR:ab,ti OR PDR:ab,ti OR ((detection:ab,ti OR detected:ab,ti OR prevalence:ab,ti OR presence:ab,ti OR rate:ab,ti OR rates:ab,ti OR diagnos*:ab,ti OR predict*:ab,ti) AND (Adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR neoplasm:ab,ti OR neoplasms:ab,ti OR cancer:ab,ti OR cancers:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti))) **AND** (((colorectal:ab,ti OR CRC:ab,ti OR colon:ab,ti OR 'colo-rectal':ab,ti OR rectal:ab,ti OR rectum:ab,ti OR sigmoid:ab,ti OR anal:ab,ti OR anus:ab,ti) AND (cancer:ab,ti OR neoplasm:ab,ti OR malign*:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti)) OR 'colon cancer'/exp) **AND** (cochrane OR

'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 MeSH descriptor: [Sigmoidoscopy] explode all trees
#3 colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#4 #1 or #2 or #3
#5 Any MeSH descriptor with qualifier(s): [Mortality - MO]
#6 interval cancer or interval CRC or interval colorectal cancer or colorectal mortality:ti,ab,kw (Word variations have been searched)
#7 #5 or #6
#8 MeSH descriptor: [Colonic Polyps] explode all trees
#9 MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
#10 (Adenoma or proximal or polyp) and (detection or rate or diagnosis):ti,ab,kw (Word variations have been searched)
#11 ADR or PDR:ti,ab,kw (Word variations have been searched)
#12 #8 or #9or #10 or #11
#13 (Colon or colorectal or rectal) and (neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#14 MeSH descriptor: [Colorectal Neoplasms] explode all trees
#15 #13 or #14
#16 #4 and #7 and #12 and #15 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Title/Abstract] OR "Sigmoidoscopy"[Mesh] OR sigmoidoscop*[Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) **AND** ("interval cancer"[Text Word] OR "interval CRC"[Text Word] OR "interval colorectal"[Text Word] OR "mortality"[Subheading] OR "mortality"[Text Word]) **AND** ("Colonic Polyps"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ADR[Title/Abstract] OR PDR[Title/Abstract] OR ((Adenoma[Text Word] OR proximal[Title/Abstract] OR polyp[Text Word] OR polyps[Text Word]) AND (detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word]))) **AND** ("Colorectal Neoplasms"[Mesh] OR ((colorectal[Title/Abstract] OR CRC [Title/Abstract] OR colon [Title/Abstract] OR "colo-rectal" [Title/Abstract] OR rectal Title/Abstract] OR rectum [Title/Abstract] OR sigmoid [Title/Abstract] OR anal[Title/Abstract] OR anus[Title/Abstract]) AND (cancer[Title/Abstract] OR cancers[Title/Abstract] OR neoplasm[Title/Abstract] OR malign*[Title/Abstract] OR tumor[Title/Abstract] OR tumour [Title/Abstract] OR tumors [Title/Abstract] OR tumours [Title/Abstract] OR carcinoma [Title/Abstract]))) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) **AND** ("interval cancer":ab,ti OR "interval CRC":ab,ti OR "interval colorectal":ab,ti OR 'cancer mortality'/exp) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR ADR:ab,ti OR PDR:ab,ti OR ((detection:ab,ti OR detected:ab,ti OR prevalence:ab,ti OR presence:ab,ti OR rate:ab,ti OR rates:ab,ti OR diagnos*:ab,ti OR predict*:ab,ti) AND (Adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR neoplasm:ab,ti OR neoplasms:ab,ti OR cancer:ab,ti OR cancers:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti))) **AND** (((colorectal:ab,ti OR CRC:ab,ti OR colon:ab,ti OR 'colo-rectal':ab,ti OR rectal:ab,ti OR rectum:ab,ti OR sigmoid:ab,ti OR anal:ab,ti OR anus:ab,ti) AND (cancer:ab,ti OR neoplasm:ab,ti OR malign*:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti)) OR 'colon cancer'/exp) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1	MeSH descriptor: [Colonoscopy] explode all trees
#2	MeSH descriptor: [Sigmoidoscopy] explode all trees
#3	colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#4	#1 or #2 or #3
#5	Any MeSH descriptor with qualifier(s): [Mortality - MO]
#6	interval cancer or interval CRC or interval colorectal cancer or colorectal mortality:ti,ab,kw (Word variations have been searched)
#7	#5 or #6
#8	MeSH descriptor: [Colonic Polyps] explode all trees
#9	MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
#10	(Adenoma or proximal or polyp) and (detection or rate or diagnosis):ti,ab,kw (Word variations have been searched)
#11	ADR or PDR:ti,ab,kw (Word variations have been searched)
#12	#8 or #9or #10 or #11
#13	(Colon or colorectal or rectal) and (neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#14	MeSH descriptor: [Colorectal Neoplasms] explode all trees
#15	#13 or #14
#16	#4 and #7 and #12 and #15 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 1849 articles (114 SR and 1735 primary studies) were found. No potentially relevant systematic reviews were found; 12 primary studies were considered potentially relevant and acquired in full text. Three further studies were found inspecting references of retrieved studies (See flow chart).

Excluded studies

Twelve studies were excluded: six because the association between adenoma or polyp detection rate and interval colon cancer not assessed (Atkin 2010, Leclercq 2014, Leung 2012 Pox 2012, Robertson 2014, Samadder 2014); six because they were letter or commentary without useful data (Barret 2014, Chen 2010, Koretz 2012, Lanspa 2010, Rustagi 2010, Singh 2010).

Included studies

Three studies were finally included (Corley 2014, Kaminski 2010, Rogal 2013).

Clinical question 3.2

Two studies evaluated the relationship between the adenoma detection rates during screening colonoscopies performed by a large number of endoscopists and their patients' risks of interval colorectal cancer (Corley 2014, Kaminski 2010). The overall number of included patients was 268868.

To be included in the study, the endoscopists should have performed at least 75 colonoscopies during the study period in Corley 2014 and at least 30 in Kaminski 2010.

The third study (Rogal 2013) evaluated the relationship between polyps detection rate, overall adenoma detection rate, proximal and distal adenoma detection rate and interval colon cancer in 46835 patients undergoing screening flexible sigmoidoscopy.

The association between proximal adenoma detection rate was assessed only in Rogal 2013 where proximal adenomas were defined as those proximal to the splenic flexure.

Author, year	**N patients**	**Interval cancer**	**HR/ OR**
Corley 2014	264,972 colonoscopies among 223,842 patients	**ADR** Quintile 1: 7.35–19.05% 186 (9.8/10,000p/yr)	**HR** 1 (ref)
		Quintile 2: 19.06–23.85% 144 (8.6 /10,000 p/yr)	0.93 (0.70–1.23)
		Quintile 3: 23.86–28.40% 139 (8/10,000 p/yr)	0.85 (0.68–1.06)
		Quintile 4: 28.41–33.50% 167 (7/10,000 p/yr)	0.70 (0.54–0.91)
		Quintile 5: 33.51–52.51% 76 (0.52 (0.39–0.69)	0.52 (0.39–0.69)

Kaminski 2010	45.026 Patients undergoing a colonoscopy	**ADR** <11.0%: 22/15883 (0.14%)	**HR** 12.50 (1.51–103.43)
		11.0–14.9%: 12/13281 (0.09%)	10.75 (1.36–85.06)
		15.0–19.9%: 7/6607(0.10%)	10.94 (1.37–87.01)
		≥20.0%: 1/9255 (0.10%)	1 (ref)
Rogal 2013	46,835 Patients undergoing a flexible sigmoidoscopy	**ADR** 1st quartile (3.6–9.3%) 13/17361 (ICR/10,000 ex 7.5) 2nd quartile (9.4–12.1%): 8/23957 (ICR/10,000 ex: 3.3) 3rd quartile (12.2–14.3%): 8/13947 (ICR/10,000 ex: 5.7) 4th quartile (14.4–24.5%): 3/11446 (ICR/10,000 ex: 2.6)	**OR** 1st quartile vs 2nd through 4th quartiles: 2.0 (0.98–4.0) 1st vs 4th quartile: 3.3 (0.8–12.9)
		Proximal ADR (proximal to splenic flexure) 1st quartile (1.0–3.1 %): 14/20436 (ICR/10,000 ex: 6.9) 2nd quartile (3.2–4.2 %): 8/21241(ICR/10,000 ex: 3.8) 3rd quartile (4.3–5.8 %): 7/16267 (ICR/10,000 ex: 4.3) 4th quartile (5.9–11.7 %) : 3/8767 (ICR/10,000 ex: 3.4)	**OR** 1st quartile vs 2nd through 4th quartiles 1.8 (0.9–3.8) 1st vs 4th quartile 2.7 (0.7–10.0)
		PDR 1st quartile (6.1–17.9%) : 15/24922 (ICR/10,000 ex: 6.0) 2nd quartile (18.0–24.3%) : 11/21591 (ICR/10,000 ex: 5.1) 3rd quartile (24.4–31.4%) : 2/8085 (ICR/10,000 ex: 2.5) 4th quartile (31.5–62.6%) : 4/12113 (ICR/10,000 ex: 3.3)	**OR** 1st quartile vs 2nd through 4th quartiles: 1.6 (0.8–3.2) 1st vs 4th quartile 2.1 (0.5–5.8)

Quality of evidence

Adenoma detection rate

Study limitations (risk of bias): no relevant limitation; observational studies
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed
Large magnitude of effect: yes
Dose-response gradient: yes

Overall quality of evidence
The overall quality of evidence was judged as moderate

Proximal adenoma detection rate
Study limitations (risk of bias): no relevant limitation; observational studies
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: yes (only one study)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of study design and imprecision

Polyps detection rate
Study limitations (risk of bias): no relevant limitation; observational studies
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: yes (only one study)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of study design and imprecision

CONCLUSIONS

Adenoma detection rate was inversely related to the risk of interval colorectal cancer (**MODERATE QUALITY OF EVIDENCE**).

Proximal Adenoma detection rate defined as adenoma proximal to the splenic flexure detected at sigmoidoscopy is not associated with the risk of interval colon cancer
(**VERY LOW QUALITY OF EVIDENCE**).

Polyps detection rate during sigmoidoscopy is not associated with the risk of interval colon cancer (**VERY LOW QUALITY OF EVIDENCE**).

Clinical question 3.1

No studies were found assessing this clinical question.

CONCLUSIONS
No conclusion can be drawn about the association between ≥5mm polyps detection rate and interval colon cancer risk or death because no evidence was found.

Clinical question 3.3

No studies were found assessing this clinical question.

CONCLUSIONS
No conclusion can be drawn about the association between advanced adenoma(>=10mm, or HGD, or villous component) detection rate and interval colon cancer risk or death because no evidence was found.

Clinical question 3.4

No studies were found assessing this clinical question.

CONCLUSIONS
No conclusion can be drawn about the association between serrated polyps detection rate and interval colon cancer risk or death because no evidence was found.

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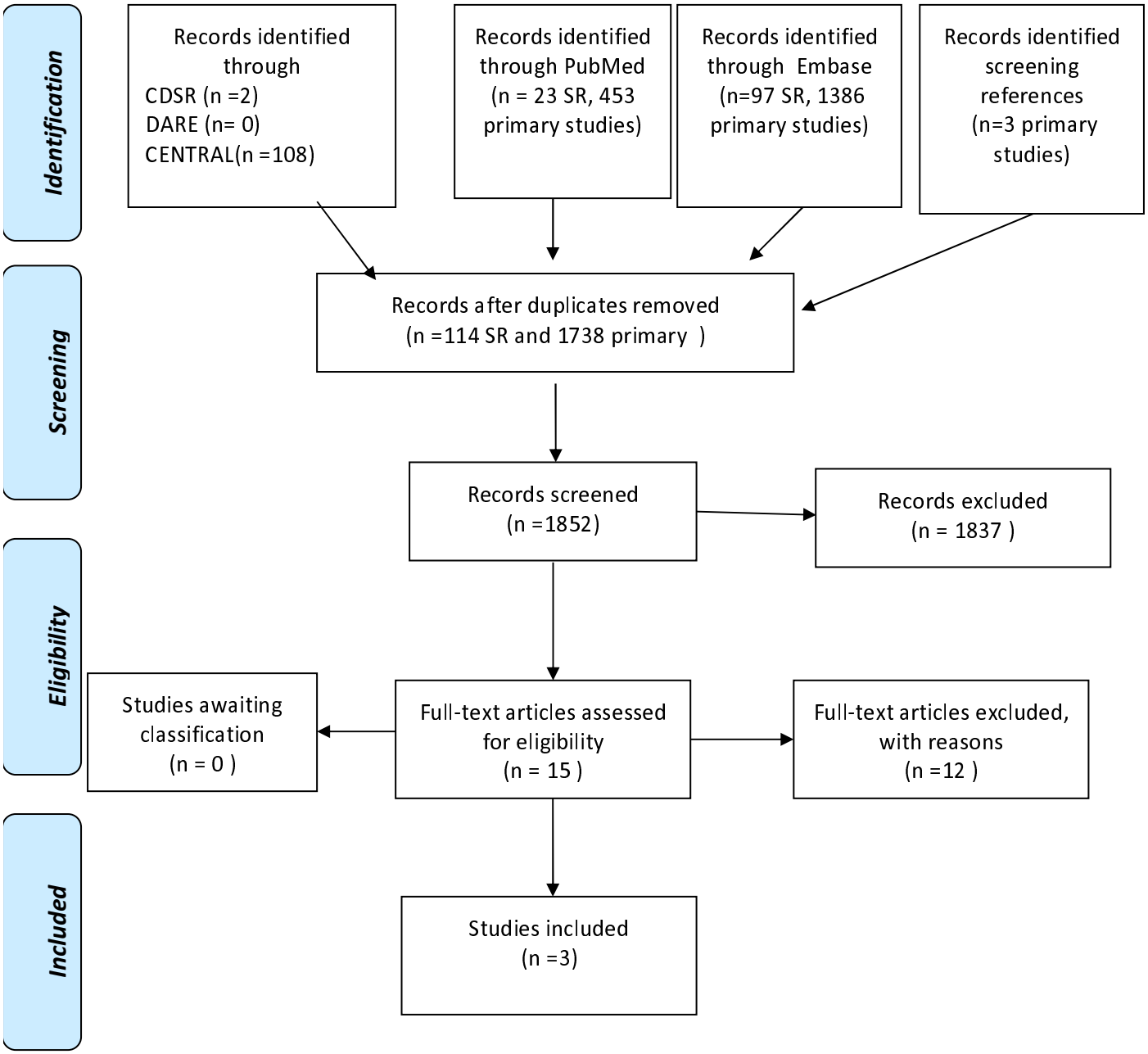
PRISMA 2009 Flow Diagram



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MINIMUM MEAN WITHDRAWAL TIME

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Clinical question

3.6 In patients undergoing screening or diagnostic colonoscopy without polypectomy what is the minimum mean withdrawal time?

P: Patients undergoing screening or diagnostic colonoscopy

I: Minimum mean withdrawal time

C: Less than "I"

O: Adenoma detection rate/Polyp detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** "withdrawal time" [Text Word] **NOT** (Polypectomy[Text Word] OR polypectomies[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('withdrawal time':ab,ti) NOT ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 withdrawal time:ti,ab,kw (Word variations have been searched)
#4 polypectomy:ti,ab,kw (Word variations have been searched)
#5 #1 or #2
#6 #5 not #4
#7 #6 and #3 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** "withdrawal time" [Text Word] **NOT** (Polypectomy[Text Word] OR polypectomies[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('withdrawal time':ab,ti) NOT ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 withdrawal time:ti,ab,kw (Word variations have been searched)
#4 polypectomy:ti,ab,kw (Word variations have been searched)
#5 #1 or #2
#6 #5 not #4
#7 #6 and #3 Publication Year from 2000 to 2015

RESULTS

Results of bibliographic search

After removing duplicates, 491 articles (13 reviews and 478 primary studies) were found. No systematic reviews were found; 21 primary studies were considered potentially relevant and acquired in full text (See flow chart)

Excluded studies

Three study were excluded: one (Floer 2014) did not report on outcome of interest, one did not report withdrawal time (Ricci 2013), one (Sawhney 2008) did not report a direct measure of association between withdrawal time and polyp, or adenoma, detection rate, but an indirect measure, i.e. the effect on polyp detection rate of the percentage increase in compliance with the

recommendation of 7 minute withdrawal time by endoscopists, expressed in terms of slope increase in polyp detection ratio for every 1% increase in compliance with 7-minute colonoscopy withdrawal time recommendation.

Awaiting assessment

Five studies were awaiting classification, four (Kajiwara 2012, Lee 2013, Moritz 2012, Velasquez 2009) because we were unable to retrieve the full text e one because it was written in Korean (Park 2014).

Included studies

Thirteen studies (Adler 2013, Barclay 2008, Benson 2010, Butterly 2014, De Wijkerslooth 2013, Gromski 2012, Hsieh 2009, Jover 2013, Kang 2014, Lee 2014, Simmons 2006, Widjaja 2014, Xiang 2014) were finally included enrolling a total of 83775 patients undergoing colonoscopy.

Eight studies included only patients receiving screening colonoscopy (Adler 2013, Barclay 2008, Benson 2010, De Wijkerslooth 2013, Jover 2013, Kang 2014, Lee 2014, Widjaja 2014). One study included patients receiving diagnostic colonoscopy, followed within 3 months by a second therapeutic colonoscopy, and it assessed the miss rate of flat adenomas (Xiang 2014). In one study (Gromski 2012) more than half of the colonoscopies were performed for screening purposes (53.6%) while the remaining were performed for a specific indication, such as abdominal pain or change in bowel habit (15% and 10.1%, respectively). Two studies (Simmons 2006, Butterly 2014) reported that patients included received “routine” colonoscopy without further specification. One study reported that all patients included were asymptomatic (Hsieh 2009)

In all but one study (Hsieh 2009) high risk patients (personal or family history of CRC, familial polyposis , prior colonic resection) were excluded.

All were prospective or retrospective cohort studies assessing the association between adenoma or polyps detection rate and withdrawal time.

The number of patients involved ranged from 532 to 31088 with a median number of 4378 patients.

Three studies did not report the number of endoscopists who performed the procedure (Butterfly 2014, Lee 2014, Widjaja 2014). In the other studies the number of endoscopists ranged from one (Hsieh 2009) to sixty (Jover 2013) with a median of 11.

Al but three studies (Benson 2010, Gromski 2012, Hsieh 2009) adjusted for confounding or covariates in assessing the association between withdrawal time and adenoma or polyp detection rate.

	N of colonoscopies	Withdrawal time	Adenoma detection rate	Polyps detection rate	Association between withdrawal time and ADR /PDR
Adler 2013	11 166	Mean 8.7 minutes (range 6 to 11)	ADR: mean 21.7% (range: 7.5% to 33.3%)		ADR Multivariate analysis: OR= 1.01 (95%CI 1.00-1.03)
Barclay 2008	2053 without a specified withdrawal protocol (pre int) 2325 with a minimum 8-minute withdrawal time (post int)	pre intervention: mean 6.3 ± 3.9 post intervention: mean 9.8 ± 5.6 minutes	<u>% of subjects with 1 or more neoplastic lesions</u>: Pre intervention:24.2% Post intervention: 35.4% p< 0.0001 <u>Overall number of lesions per subject</u>: Pre intervention:0.47 ± 1.08 Post intervention: 0.64 ± 1.2 p <0.0001		ADR P < 0.0001
Benson 2010	550	Mean: 7.0 min (range 3.4 to 9.6)	n. of adenomas detected /n of patients screened: Mean 0.46		ADR Regression analysis: P = 0.006
Butterfly 2014	7996	Most common median: 8 minutes (29%), but almost ¼ of endoscopists (24%) had median WT of 6 min or less	% of colonoscopies in which at least one adenoma was found and 95%CI) 3–5 min 20.1% (17.5 –22.8) 6 min 23.8% (21.3 – 26.6) 7 min 30.2 %(27.8 – 32.7) 8 min 30.4% (28.1 – 32.8) 9 min 33.6 %(30.9 – 36.4) 10 min 24.5% (22.1 – 27.0) >10 min 20.8% (18.0 – 23.8)	% of colonoscopies in which at least one polyp was found (95%CI) 3–5 min 38.7 (35.6– 42.0) 6 min 42.6 (39.5 – 45.7) 7 min 50.8 (48.2 – 53.5) 8 min 52.0 (49.5 – 54.6) 9 min 53.1 (50.2 – 56.1) 10 min 43.1 (40.3 – 45.9) >10 min 47.8 44.2 – 51.4)	IRR (95%CI) of ADR 3–5 min 1.16 (0.87, 1.56) 6 min 1.00 7 min 1.23 (1.01, 1.50) 8 min 1.32 (1.06, 1.64) 9 min 1.50 1.21, 1.85) 10 min 1.41 (1.03, 1.94) >10 min 1.23 (0.95, 1.59)

					IRR (95%CI) of PDR 3–5 min 1.21 (0.95, 1.54) 6 min 1.00 7 min 1.21 (1.06, 1.38) 8 min 1.29 (1.06, 1.55) 9 min 1.46 (1.22, 1.75) 10 min 1.39 (1.03, 1.87) >10 min 1.23 (0.99, 1.54)
de Wijkerslooth 2013	1354	median 10 minutes (IQR 8-15 minutes)	mean number of adenomas per patient : 0.52 (SD 1.08).	mean number of serrated polyps per patient: 0.51 (SD 1.16).	Proximal serrated polyps detection rate OR: 1.12 (95%CI 1.10-1.16) Adenoma detection rate OR: 1.12 (95%CI 1.09-1.15)
Gromski 2012	1210 (53.6% screening)	Mean : 10.2 ± 3.4 min	<8 min:7.5% 8–10 min:12.9% 10–12 min:29.9% >12 min:35.8%	<8 min: 14% 8–10 min:25.2% 10–12 min:44.3% >12 min: 45.9%	ADR <8 min vs. 8-10: p = 0.04, <8 vs 10-12: P<0.001, <8 vs >12: p<0.001, 8–10 min 10-12: p<0.001 8-10 vs >12: p<0.001, 10–12-min vs >12-min group p =0.1
Hsieh 2009	532 routine colonoscopies	Group 1: 4.2 ± 1.1 minutes Group 2: 5.7 ± 1.6 minutes	patients with at least one adenoma detected Group 1: 23.7% Group 2: 33.9% (p<0.01) Numbers of detected adenoma Group 1:85 Group 2:126 p = 0.038		ADR patients with at least one adenoma detected: p<0.01 Numbers of detected adenoma: p=0.038

Jover 2013	4539	Mean: 8.6 minutes (range 4.25-18.95)			ADR: Withdrawal time >6 min OR: 1.26 (95%CI 0.93-1.70) withdrawal time > 8 min: OR: 1.51 (95% CI1.17-1.96)
Kang 2014	1908	Mean:8.3±3.7 min	patients with at least one adenoma detected: 37.3%	patients with at least one polyps detected:56.5%	ADR: Withdrawal time >6 min OR: 1.59 (95%CI 1.25-2.03)
Lee 2014	31088		Withdrawal time < 10min: 45.5% ≥10 min: 4.9 p<0.001		ADR: Withdrawal time ≥10 min vs < 10 min OR: 1.10 (95%CI 1.05-1.16)
Simmons 2006	10955	Median: 6.3 min (range: 4.2–11.9		44% median polyp detection rate corresponded to a withdrawal time of 6.7 min.	PDR Withdrawal time >6.3 min OR : 11.8, (95% CI: 2.3–78.4)
Widjaja 2014	8331	Colon preparation: excellent: 10 ± 5.5 min Good: 12 ± 5.3 min fair: 13 ± 5.9 min poor: 12 ± 5.2 min unsatisfactory 11 ± 9.4 min		44%	PDR Longer duration of colonoscope withdrawal OR: 1.14 (95%CI 1.12-1.16)
Xiang 2014	2093	< 6 min: n not reported ≥ 6 min: n. not reported	"per-adenoma" miss rate: < 6 min: 310/662 (46.8%) ≥6 min: 96/254 (37.8%)		Adenoma miss rate OR: 1.958 (95%CI 1.276-3.006)

Quality of evidence
Study limitations (risk of bias): no major limitation.
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed
Large magnitude of effect: yes
Plausible confounding, which would reduce a demonstrated effect: no
Dose-response gradient: yes

Overall quality of evidence
The overall quality of evidence was judged as moderate because it comes from observational prospective or retrospective cohort studies without serious limitation but it is based on a large number of subjects, results are consistent across many studies conducted in different settings, a dose response gradient is present.

CONCLUSIONS

Adenoma detection rate: four studies found that more adenomas are detected the longer the colonoscopic withdrawal time
(MODERATE QUALITY OF EVIDENCE).

Four studies found that a withdrawal time longer than 6 minutes in associated with greater detection rate
(MODERATE QUALITY OF EVIDENCE).

Two studies found that a withdrawal time longer than 8 minutes in associated with greater detection rate
(**MODERATE QUALITY OF EVIDENCE**).

One study found that a withdrawal time longer than 10 minutes in associated with greater detection rate
(LOW QUALITY OF EVIDENCE).

One study demonstrated a steady increase in withdrawal, for each additional minute compared to 6 minutes, leveling off but showing trends of remaining elevated at 10 minutes
(MODERATE QUALITY OF EVIDENCE).

Polyps detection rate: two studies found that more polyps are detected the longer the colonoscopic withdrawal time is
(MODERATE QUALITY OF EVIDENCE)

Two studies found that a withdrawal time longer than 6 minutes in associated with greater detection rate
(MODERATE QUALITY OF EVIDENCE).

One study demonstrated a steady increase in withdrawal, for each additional minute compared to 6 minutes, leveling off but showing trends of remaining elevated at 10 minutes
(MODERATE QUALITY OF EVIDENCE)

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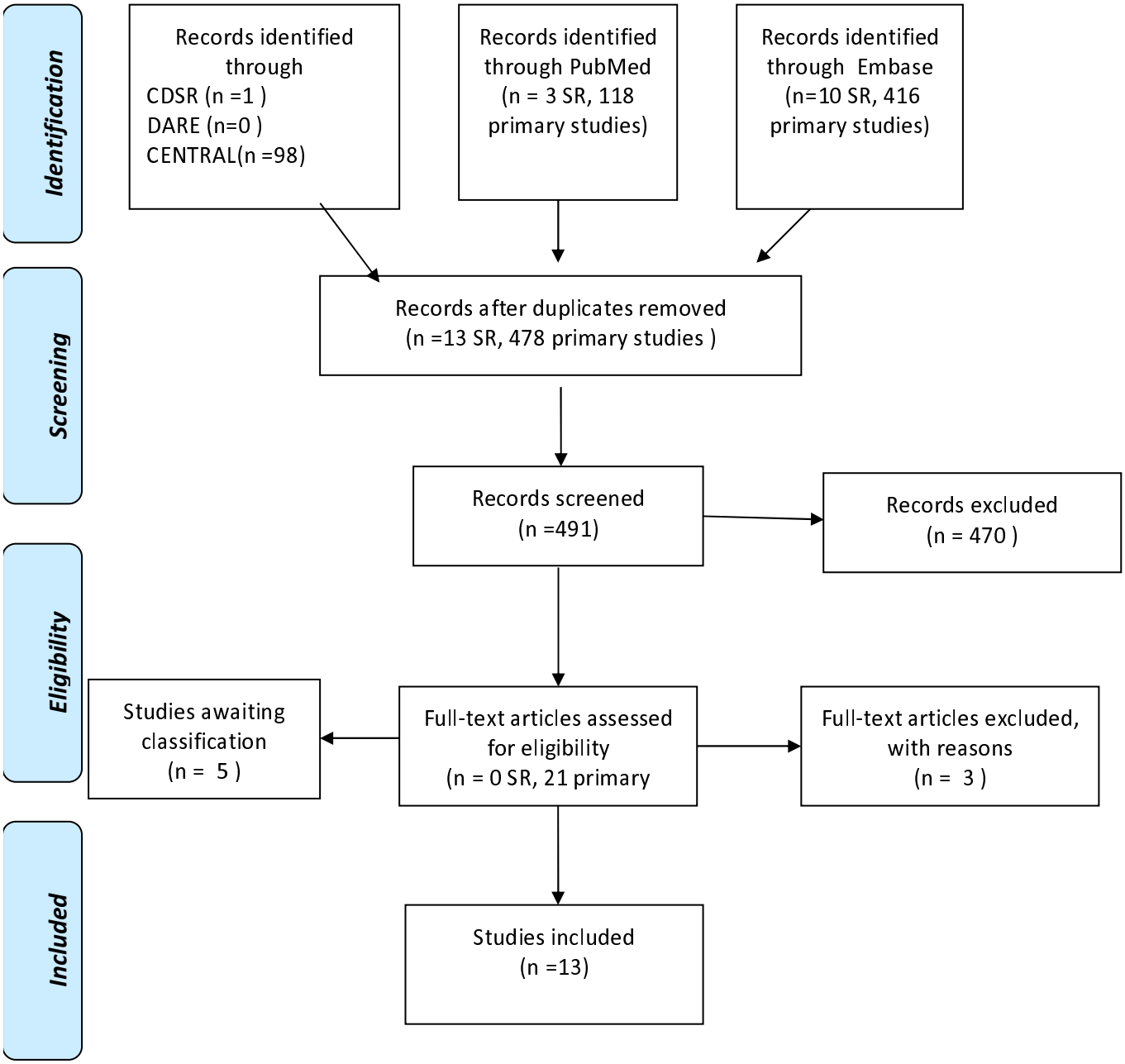
PRISMA 2009 Flow Diagram



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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

MINIMUM RATE OF BIOPSIES TAKEN PER PROTOCOL

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Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical questions

3.7 In patients undergoing diagnostic colonoscopy for chronic diarrhea/first diagnostic colonoscopy in suspected IBD (what is the minimum rate of biopsies taken per protocol?

P: Patients undergoing diagnostic colonoscopy for chronic diarrhea/IBD

I: Minimum rate of biopsies taken per protocol

C: Less than "I"

O: Need for repeated procedure/ rate of patient with positive diagnosis

3.8 In patients undergoing surveillance colonoscopy for IBD what is the minimum rate of biopsies taken per protocol?

P: Patients undergoing diagnostic colonoscopy for chronic diarrhea/IBD

I: Minimum rate of biopsies taken per protocol

C: Less than "I"

O: Neoplasia detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Inflammatory Bowel Diseases"[Mesh] OR "Crohn Disease"[Text Word] OR "Ulcerative Colitis"[Text Word] OR Crohn [Title/Abstract] OR IBD [Title/Abstract] OR "Diarrhea"[Mesh] OR Diarrhea[Title/Abstract] OR diarrhoea[Title/Abstract]) **AND** ("Biopsy"[Mesh] OR "Biopsy"[Text Word] OR biopsies[Title/Abstract]) **AND** ("Colonic Polyps"[Mesh] OR "Colorectal Neoplasms"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ((detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word]) AND (positive OR Adenoma[Text Word] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word]))) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('inflammatory bowel disease'/exp OR 'Crohn disease'/exp OR 'ulcerative colitis'/exp OR Crohn:ab,ti OR IBD:ab,ti OR 'Ulcerative Colitis':ab,ti OR Diarrhea:ti,ab OR 'diarrhea'/exp OR Diarrhoea:ti,ab) **AND** ('biopsy'/exp OR biopsy:ab,ti OR biopsies:ti,ab) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR ((detection:ab,ti OR detected:ab,ti OR prevalence:ab,ti OR presence:ab,ti OR rate:ab,ti OR rates:ab,ti OR diagnos*:ab,ti OR predict*:ab,ti) AND (positive:ab,ti OR Adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR neoplasm:ab,ti OR neoplasms:ab,ti OR cancer:ab,ti OR cancers:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti))) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #1 or #2
#4 MeSH descriptor: [Inflammatory Bowel Diseases] explode all trees
#5 MeSH descriptor: [Diarrhea] explode all trees
#6 Ulcerative Colitis or crohn disease or IBD or diarrhoea or Diarrhea:ti,ab,kw (Word variations have been searched)
#7 #4 or #5 or #6
#8 MeSH descriptor: [Biopsy] explode all trees
#9 biopsy:ti,ab,kw (Word variations have been searched)
#10 #8 or #9
#11 MeSH descriptor: [Colonic Polyps] explode all trees
#12 MeSH descriptor: [Colorectal Neoplasms] explode all trees
#13 MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
#14 (detection or prevalenceOR presence or rate or diagnosis or predict) and (positive or Adenoma or polyp or neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)
#15 #11 or #12 or #13 or #14
#16 #3 and #7 and #10 and #15 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Inflammatory Bowel Diseases"[Mesh] OR "Crohn Disease"[Text Word] OR "Ulcerative Colitis"[Text Word] OR Crohn [Title/Abstract] OR IBD [Title/Abstract] OR "Diarrhea"[Mesh] OR Diarrhea[Title/Abstract] OR diarrhoea[Title/Abstract]) **AND** ("Biopsy"[Mesh] OR "Biopsy"[Text Word] OR biopsies[Title/Abstract]) **AND** ("Colonic Polyps"[Mesh] OR "Colorectal Neoplasms"[Mesh] OR "Adenoma/diagnosis"[Mesh] OR ((detect*[Text Word] OR prevalence[Text Word] OR presence[Text Word] OR rate[Text Word] OR rates[Text Word] OR diagnos*[Text Word] OR predict*[Text Word]) AND (positive OR Adenoma[Text Word] OR polyp[Text Word] OR polyps[Text Word] OR neoplasm[Text Word] OR neoplasms[Text Word] OR cancer[Text Word] OR cancers[Text Word] OR tumor[Text Word] OR tumour[Text Word] OR tumors[Text Word] OR tumours[Text Word] OR carcinoma[Text Word]))) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('inflammatory bowel disease'/exp OR 'Crohn disease'/exp OR 'ulcerative colitis'/exp OR Crohn:ab,ti OR IBD:ab,ti OR 'Ulcerative Colitis':ab,ti OR Diarrhea:ti,ab OR 'diarrhea'/exp OR Diarrhoea:ti,ab) **AND** ('biopsy'/exp OR biopsy:ab,ti OR biopsies:ti,ab) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR ((detection:ab,ti OR detected:ab,ti OR prevalence:ab,ti OR presence:ab,ti OR rate:ab,ti OR rates:ab,ti OR diagnos*:ab,ti OR predict*:ab,ti) AND (positive:ab,ti OR Adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR neoplasm:ab,ti OR neoplasms:ab,ti OR cancer:ab,ti OR cancers:ab,ti OR tumor:ab,ti OR tumour:ab,ti OR tumors:ab,ti OR tumours:ab,ti OR carcinoma:ab,ti))) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1	MeSH descriptor: [Colonoscopy] explode all trees
#2	colonoscopy:ti,ab,kw (Word variations have been searched)
#3	#1 or #2
#4	MeSH descriptor: [Inflammatory Bowel Diseases] explode all trees
#5	MeSH descriptor: [Diarrhea] explode all trees
#6	Ulcerative Colitis or crohn disease or IBD or diarrhoea or Diarrhea:ti,ab,kw (Word variations have been searched)
#7	#4 or #5 or #6
#8	MeSH descriptor: [Biopsy] explode all trees
#9	biopsy:ti,ab,kw (Word variations have been searched)
#10	#8 or #9
#11	MeSH descriptor: [Colonic Polyps] explode all trees
#12	MeSH descriptor: [Colorectal Neoplasms] explode all trees
#13	MeSH descriptor: [Adenoma] explode all trees and with qualifier(s): [Diagnosis - DI]
#14	(detection or prevalenceOR presence or rate or diagnosis or predict) and (positive or Adenoma or polyp or neoplasm or cancer or tumor or carcinoma):ti,ab,kw (Word variations have been searched)

#15 #11 or #12 or #13 or #14
#16 #3 and #7 and #10 and #15 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches
After removing duplicates, 1289 articles (45 reviews and 1244 primary studies) were found. One potentially relevant systematic review was found; nine primary studies were considered potentially relevant and acquired in full text (See flow chart).

Excluded studies
2 studies were excluded: one because a narrative studies (Ahmed 2010) and one because no data on number of biopsies were reported (Melton 2011).

Included studies
8 studies were finally included (Freire 214, Friedman 2001, Gunther 2011, Hlavaty 2011, Navaneethan 2013, Rutter 2004, Thomas 2007, van den Broek 2014).

Clinical question 3.7

Only one study (Friedman 2001) was included for this question. The aim of the study was to assess the incidence of dysplasia in patients with chronic Crohn's colitis. It was an uncontrolled case series including 259 patients with at least 7 years of Crohn's colitis affecting at least one third of the colon who underwent colonoscopic screening and surveillance (1424 examinations). Patients received 4 circumferential biopsies performed at approximately 10-cm intervals and additional biopsies if strictures or suspicious polypoid lesions were observed (target and random biopsies). The overall dysplasia or cancer detection rate including baseline and follow up examinations was of 18.5%. No data on dysplasia or cancer detected by random vs targeted biopsies were reported. No data on the number of biopsies done were reported.

Quality of evidence
Need for repeated procedure*:* the study did not assess this outcome
Rate of patient with positive diagnosis: No data on dysplasia or cancer detected by random vs targeted biopsies were reported. No data on the number of biopsies done were reported.

CONCLUSIONS
No conclusion can be drawn about the minimum number of biopsies or whether random versus targeted biopsies because the study did not report this information.

Clinical question 3.8
7 studies were included for this question: one systematic review (Thomas 2007), one RCT (Freire 214), two prospective cohort studies (Gunther 2011, Hlavaty 2011) and three retrospective uncontrolled case series (Navaneethan 2013, Rutter 2004, Van den Broek 2014).
The systematic review had the aim to determine the incidence of cancer and the relative risk of developing cancer in patients with low-grade dysplasia (LGD) in chronic ulcerative colitis (UC) undergoing surveillance. It included 20 studies with more than 2677 patients, 508 of which with

LGD. The aim of the review was not to analyse the association between type of biopsies (random vs target) and the detection rate of neoplasia. The only information related to our clinical question was that “at multivariate regression analysis the number of biopsies taken per colonoscopy had a statistically significant influence on the incidence rates of advanced lesions (P = 0.002) in patients with LGD, but the number of biopsies done per colonoscopy (P = 0.09) had no significant influence on the incidence rates of LGD”.
All the primary studies compared the neoplasia detection rate (dysplasia, intraepithelial neoplasia, cancer) by random biopsies and by target biopsies of suspicious lesions.

Study	Study design	Patients	Number of biopsies per patient	Random biopsies	Targeted biopsies	random + targeted biopsies
Freire 2014	RCT 1) Chromoendoscopy + Targeted biopsy 2) Conventional colonoscopy + random biopsies quadrant biopsies taking 4 samples every 10 cm from the caecum to the rectum	145 with UC Group 1: 72 Group 2: 73	Chromoendoscopy + Targeted biopsy: 4.7 ± 4.9 Conventional colonoscopy + random biopsies: 36.0 ± 6.2 p < 0.001	IN detection rate: 6/73 Proportion of biopsies with IN (yield of IN) 1/438 (0.2%)	IN detection rate: 7/72 Proportion of biopsies with IN (yield of IN) 1/48 (2.1%) Target vs random p < 0.001	
Gunther 2011	Prospective cohort study 1) high-resolution video endoscopy and random quadrant biopsies taking 4 samples every 10 cm from the caecum to the rectum (random) 2) random biopsies + chromoendoscopy-guided biopsies (random + targeted biopsies) 3) random biopsies + confocal endomicroscopy guided biopsies (random + targeted biopsies)	150 patients (ulcerative colitis, UC n=141; Crohn's disease, CD n=9) Group 1: n:50 Group 2: n:50 Group 3: n:50	4,819 biopsies Group 1: 31±11 Group 2: 43±14 Group 3: 32±12	<u>High grade IN detection rate</u> Group 1: 0/50 <u>Flat polypoid lesions detected</u> Group1: 0/50		<u>High grade IN detection rate</u> Group 2: 2/50 Group 3 :4/50 <u>Flat polypoid lesions detected</u> Group 2: 18/50 Group 3: 10/50

Hlavaty 2011	Prospective cohort study 1) conventional white light colonoscope (WLE) + random quadrant biopsies taking 4 samples every 10 cm from the caecum to the rectum + targeted biopsies 2) WLE + chromoendoscopy + confocal endomicroscopy + target biopsy + random biopsies	45 with UC or CD Group1: 15 Group 2: 30	Random biopsies: 1584 (35.2 per patient) Target biopsies: 114 (1.42 per patient)	<u>IN detection rate</u> 0/45	<u>IN detection rate</u> 7/45 Random vs target: p=0.002	
Navaneeth an 2013	retrospective case series random quadrant biopsies taking 4 samples every 10 cm from the caecum to the rectum + targeted biopsies	71 with PSC–UC 267 colonoscopies	random biopsies :3975 (median 12 per patient) target biopsies: not reported	<u>Per colonoscopy analysis:</u> Neoplasia 10/267 (3.7%) <u>Per patient analysis</u> Neoplasia 8/71 (11.3%) <u>Multivariable logistic regression analysis</u> number of random biopsies (per increase by 8) (OR= 1.64; 95% CI, 1.18–2.28)	<u>Per colonoscopy analysis</u>: Neoplasia 8/267 (3%) <u>Per patient analysis</u> Neoplasia 5/ 71 (7%). <u>Multivariable logistic regression analysis</u> target biopsies during colonoscopy (OR= 9.08; 95% CI, 3.18–26.0) independently predicted the detection of any dysplasia	<u>Per colonoscopy analysis:</u> Neoplasia 4/267 (1.5%) <u>Per patient analysis</u> Neoplasia 3/71 (4.2%)

Rutter 2004	retrospective case series segmental biopsy specimens are taken in all patients (8-12 biopsy specimens on average), with additional biopsy specimens from any mucosal irregularity. (random + target)	525 with UC (2204 colonoscopies)	N of random biopsies and target biopsies not reported	<u>Per colonoscopy analysis:</u> macroscopically invisible neoplasia: 25/2204 (1.13%) Cancer: 3/2204 (0.1%) <u>Per patient analysis</u> Neoplasia: 6/525(1.1%) Cancer: 3/525 (0.6%)	<u>Per colonoscopy analysis:</u> macroscopically visible neoplasia: 85/2204 (3.85%) cancer: 10/2204 (0.4%) <u>Per patient analysis</u> Neoplasia 50/525(9.5%) Cancer: 10/525 (1.9%)	
Van den Broek 2014	Random and target biopsies	475 with UC (1010 colonoscopies)	11,772 random biopsies (median 29 per patient)	<u>Per colonoscopy analysis:</u> 5/1010 (0.5%) <u>Per patient analysis</u> 4/475 (0.84%)	<u>Per colonoscopy analysis:</u> 75/1010 (7.4%) <u>Per patient analysis</u> 44/475 (9.2%)	<u>Per colonoscopy analysis:</u> 8/1010 (0.8%) <u>Per patient analysis</u> 5/475(1%)

Quality of evidence

Neoplasia detection rate
Study limitations (risk of bias): the two cohort studies did not report the criteria by which patients were allocated to groups. In the uncontrolled case series data collection were retrospective and the e quality of reporting was poor. The systematic review was of intermediate quality, but the primary studies were uncontrolled case series.
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as low because of study design: only one randomised trials was found.

CONCLUSIONS
Minimum rate of biopsies taken per protocol: the number of biopsies taken per colonoscopy had a statistically significant influence on the incidence rates of advanced lesions in patients with LGD but the number of biopsies done per colonoscopy had no significant influence on the incidence rates of LGD.
(**LOW QUALITY OF EVIDENCE**)

Random biopsies vs targeted biopsies**:** targeted biopsies found more neoplastic lesions than random biopsies or found the same number but with significantly less number of biopsies necessaries
(**LOW QUALITY OF EVIDENCE**)

References

Included studies

1. Freire P.; Figueiredo P.; Cardoso R.; Donato M.M.; Ferreira M.; Mendes S.; Silva M.R.; Cipriano A.; Ferreira A.M.; Vasconcelos H.; Portela F., and Sofia C. Surveillance in ulcerative colitis: Is chromoendoscopy-guided endomicroscopy always better than conventional colonoscopy? a randomized trial. Inflammatory Bowel Dis. 2014; 20(11):2038-2045

2. Friedman S.; Rubin P.H.; Bodian C.; Goldstein E.; Harpaz N., and Present D.H. Screening and surveillance colonoscopy in chronic Crohn's colitis. Gastroenterology. 2001; 120(4):820-826.

3. Gunther U.; Kusch D.; Heller F.; Burgel N.; Leonhardt S.; Daum S.; Siegmund B.; Loddenkemper C.; Grunbaum M.; Buhr H.-J.; Schulzke J.-D.; Zeitz M., and Bojarski C. Surveillance colonoscopy in patients with inflammatory bowel disease: Comparison of random biopsy vs. targeted biopsy protocols. Int. J. Colorectal Dis. 2011; 26(5):667-672;

4. Hlavaty T.; Huorka M.; Koller T.; Zita P.; Kresanova E.; Rychly B., and Toth J. Colorectal cancer screening in patients with ulcerative and crohn's colitis with use of colonoscopy, chromoendoscopy and confocal endomicroscopy. Eur. J. Gastroenterol. Hepatol. 2011; 23(8):680-689

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6. Rutter M.D.; Saunders B.P.; Wilkinson K.H.; Kamm M.A.; Williams C.B., and Forbes A. Most dysplasia in ulcerative colitis is visible at colonoscopy. Gastrointest. Endosc. 2004; 60(3):334-339;

7. Thomas T.; Abrams K.A.; Robinson R.J., and Mayberry J.F. Meta-analysis: Cancer risk of low-grade dysplasia in chronic ulcerative colitis. Aliment. Pharmacol. Ther. 2007; 25(6):657-668;

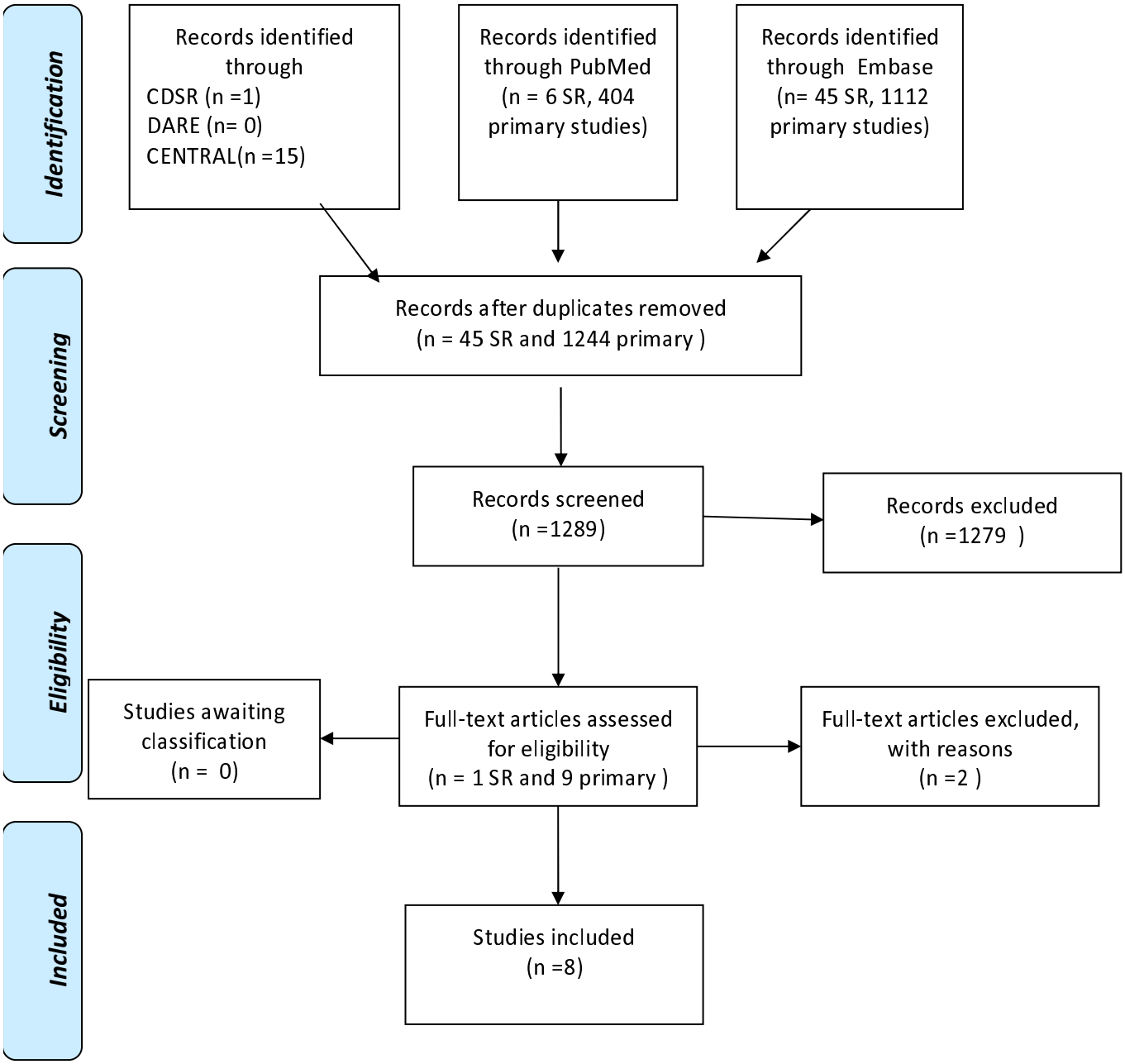
8. van den Broek, F. J.; Stokkers, P. C.; Reitsma, J. B.; Boltjes, R. P.; Ponsioen, C. Y.; Fockens, P., and Dekker, E. Random biopsies taken during colonoscopic surveillance of patients with longstanding ulcerative colitis: low yield and absence of clinical consequences. Am J Gastroenterol. 2014 May; 109(5):715-22.

Excluded studies

1. Ahmed, T.; Monti, J., and Lashner, B. Random versus targeted biopsies for colorectal cancer surveillance in inflammatory bowel disease. Gastroenterol Hepatol (N Y). 2010 Jul; 6(7):438-42

2. Melton S.D.; Feagins L.A.; Saboorian M.H., and Genta R.M. Ileal biopsy: Clinical indications, endoscopic and histopathologic findings in 10,000 patients. Dig. Liver Dis. 2011; 43(3):199-203

PRISMA 2009 Flow Diagram



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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

MEASURE OF ACCURATE DESCRIPTION OF PATHOLOGY

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

3.9 In patients undergoing removal of non-polypoid colorectal lesions what is the measure of accurate description of pathology?

P: Patients undergoing removal of removal of non-polypoid colorectal lesions

I: Paris classification

C: Three categories: stalked, sessile, non polypoid (flat and depressed)

O: Incomplete resection rate/Interrupted procedure rate\complication

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

(Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** ((flat[Text Word] OR depressed[Text Word] OR "non polypoid"[Text Word] OR nonpolypoid[Text Word]) AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh])) **AND** Paris[Title/Abstract] **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'surgery'/exp OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** ((flat:ab,ti OR depressed:ab,ti OR nonpolypoid:ab,ti OR "non polypoid":ab,ti) AND ('adenoma'/exp OR adenoma:ab,ti OR polyp:ab,ti OR lesion:ab,ti OR polyps:ab,ti OR lesions:ab,ti OR 'colon polyp'/exp)) **AND** Paris:ab,ti **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Dissection] explode all trees
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU]
#3 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#4 #1 or #2 or #3
#5 Flat or depressed or nonpolypoid:ti,ab,kw (Word variations have been searched)
#6 MeSH descriptor: [Colonic Polyps] explode all trees
#7 MeSH descriptor: [Adenoma] explode all trees
#8 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#9 #6 or #7 or #8
#10 #5 and #9
#11 paris classification:ti,ab,kw (Word variations have been searched)
#12 #4 and #10 and #11 Publication Year from 2000 to 2015

Primary studies

PubMed

(Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** ((flat[Text Word] OR depressed[Text Word] OR "non polypoid"[Text Word] OR nonpolypoid[Text Word]) AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh])) **AND** Paris[Title/Abstract] **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'surgery'/exp OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** ((flat:ab,ti OR depressed:ab,ti OR nonpolypoid:ab,ti OR "non polypoid":ab,ti) AND ('adenoma'/exp OR adenoma:ab,ti OR polyp:ab,ti OR lesion:ab,ti OR polyps:ab,ti OR lesions:ab,ti OR 'colon polyp'/exp)) **AND** Paris:ab,ti **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Dissection] explode all trees
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU]

#3 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#4 #1 or #2 or #3
#5 Flat or depressed or nonpolypoid:ti,ab,kw (Word variations have been searched)
#6 MeSH descriptor: [Colonic Polyps] explode all trees
#7 MeSH descriptor: [Adenoma] explode all trees
#8 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#9 #6 or #7 or #8
#10 #5 and #9
#11 paris classification:ti,ab,kw (Word variations have been searched)
#12 #4 and #10 and #11 Publication Year from 2000 to 2015

RESULTS

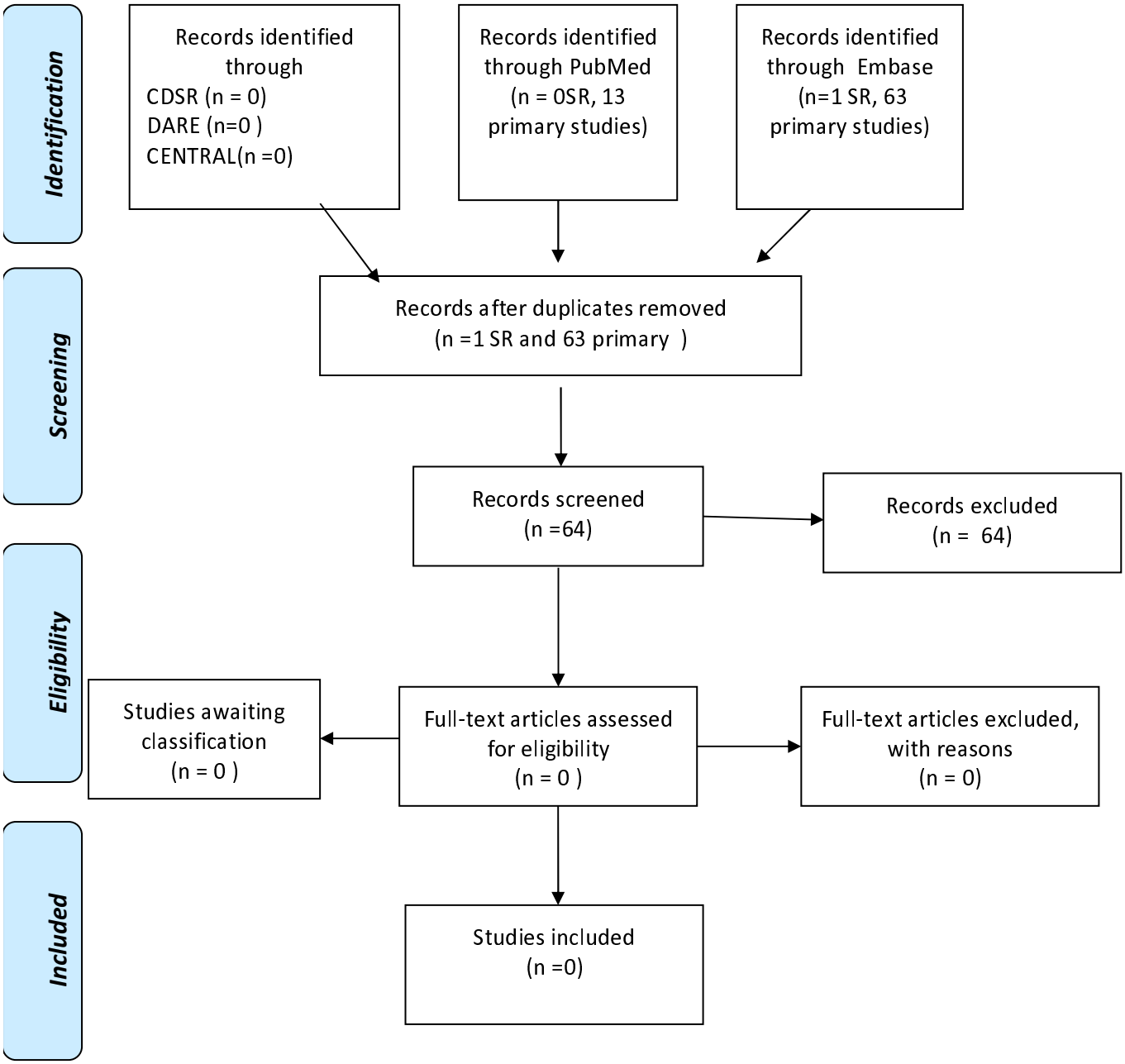
Results of bibliographic search

After removing duplicates, 64 articles (1 review and 63 primary studies) were found. No potentially relevant systematic reviews and primary studies comparing the Paris classification with three categories: stalked, sessile, non polypoid (flat and depressed) were found (See flow chart).

CONCLUSIONS

No conclusion can be drawn about the best measure of accurate description of pathology because no evidence was found.

PRISMA 2009 Flow Diagram



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ROUTINE RETROFLEXION TO IDENTIFY PATHOLOGY

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Clinical question

3.10 **Does routine retroflexion in the rectum help to identify pathology in the rectum?**

P: Patients undergoing screening/diagnostic colonoscopy

I: Routine retroflection in the rectum

C: No/non-routine retroflexion in the rectum

O: Adenoma detection rate/Rate of missed adenomas\ patient experience\CRC

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Retroflex view" [Text Word] OR retroflexion[Text Word] OR retroflection[Text Word]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** (retroflexion:ab,ti OR 'retroflex view':ab,ti OR retroflection:ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #31 or #32
#4 retroflex view or retroflection or retroflexion:ti,ab,kw (Word variations have been searched)
#5 #3 and #4 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Retroflex view" [Text Word] OR retroflexion[Text Word] OR retroflection[Text Word]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** (retroflexion:ab,ti OR 'retroflex view':ab,ti OR retroflection:ab,ti) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #31 or #32
#4 retroflex view or retroflection or retroflexion:ti,ab,kw (Word variations have been searched)
#5 #3 and #4 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 8 articles (1 review and 86 primary studies) were found. No potentially relevant systematic reviews were found; 10 primary studies were considered potentially relevant and acquired in full text (See flow chart)

Awaiting assessment

For one study we were unable to retrieve the pdf (Rajasekhar2015); another study was published in Korean (Kim 2015)

Excluded studies

Five studies were excluded: four because the intervention was not in the inclusion criteria: retroflexion in the right colon in three studies (Chandran 2011, Hewett 2011, Kushnir 2015) and outside the rectum in one study (Pishvaian2006); one because the outcome of interest was not reported (Mattar 2011).

Included studies

Three studies were finally included (Hanson 2001, Saad 2008, Tellez-Avila 2014).

They were prospective observational studies. Two included 2436 patients undergoing colonoscopy (Saad 2008, Tellez-Avila 2014). One included 526 subject undergoing unsedated screening FS.

In all the studies the rectum was initially examined on forward view during withdrawal of the colonoscope to the dentate line**;** then the endoscope was reinserted and retroflexed.

Study	**Patients**	**successful retroflexion**	**Patient experience (n reporting pain)**	**Total polyps detected**	**lesions (polyps, angiodysplasia, ulcers) visible in both the forward and retroflexed view**	**Lesions detected only during retroflexion**	**Adenoma detected only during retroflexion**
Hanson 2001	526 (FS)	96.5%	17 (3.5%)	nr	Nr (polyps)	12 (2.5% of patients)	4
Saad 2008	1502	93.9%	Nr	40 (9 adenoma)	33/40 (polyps) (8 adenomatous)	7/40 (17.5%)	1/9 (11%)
Tellez-Avila 2014	934	98.2%	Nr	32 (10 adenoma)	22/32 (7 polyps, 5 adenoma, 9 angiodysplaisa, 6 ulcers)	10/32 (31.2%)	5/10 (50%)

Quality of evidence

Polyps/ adenoma detected only by retroflexion
Study limitations (risk of bias): no relevant limitation; observational studies
Inconsistency of results: yes
Indirectness of evidence: no
Imprecision: yes (few patients with polyps in the rectum)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of study design and, imprecision and inconsistency

Pain during retroflexion
Study limitations (risk of bias): no relevant limitation; observational studies
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: yes (only one study)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of study design and imprecision

CONCLUSIONS

Polyps detection rate: polys detected only during retroflexion ranged between 17% and 31.% of all polys detected
(**VERY LOW QUALITY OF EVIDENCE**)

Adenoma detection rate: adenoma detected only during retroflexion ranged between 11% and 50% of all polys detected
(**VERY LOW QUALITY OF EVIDENCE**)

Patients experience: in one study was reported that 3.5% of the procedure had to be stopped because of pain
(**VERY LOW QUALITY OF EVIDENCE**)

References

Included studies

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2. Saad, A. and Rex, D. K. Routine rectal retroflexion during colonoscopy has a low yield for neoplasia. World J Gastroenterol. 2008 Nov 14; 14(42):6503-5.

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Excluded studies

1. Chandran, S.; Parker, F.; Vaughan, R.; Mitchell, B.; Fanning, S.; Brown, G.; Yu, J., and Efthymiou, M. Right-sided adenoma detection with retroflexion versus forward-view colonoscopy. Gastrointest Endosc. 2015 Mar; 81(3):608-13.

2. Hewett, D. G. and Rex, D. K. Miss rate of right-sided colon examination during colonoscopy defined by retroflexion: an observational study. Gastrointest Endosc. 2011 Aug; 74(2):246-52.

3. Kushnir V.M.; Oh Y.S.; Hollander T.; Chen C.-H.; Sayuk G.S.; Davidson N.; Mullady D.; Murad F.M.; Sharabash N.M.; Ruettgers E.; Dassopoulos T.; Easler J.J.; Gyawali C.P.; Edmundowicz S.A., and Early D.S. Impact of retroflexion Vs. second forward view examination of the right colon on adenoma detection: A comparison study. Am. J. Gastroenterol. 2015; 110(3):415-422

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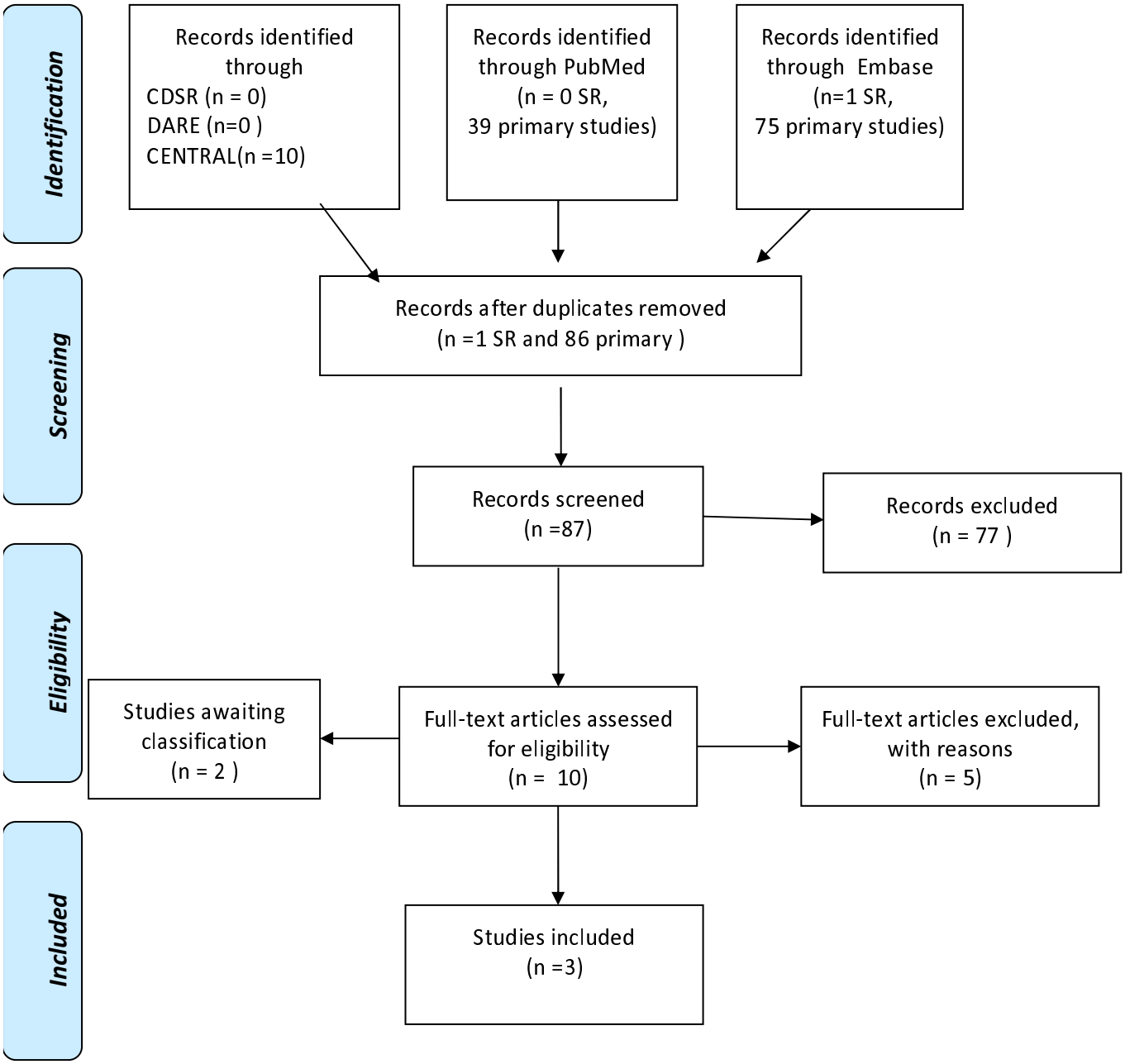
5. Pishvaian, A. C. and Al-Kawas, F. H. Retroflexion in the colon: a useful and safe technique in the evaluation and resection of sessile polyps during colonoscopy. Am J Gastroenterol. 2006 Jul; 101(7):1479-83.

Awaiting classification

1. Kim, H. U.; Boo, S. J.; Na, S. Y., and Song, H. J. [Additional polyp detection rate using colonoscopic retroflexion in right colon]. Korean J Gastroenterol. 2015 Feb; 65(2):90-8.

2. Rajasekhar, P. T.; Rees, C. J.; Bramble, M. G.; Wilson, D. W.; Rutter, M. D.; Saunders, B. P.; Hungin, A. P., and East, J. E. A multicenter pragmatic study of an evidence-based intervention to improve adenoma detection: the Quality Improvement in Colonoscopy (QIC) study. Endoscopy. 2015 Mar; 47(3):217-24.

PRISMA 2009 Flow Diagram



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Centro di Riferimento per l'Epidemiologia e la Prevenzione Oncologica in Piemonte

THERAPEUTIC COLONOSCOPY

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Clinical question

4.1 . In patients undergoing therapeutic colonoscopy what is the measure of accurate therapy?

P: Patients undergoing therapeutic colonoscopy

I: Therapeutic colonoscopy

C: Not applicable

O: Incomplete polyp removal and/or need for repeat procedure

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** (complete*[Text Word] OR incomplete*[Text Word] OR fail*[Text Word] OR interrupt*[Text Word]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** (complete*:ab,ti OR incomplete*:ab,ti OR fail*:ab,ti OR interrupt*:ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Dissection] explode all trees
#5 Polypectomy or resection or remove or dissection:ti,ab,kw (Word variations have been searched)
#6 #5 or #4
#7 Complete or incomplete or failed or interrupted:ti,ab,kw (Word variations have been searched)
#8 #3 and #6 and #7 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** (complete*[Text Word] OR incomplete*[Text Word] OR fail*[Text Word] OR interrupt*[Text Word]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) **AND** ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** (complete*:ab,ti OR incomplete*:ab,ti OR fail*:ab,ti OR interrupt*:ab,ti) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Dissection] explode all trees
#5 Polypectomy or resection or remove or dissection:ti,ab,kw (Word variations have been searched)
#6 #5 or #4

#7 Complete or incomplete or failed or interrupted:ti,ab,kw (Word variations have been searched)
#8 #3 and #6 and #7 Publication Year from 2000 to 2015

Results

Results of the bibliographic searches
After removing duplicates, 1547 articles (28 reviews and 1519 primary studies) were found. No potentially relevant systematic reviews were found; 8 primary studies were considered potentially relevant and acquired in full text (See flow chart).

Awaiting assessment
For one study we were unable to retrieve the full text (Jung 2013).

Excluded studies
Three studies were excluded: one because it analysed only patients who underwent subsequent colorectal resection after incomplete endoscopic resection of malignant polyps and the prevalence of incomplete resection in the baseline sample was not reported (Rickert 2014); one because it was a retrospective analysis including only patients with invasive colon cancer following colonoscopy (Robertson 2014); one because it was a narrative review (Christodoulou 2007).

Included studies
Four studies were finally included (Brenner 2012, Choi 2014, Hayashi 2014, Pohl 2013).
Two studies were uncontrolled case series (Hayashi 2014, Pohl 2013); one was a retrospective cohort study (Choi 2014,) and one was case-control study (Brenner 2012).
All the studies included patients undergoing at least one polypectomy and reported the incomplete polyp removal outcome determined by the histopathologic examination. In Brenner 2012, the incompleteness of resection was determined by the indication in the report that at least 1 polyp was not removed or was only partly removed.

Study	**Patients and n of polyps removed**	**Incomplete polyp removal defined as**	**Results**
Brenner 2012	260 controls who underwent colonoscopy with detection of polyps (other than hyperplastic polyps) in the past 10 years 155 cases: a first diagnosis of primary invasive CRC aged 30 years or older	Incomplete polypectomy (not all polyps completely removed that is, indication in the report that at least 1 polyp was not removed or was only partly removed)	**Incomplete polypectomy** Case=45/155 (29.0) Control=25/260 (9.6) Overall=70/415(16.9%)

Choi 2014	1,860 patients who underwent at least one polypectomy for an adenomatous polyp neoplastic polyps removed=3,469	Incomplete resection : if piecemeal resection was performed or a margin of the resected specimen proved histologically positive or uncheckable. resection margin classified as ‘‘uncheckable’’ when: Margin status could not be fully evaluated due to cautery artifact, piecemeal resection, or tangential cutting of the specimen, if tumor-free margin was <1 mm	**Overall margin positive** 65/3469(1.87%) **Overall Uncheckable margin** 1590/3469 (45.8%) **Overall incomplete resection** 1655/3469 (47.7%)
Hayashi 2014	267 consecutive colorectal tumours (adenoma/early carcinoma) treated by ESD	Complete resection defined as histopathological complete en bloc resection with a negative tumuor margin.	**Incomplete resections** 4.1 % (11/267)
Pohl 2013	269 patients who underwent colonoscopy and had at least 1 non-pedunculated polyp (5–20 mm). 418 polyps resected	Incomplete resection rate (IRR) of neoplastic polyps as determined by the histopathologic examination of polyp margin biopsies	**IRR for neoplastic polyps** 35/346=10.1% (95%CI: 6.9%–13.3%)

Quality of evidence

Incomplete polyp removal
Study limitations (risk of bias): no relevant limitation; observational data
Inconsistency of results: yes (% incomplete resection ranged from 1.87 % to 16.9%, if only margin positive specimens of the Choi 2014 study are counted; from 1.87% to 47.7% if the broad definition of incomplete resection of Choi 2014 are considered)
Indirectness of evidence: yes for the Brenner 2012 study
Imprecision: yes (4 studies with 2656 patients)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of inconsistency and imprecision; moreover different definition of incomplete resection are used in the including studies limiting the reliability of the results

Need for repeat procedure: no studies evaluated this outcome.

CONCLUSIONS

Incomplete polyp removal: incomplete resection ranged from 1.87 % to 16.9%, if only margin positive specimens of the Choi 2014 study are counted; from 1.87% to 47.7% if the broad definition of incomplete resection of Choi 2014 are considered
(**VERY LOW QUALITY OF EVIDENCE**)

Need for repeat procedure: no conclusion can be draws because no evidence was found.

REFERENCES

Included studies

1. Brenner H.; Chang-Claude J.; Jansen L.; Seiler C.M., and Hoffmeister M. Role of colonoscopy and polyp characteristics in colorectal cancer after colonoscopic polyp detection: A population-based case-control study. Ann. Intern. Med. 2012; 157(4):225-233;

2. Choi J.M.; Lee C.; Park J.H.; Oh H.J.; Hwang S.W.; Chun J.; Koh S.-J.; Im J.P.; Kim J.W.; Kim J.S.; Kim B.G., and Lee K.L. Complete Resection of Colorectal Adenomas: What Are the Important Factors in Fellow Training? Dig. Dis. Sci. 2014;

3. Hayashi, N.; Tanaka, S.; Nishiyama, S.; Terasaki, M.; Nakadoi, K.; Oka, S.; Yoshihara, M., and Chayama, K. Predictors of incomplete resection and perforation associated with endoscopic submucosal dissection for colorectal tumors. Gastrointest Endosc. 2014 Mar; 79(3):427-35.

4. Pohl H.; Srivastava A.; Bensen S.P.; Anderson P.; Rothstein R.I.; Gordon S.R.; Levy L.C.; Toor A.; MacKenzie T.A.; Rosch T., and Robertson D.J. Incomplete polyp resection during colonoscopy - Results of the complete adenoma resection (CARE) study. Gastroenterology. 2013; 144(1):74-80

Excluded studies

1. Christodoulou D.; Kandel G.; Tsianos E.V., and Marcon N. Endoscopic resection of colonic polyps - A review. Ann. Gastroenterol. 2007; 20(3):180-194

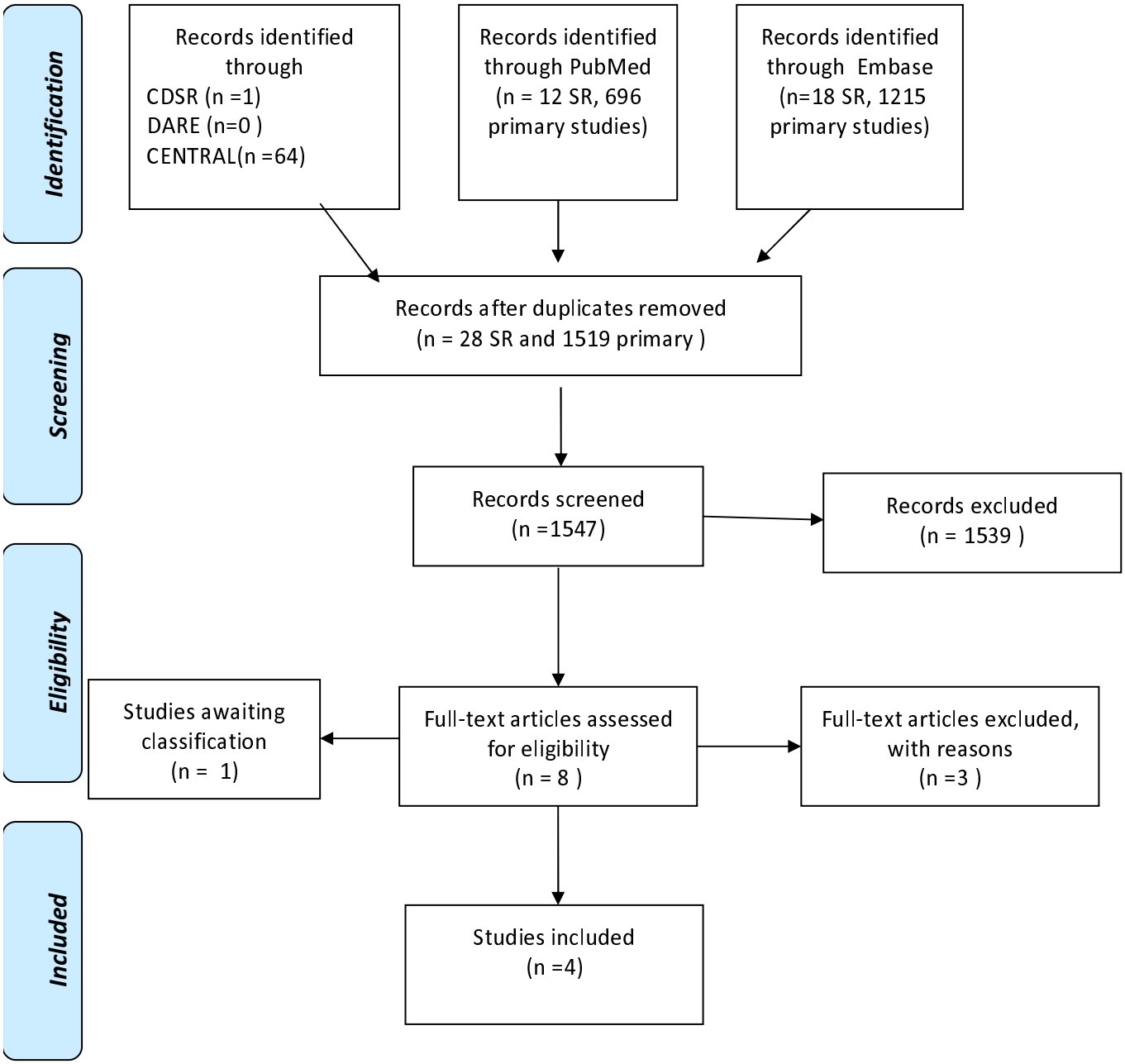
2. Rickert, A.; Aliyev, R.; Belle, S.; Post, S.; Kienle, P., and Kahler, G. Oncologic colorectal resection after endoscopic treatment of malignant polyps: does endoscopy have an adverse effect on oncologic and surgical outcomes? Gastrointest Endosc. 2014 Jun; 79(6):951-60.

3. Robertson D.J.; Lieberman D.A.; Winawer S.J.; Ahnen D.J.; Baron J.A.; Schatzkin A.; Cross A.J.; Zauber A.G.; Church T.R.; Lance P.; Greenberg E.R., and Martinez M.E. Colorectal cancers soon after colonoscopy: A pooled multicohort analysis. Gut. 2014; 63(6):949-956;

Awaiting classification

1. Jung Y.S.; Park J.H.; Kim H.J.; Cho Y.K.; Sohn C.I.; Jeon W.K.; Kim B.I.; Sohn J.H., and Park D.I. Complete biopsy resection of diminutive polyps. Endoscopy. 2013; 45(12):1024-1029

PRISMA 2009 Flow Diagram



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MANAGEMENT OF PATHOLOGY- APPROPRIATE MEASURE OF COMPLETE POLYP RESECTION RATE

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Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

4.2 In patients undergoing therapeutic colonoscopy what is the appropriate measure of complete polyp resection rate?

P: Patients undergoing en-bloc polyp removal (polypectomy, EMR, ESD)

I: Completeness of removal assessed by pathologist

C: Completeness of removal assessed by endoscopist

O: Interval CRC and/or need for repeat procedure/ recurrence at surveillance

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ((Polypectomy[Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh] OR dissection[Text Word] OR EMR[Text Word] OR ESD[Text Word] OR "Endoscopic submucosal dissection"[Text Word] OR "Endoscopic mucosal resection"[Text Word]) AND (en-bloc [Text Word] OR "methods" [Subheading]))
AND (Complete*[Text Word] OR incomplete*[Text Word]) **AND** ("Recurrence"[Text Word] OR "Neoplasm Recurrence, Local"[Mesh] OR "interval cancer"[Text Word] OR "interval CRC" [Text

Word] OR recurrences[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND (('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti OR EMR:ab,ti OR ESD:ab,ti OR "Endoscopic submucosal dissection":ab,ti OR "Endoscopic mucosal resection":ab,ti) AND en-bloc:ab,ti) **AND (**Complete*:ab,ti OR incomplete*:ab,ti) **AND** (recurrence:ab,ti OR 'tumor recurrence'/exp OR "interval cancer":ab,ti OR "interval CRC":ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Dissection] explode all trees
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU]
#3 Any MeSH descriptor with qualifier(s): [Methods - MT]
#4 Polypectomy or resection or remove or dissection or EMR or ESD or "Endoscopic submucosal dissection" or "Endoscopic mucosal resection":ti,ab,kw (Word variations have been searched)
#5 en-bloc
#6 #3 or #5
#7 #1 or #2 or #4
#8 #7 and #6
#9 Complete or incomplete:ti,ab,kw (Word variations have been searched)
#10 MeSH descriptor: [Recurrence] explode all trees
#11 MeSH descriptor: [Neoplasm Recurrence, Local] explode all trees
#12 recurrence or 'interval cancer' or 'interval CRC':ti,ab,kw (Word variations have been searched)
#13 #11 or #12 or #10
#14 colonoscopy:ti,ab,kw (Word variations have been searched)
#15 MeSH descriptor: [Colonoscopy] explode all trees
#16 #14 or #15
#17 #9 and #8 and #13 and #16 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ((Polypectomy[Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh] OR dissection[Text Word] OR EMR[Text Word] OR ESD[Text Word] OR "Endoscopic submucosal dissection"[Text Word] OR "Endoscopic mucosal resection"[Text Word]) AND (en-bloc [Text Word] OR "methods" [Subheading])) **AND** (Complete*[Text Word] OR incomplete*[Text Word]) **AND** ("Recurrence"[Text Word] OR "Neoplasm Recurrence, Local"[Mesh] OR "interval cancer"[Text Word] OR "interval CRC" [Text Word] OR recurrences[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR

"meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND (('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti OR EMR:ab,ti OR ESD:ab,ti OR "Endoscopic submucosal dissection":ab,ti OR "Endoscopic mucosal resection":ab,ti) AND en-bloc:ab,ti) **AND (**Complete*:ab,ti OR incomplete*:ab,ti) **AND** (recurrence:ab,ti OR 'tumor recurrence'/exp OR "interval cancer":ab,ti OR "interval CRC":ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Dissection] explode all trees 185
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU] 47557
#3 Any MeSH descriptor with qualifier(s): [Methods - MT] 103695
#4 Polypectomy or resection or remove or dissection or EMR or ESD or "Endoscopic submucosal dissection" or "Endoscopic mucosal resection":ti,ab,kw (Word variations have been searched)
#5 en-bloc
#6 #3 or #5
#7 #1 or #2 or #4
#8 #7 and #6
#9 Complete or incomplete:ti,ab,kw (Word variations have been searched)
#10 MeSH descriptor: [Recurrence] explode all trees
#11 MeSH descriptor: [Neoplasm Recurrence, Local] explode all trees
#12 recurrence or 'interval cancer' or 'interval CRC':ti,ab,kw (Word variations have been searched)
#13 #11 or #12 or #10
#14 colonoscopy:ti,ab,kw (Word variations have been searched)
#15 MeSH descriptor: [Colonoscopy] explode all trees
#16 #14 or #15
#17 #9 and #8 and #13 and #16 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, no systematic reviews and 137 primary studies were found. 5 were considered potentially relevant and acquired in full text (See flow chart).

Excluded studies

One study was excluded (Serrano 2012) because it did not assess the comparison of interest.

Awaiting assessment

Two studies are awaiting assessment: for one we were unable to retrieve the full text (Ko 2014) and the other is written in Korean (Lee 2011).

Included

Finally, two studies were included (Zhou 2009, Jameel 2006). They were uncontrolled case series enrolling a total of 40 patients.

Zhou 2009 assessed recurrence and need to repeat the procedure for 16 patients with locally recurrent colorectal lesions who underwent ESD to treat locally recurrent colorectal lesions after previous EMR. Excision was judged as complete in 14/16 patients (87.5%) both by endoscopists and by pathologist. No lesion residue or recurrence during a mean follow-up of 15.5 ± 6.8 (range, 6-24) months

Jameel 2006 assessed the safety and efficacy of EMR on 30 lesions on 24 patients. Median size of 30 polyps resected by EMR was 20 mm with the largest being a 50 mm pedunculated polyp in the sigmoid colon. Excision was judged as complete for 29/30 lesions according to the endoscopist; it was judged as complete in 10/30 according to the pathologist while completeness of excision could not be stated on histology in 19 lesions due to diathermy artifact. None of the patients diagnosed with adenocarcinoma showed any evidence of recurrence

Quality of evidence

Study limitations (risk of bias): uncontrolled case series; one study was retrospective and didn't enrol consecutively the patients.
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: yes because sample size very small
Publication bias: not assessed

Overall quality of evidence

The overall quality of evidence was judged as very low because of study design and imprecision.

CONCLUSIONS

No conclusion can be drawn about the most appropriate measure of complete polyp resection rate because only two uncontrolled case series with very small sample were retrieved and because the outcomes of interest were not reported separately for completeness of resection assessed by endoscopist and by histology.

(VERY LOW QUALITY OF EVIDENCE)

References

Included

1. Zhou, P.; Yao, L.; Qin, X.; Xu, M.; Zhong, Y., and Chen, W. Endoscopic submucosal dissection for locally recurrent colorectal lesions after previous endoscopic mucosal resection. Dis Colon Rectum. 2009 Feb; 52(2):305-10

2. Jameel J.K.A.; Pillinger S.H.; Moncur P.; Tsai H.H., and Duthie G.S. Endoscopic mucosal resection (EMR) in the management of large colo-rectal polyps. Colorectal Dis. 2006; 8(6):497-500

Excluded

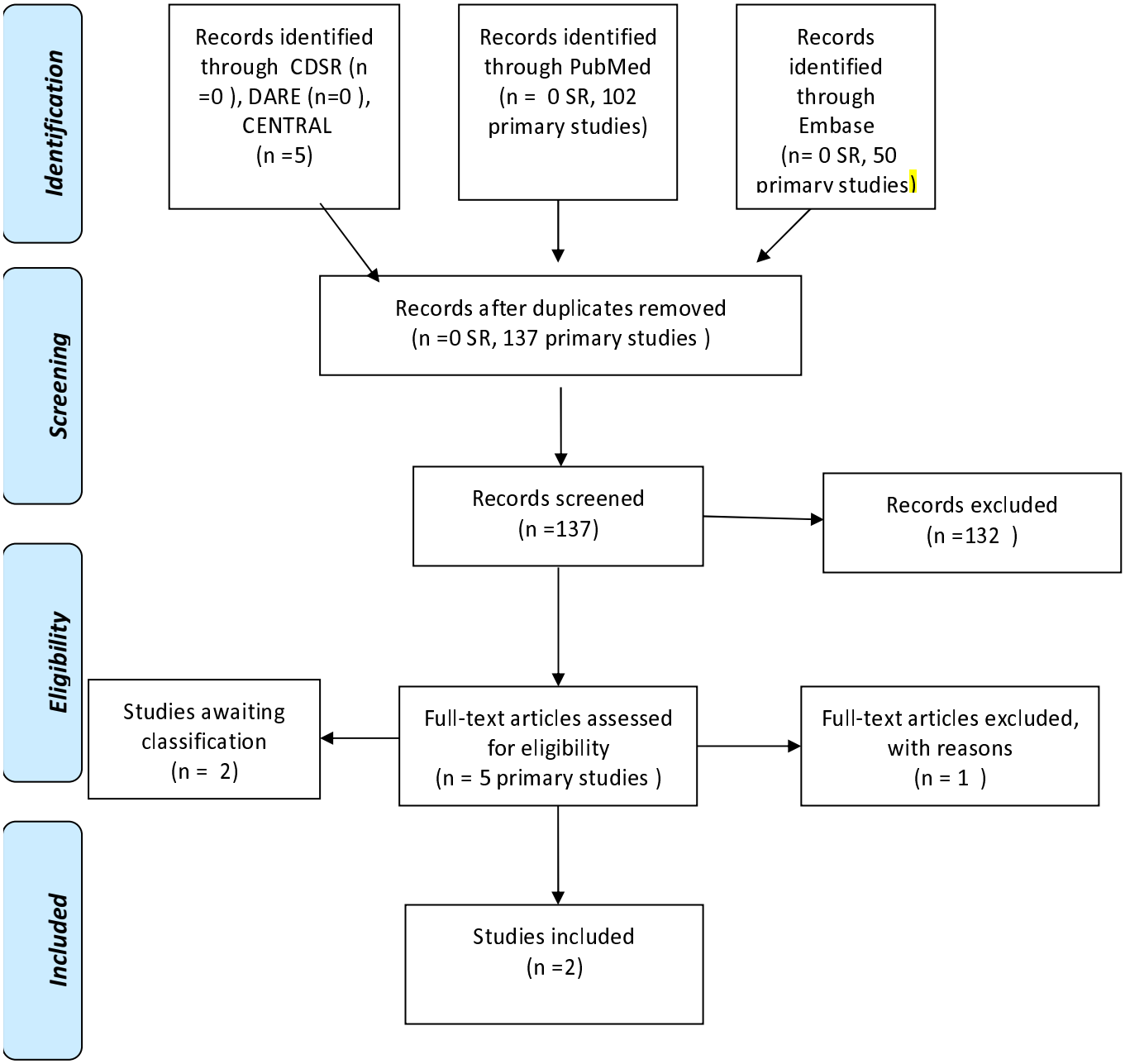
1. Serrano, M.; Mao de Ferro, S.; Fidalgo, P.; Lage, P.; Chaves, P., and Dias Pereira, A. Endoscopic mucosal resection of superficial colorectal neoplasms: review of 140 procedures. Acta Med Port. 2012 Sep-2012 Oct 31; 25(5):288-96.

Awaiting assessment

1. Lee H.J.; Jeong H.Y.; Park N.H.; Hong S.C.; Nam G.W.; Moon H.S.; Lee E.S.; Kim S.H.; Sung J.K., and Lee B.S. [Follow-up results of endoscopic mucosal resection for early colorectal cancer]. Korean J Gastroenterol. 2011; 57(4):230-236

2. Ko O.B.; Byeon J.S.; Kim M.J.; Lim H.; Kim M.J.; Yang D.H.; Yoon S.M.; Kim K.J.; Ye B.D.; Myung S.J.; Yang S.K., and Kim J.H. Clinical outcomes of colonic mucosal cancers with histologically positive or uncertain resection margin after endoscopic resection. Hepatogastroenterology. 2014; 61(129):65-69;

PRISMA 2009 Flow Diagram



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MINIMUM RATE OF USE OF VIRTUAL/CONVENTIONAL CHROMOENDOSCOPY FOR DELINEATION OF MARGINS/PREDICTION OF INVASION

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

4.4 In patients undergoing removal of colorectal lesions with a depressed component (0-IIc according to the Paris classification) or nongranular or mixed-type laterally spreading tumors what is the minimum rate of use of virtual/conventional chromoendoscopy for delineation of margins/prediction of invasion?

P: Patients undergoing removal of colorectal lesions with a depressed component (0-IIc according to the Paris classification) or nongranular or mixed-type laterally spreading tumors

I: Minimum rate of use of conventional chromoendoscopy or virtual (NBI, FICE, high scan)

C: Less than "I"

O: Incomplete resection rate/Interrupted procedure rate/ cancer detection rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("high scan"[Text Word] OR FICE[Text Word] OR NBI[Text Word] OR "flexible spectral imaging color enhancement"[Text Word] OR "Narrow Band Imaging"[Text Word] OR chromoendoscopy [Text Word] OR chromoendoscopies[Title/Abstract]) **AND** ((depressed[Text Word] AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh] OR "Colonic Neoplasms"[Mesh])) OR LST-NG[Title/Abstract] OR LST-G-MIX[Title/Abstract] OR ((LSTs[Text Word] OR LST[Text Word] OR "laterally spreading tumors"[Text Word] OR "laterally spreading tumor"[Text Word] OR "laterally spreading tumours"[Text Word] OR "laterally spreading tumour"[Text Word]) AND ("non-granular"[Text Word] OR nongranular[Text Word] OR "non granular"[Text Word] OR "mixed type"[Text Word] OR "mixed-type"[Text Word]))) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('narrow band imaging'/exp OR 'chromoendoscopy'/exp OR chromoendoscopy:ab,ti OR chromoendoscopies:ab,ti OR NBI:ab,ti OR FICE:ab,ti OR 'flexible spectral imaging color enhancement':ab,ti OR 'high scan':ab,ti) **AND** ((depressed:ab,ti AND ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti)) OR LST-NG:ab,ti OR LST-G-MIX:ab,ti OR ((LSTs:ab,ti OR LST:ab,ti OR 'laterally spreading tumors':ab,ti OR 'laterally spreading tumor':ab,ti OR 'laterally spreading tumours':ab,ti OR 'laterally spreading tumour':ab,ti) AND ('non-granular':ab,ti OR nongranular:ab,ti OR 'non granular':ab,ti OR 'mixed type':ab,ti OR 'mixed-type':ab,ti))) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees 1307
#5 depressed:ti,ab,kw (Word variations have been searched)
#6 #4 or #1 or #2 or #3
#7 #6 and #5
#8 LST-NG or LST-G-MIX:ti,ab,kw (Word variations have been searched)
#9 (LST or laterally spreading tumor) and (non granular or mixed type):ti,ab,kw (Word variations have been searched)
#10 #9 or #8 or #7
#11 MeSH descriptor: [Narrow Band Imaging] explode all trees
#12 high scan or FICE or NBI or "flexible spectral imaging color enhancement" or "Narrow Band Imaging" or chromoendoscopy:ti,ab,kw (Word variations have been searched)
#13 #11 or #12
#15 #10 and #13 Publication Year from 2000 to 2015

Primary studies

PubMed

("high scan"[Text Word] OR FICE[Text Word] OR NBI[Text Word] OR "flexible spectral imaging color enhancement"[Text Word] OR "Narrow Band Imaging"[Text Word] OR chromoendoscopy [Text Word] OR chromoendoscopies[Title/Abstract]) **AND** ((depressed[Text Word] AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh] OR "Colonic Neoplasms"[Mesh])) OR LST-NG[Title/Abstract] OR LST-G-MIX[Title/Abstract] OR ((LSTs[Text Word] OR LST[Text Word] OR "laterally spreading tumors"[Text Word] OR "laterally spreading tumor"[Text Word] OR "laterally spreading tumours"[Text Word] OR "laterally spreading tumour"[Text Word]) AND ("non-granular"[Text Word] OR nongranular[Text Word] OR "non granular"[Text Word] OR "mixed type"[Text Word] OR "mixed-type"[Text Word]))) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('narrow band imaging'/exp OR 'chromoendoscopy'/exp OR chromoendoscopy:ab,ti OR chromoendoscopies:ab,ti OR NBI:ab,ti OR FICE:ab,ti OR 'flexible spectral imaging color enhancement':ab,ti OR 'high scan':ab,ti) **AND** ((depressed:ab,ti AND ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti)) OR LST-NG:ab,ti OR LST-G-MIX:ab,ti OR ((LSTs:ab,ti OR LST:ab,ti OR 'laterally spreading tumors':ab,ti OR 'laterally spreading tumor':ab,ti OR 'laterally spreading tumours':ab,ti OR 'laterally spreading tumour':ab,ti) AND ('non-granular':ab,ti OR nongranular:ab,ti OR 'non granular':ab,ti OR 'mixed type':ab,ti OR 'mixed-type':ab,ti))) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees 1307
#5 depressed:ti,ab,kw (Word variations have been searched)
#6 #4 or #1 or #2 or #3
#7 #6 and #5
#8 LST-NG or LST-G-MIX:ti,ab,kw (Word variations have been searched)
#9 (LST or laterally spreading tumor) and (non granular or mixed type):ti,ab,kw (Word variations have been searched)
#10 #9 or #8 or #7
#11 MeSH descriptor: [Narrow Band Imaging] explode all trees
#12 high scan or FICE or NBI or "flexible spectral imaging color enhancement" or "Narrow Band Imaging" or chromoendoscopy:ti,ab,kw (Word variations have been searched)
#13 #11 or #12
#15 #10 and #13 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 174 articles (3 systematic reviews and 171 primary studies) were found. Six potentially relevant studies were considered potentially relevant and acquired in full text (See flow chart).

Awaiting classification

For two studies we were unable to retrieve the full text (Du 2014, Ji 2013).

Excluded studies

Four studies were excluded: two because the comparison was not in the inclusion criteria: all patients received chromoendoscopy (Bianco 2003, Wada 2011); two because the intervention were not in the inclusion criteria (Cipolletta 2014: all patients received white-light colonoscopy; Miwa 2012: NBI was performed before the surgical intervention)

CONCLUSIONS:

No conclusion can be drawn about what is the minimum rate of use of virtual/conventional chromoendoscopy for delineation of margins or prediction of invasion because no evidence was found.

References

Excluded studies

1. Bianco, M. A.; Rotondano, G.; Marmo, R.; Garofano, M. L.; Piscopo, R.; de Gregorio, A.; Baron, L.; Orsini, L., and Cipolletta, L. Predictive value of magnification chromoendoscopy for diagnosing invasive neoplasia in nonpolypoid colorectal lesions and stratifying patients for endoscopic resection or surgery. Endoscopy. 2006 May; 38(5):470-6. OK PDF

2. Cipolletta L.; Rotondano G.; Bianco M.A. et al. Endoscopic resection for superficial colorectal neoplasia in Italy: A prospective multicentre study. Dig. Liver Dis. 2014; 46(2):146-151; ISSN: 1590-8658. 1878-3562.

3. Miwa, K.; Doyama, H.; Ito, R.; Nakanishi, H.; Hirano, K.; Inagaki, S.; Tominaga, K.; Yoshida, N.; Takemura, K.; Yamada, S.; Kaneko, Y.; Katayanagi, K.; Kurumaya, H.; Okada, T., and Yamagishi, M. Can magnifying endoscopy with narrow band imaging be useful for low grade adenomas in preoperative biopsy specimens? Gastric Cancer. 2012 Apr; 15(2):170-8. OK PDF

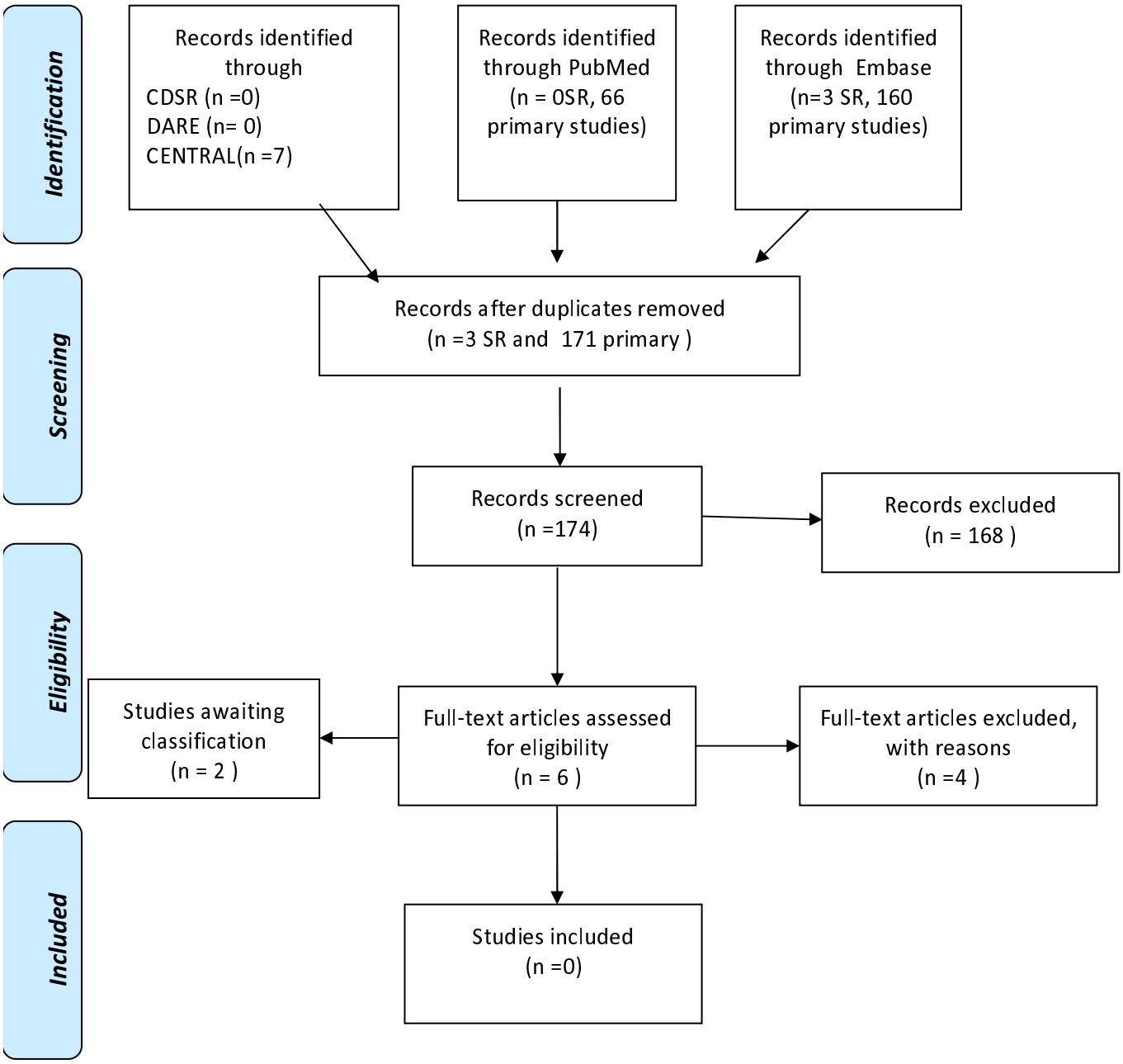
4. Wada, Y.; Kudo, S. E.; Misawa, M.; Ikehara, N., and Hamatani, S. Vascular pattern classification of colorectal lesions with narrow band imaging magnifying endoscopy. Dig Endosc. 2011 May; 23 Suppl 1:106-11.

Awaiting classification

1. Du L.; Jiang J., and Liu J. Clinical study on chromoendoscopy and endoscopic mucosal resection in diagnosis and treatment of colorectal laterally spreading tumor. Chin. J. Gastroenterol. 2013; 18(1):43-44; ISSN: 1008-7125.

2. Ji X.-Q.; Sun C.; Zhao F.-R., and Xin L.-J. Magnifying chromoendoscopy for estimation of lesion histology and shape in colorectal neoplasia. World Chin. J. Dig. 2014; 22(25):3868-3871; ISSN: 1009-3079.

PRISMA 2009 Flow Diagram



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Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

4.5 In patients undergoing removal of colorectal lesions with a depressed component (0-IIc according to the Paris classification) or non-granular or mixed-type laterally spreading tumors does tattooing resection site increase ability to relocate the lesion and reduce interval cancer ?

P: Patients undergoing removal of colorectal lesions with a depressed component (0-IIc according to the Paris classification) or non-granular or mixed-type laterally spreading tumors

I: tattooing resection sites

C: no tattooing

O: ability to relocate resection site/ interval cancer rate

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Tattooing"[Mesh] OR Tattooing[Title/Abstract] OR Tattoo[Title/Abstract]) **AND** ((depressed[Text Word] AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh] OR "Colonic Neoplasms"[Mesh])) OR LST-NG[Title/Abstract] OR LST-G-MIX[Title/Abstract] OR ((LSTs[Text Word] OR LST[Text Word] OR "laterally spreading tumors"[Text Word] OR "laterally spreading tumor"[Text Word] OR "laterally spreading tumours"[Text Word] OR "laterally spreading tumour"[Text Word]) AND ("non-granular"[Text Word] OR nongranular[Text Word] OR "non granular"[Text Word] OR "mixed type"[Text Word] OR "mixed-type"[Text Word]))) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('tattooing'/exp OR Tattooing:ab,ti OR tatto:ab,ti) **AND** ((depressed:ab,ti AND ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti)) OR LST-NG:ab,ti OR LST-G-MIX:ab,ti OR ((LSTs:ab,ti OR LST:ab,ti OR 'laterally spreading tumors':ab,ti OR 'laterally spreading tumor':ab,ti OR 'laterally spreading tumours':ab,ti OR 'laterally spreading tumour':ab,ti) AND ('non-granular':ab,ti OR nongranular:ab,ti OR 'non granular':ab,ti OR 'mixed type':ab,ti OR 'mixed-type':ab,ti))) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees 1307
#5 depressed:ti,ab,kw (Word variations have been searched)
#6 #4 or #1 or #2 or #3
#7 #6 and #5
#8 LST-NG or LST-G-MIX:ti,ab,kw (Word variations have been searched)
#9 (LST or laterally spreading tumor) and (non granular or mixed type):ti,ab,kw (Word variations have been searched)
#10 #9 or #8 or #7
#11 MeSH descriptor: [Tattooing] explode all trees
#12 Tattooing:ti,ab,kw (Word variations have been searched)
#13 #11 or #12
#14 #13 and #10

Primary studies

PubMed

("Tattooing"[Mesh] OR Tattooing[Title/Abstract] OR Tattoo[Title/Abstract]) **AND** ((depressed[Text Word] AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh] OR

"Colonic Neoplasms"[Mesh])) OR LST-NG[Title/Abstract] OR LST-G-MIX[Title/Abstract] OR ((LSTs[Text Word] OR LST[Text Word] OR "laterally spreading tumors"[Text Word] OR "laterally spreading tumor"[Text Word] OR "laterally spreading tumours"[Text Word] OR "laterally spreading tumour"[Text Word]) AND ("non-granular"[Text Word] OR nongranular[Text Word] OR "non granular"[Text Word] OR "mixed type"[Text Word] OR "mixed-type"[Text Word]))) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('tattooing'/exp OR Tattooing:ab,ti OR tatto:ab,ti)) **AND** ((depressed:ab,ti AND ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti)) OR LST-NG:ab,ti OR LST-G-MIX:ab,ti OR ((LSTs:ab,ti OR LST:ab,ti OR 'laterally spreading tumors':ab,ti OR 'laterally spreading tumor':ab,ti OR 'laterally spreading tumours':ab,ti OR 'laterally spreading tumour':ab,ti) AND ('non-granular':ab,ti OR nongranular:ab,ti OR 'non granular':ab,ti OR 'mixed type':ab,ti OR 'mixed-type':ab,ti))) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees
#5 depressed:ti,ab,kw (Word variations have been searched)
#6 #4 or #1 or #2 or #3
#7 #6 and #5
#8 LST-NG or LST-G-MIX:ti,ab,kw (Word variations have been searched)
#9 (LST or laterally spreading tumor) and (non granular or mixed type):ti,ab,kw (Word variations have been searched)
#10 #9 or #8 or #7
#11 MeSH descriptor: [Tattooing] explode all trees
#12 Tattooing:ti,ab,kw (Word variations have been searched)
#13 #11 or #12
#14 #13 and #10

With these search strategy no records were identified in any of the databases. So a less specific bibliographic search was performed with the following search strategy:

Systematic reviews and meta-analysis

PubMed

("Colonic Polyps"[Mesh] OR "Adenoma"[Mesh] OR "Colonic Neoplasms"[Mesh] OR Adenoma[Title/Abstract] OR polyp[Title/Abstract] OR lesion[Title/Abstract] OR polyps[Title/Abstract] OR lesions[Title/Abstract]) AND ("Tattooing"[Mesh] OR Tattoo*[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('tattooing'/exp OR Tattoo*:ab,ti) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees
#5 #4 or #1 or #2 or #3
#6 MeSH descriptor: [Tattooing] explode all trees
#7 Tattoo:ti,ab,kw (Word variations have been searched)
#8 #6 or #7
#9 #8 and #5 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonic Polyps"[Mesh] OR "Adenoma"[Mesh] OR "Colonic Neoplasms"[Mesh] OR Adenoma[Title/Abstract] OR polyp[Title/Abstract] OR lesion[Title/Abstract] OR polyps[Title/Abstract] OR lesions[Title/Abstract]) AND ("Tattooing"[Mesh] OR Tattoo*[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('tattooing'/exp OR Tattoo*:ab,ti) **AND** ('colon polyp'/exp OR 'colon tumor'/exp OR adenoma:ab,ti OR polyp:ab,ti OR polyps:ab,ti OR lesion:ab,ti OR lesions:ab,ti) **NOT** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL

#1 MeSH descriptor: [Colonic Polyps] explode all trees
#2 MeSH descriptor: [Adenoma] explode all trees
#3 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#4 MeSH descriptor: [Colonic Neoplasms] explode all trees
#5 #4 or #1 or #2 or #3
#6 MeSH descriptor: [Tattooing] explode all trees
#7 Tattoo:ti,ab,kw (Word variations have been searched)
#8 #6 or #7
#9 #8 and #5 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 452 articles (0 systematic reviews and 453 primary studies) were found. Three potentially relevant studies were considered potentially relevant and acquired in full text (See flow chart).

Excluded studies

Three studies were excluded: one because patients and outcomes were not in the inclusion criteria (Keller 2012), one (Kim 2015) because intervention was not in the inclusion criteria, one (Zafar 2012) because intervention and outcomes did not meet the inclusion criteria.

CONCLUSIONS

No conclusion can be drawn about whether tattooing resection site increase ability to relocate the lesion and reduce interval cancer because in patients undergoing removal of colorectal lesions with a depressed component (0-IIc according to the Paris classification) or non-granular or mixed-type laterally spreading tumors because no evidence was found.

References

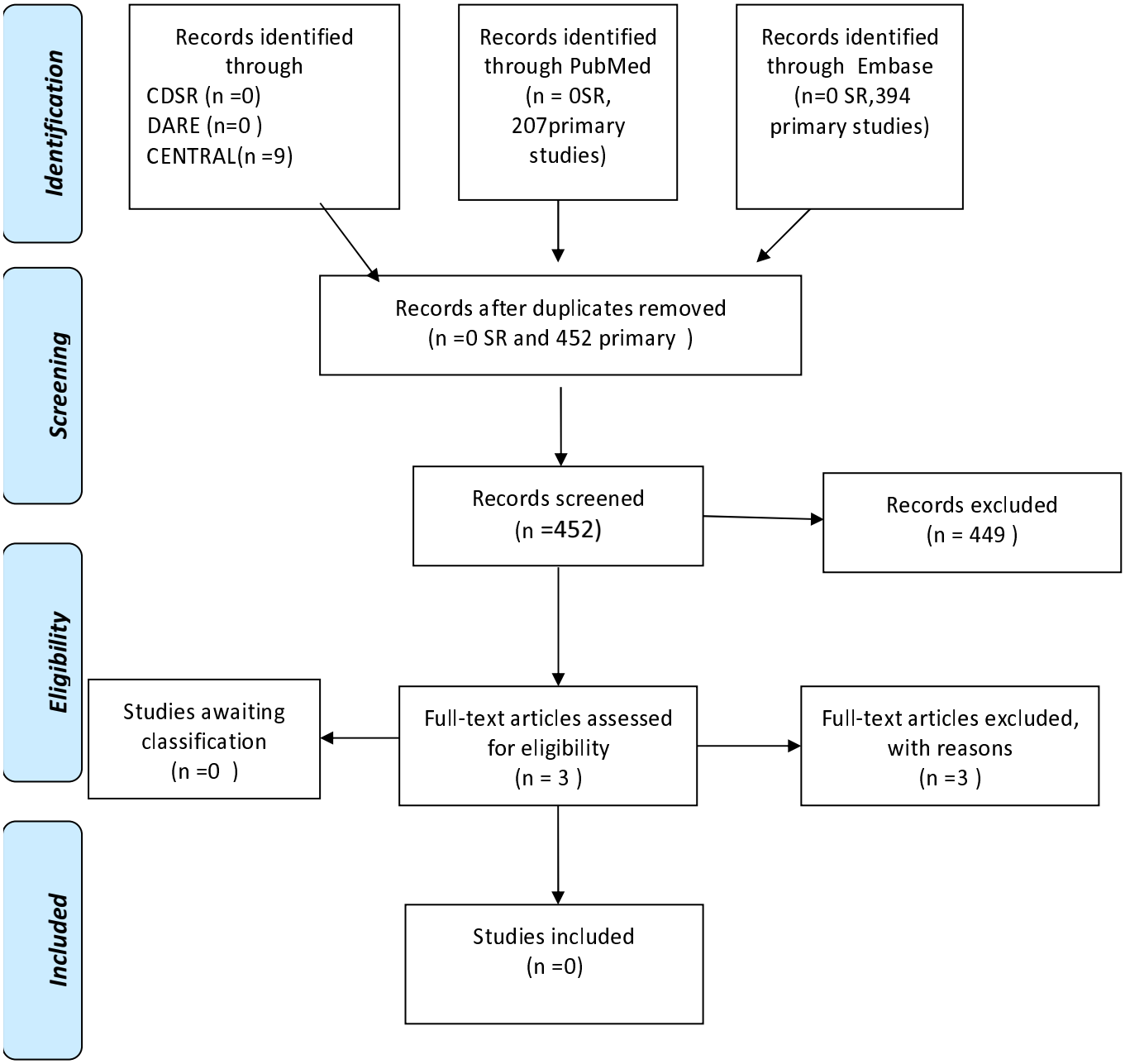
Excluded studies

1. Keller D.; Jaffe J.; Philp M.M.; Haluszka O., and Khanna A. Should all endoscopically excised rectal polyps be tattooed? A plea for localization. Surg. Endosc. Interv. Tech. 2012; 26(11):3101-3105

2. Kim H.G.; Thosani N.; Banerjee S.; Chen A., and Friedland S. Effect of prior biopsy sampling, tattoo placement, and snare sampling on endoscopic resection of large nonpedunculated colorectal lesions. Gastrointest. Endosc. 2015; 81(1):204-213;

3. Zafar A.; Mustafa M., and Chapman M. Colorectal polyps: When should we tattoo? Surg. Endosc. Interv. Tech. 2012; 26(11):3264-3266;

PRISMA 2009 Flow Diagram



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USE OF APPROPRIATE POLYPECTOMY TECHNIQUE

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Clinical question

4.6 In patients undergoing removal of colorectal lesions what is the minimum rate of use of appropriate polypectomy technique?

P: Patients undergoing removal of colorectal lesions

I: Minimum rate of use of appropriate polypectomy technique (type of accessory used for lesion size)

C: Less than "I"

O: Incomplete resection rate/Interrupted procedure rate, complications

Bibliographic searches

Bibliographic searches were performed on Cochrane library, Pubmed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and randomized controlled trials using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (Polypectomy[Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR remov*[Title/Abstract]) **AND** ("hot snare"[Text Word] OR "Cold snare"[Text Word] OR "biopsy forceps"[Text Word] OR snare[Title/Abstract] OR "biopsy forcep"[Text Word] OR biopsy[Text Word] OR "Biopsy"[Mesh] OR "polypectomy techniques" [Text Word] OR "polypectomy technique" [Text Word] OR "methods" [Subheading] OR EMR[Text Word] OR ESD[Text Word] OR "Endoscopic submucosal

dissection"[Text Word] OR "Endoscopic mucosal resection"[Text Word]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** ('hot snare':ab,ti OR 'Cold snare':ab,ti OR 'biopsy forceps':ab,ti OR snare:ab,ti OR 'biopsy forcep':ab,ti OR biopsy:ab,ti OR 'polypectomy techniques':ab,ti OR 'polypectomy technique':ab,ti OR EMR:ab,ti OR ESD:ab,ti OR "Endoscopic submucosal dissection":ab,ti OR "Endoscopic mucosal resection":ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#5 #3 and #4
#6 MeSH descriptor: [Biopsy] explode all trees
#7 hot snare or Cold snare OR biopsy forceps or polypectomy techniques or EMR or ESD or "Endoscopic submucosal dissection" or "Endoscopic mucosal resection":ti,ab,kw (Word variations have been searched)
#8 #6 or #7
#9 #8 and #5 Publication Year from 2000 to 2015

Randomized controlled trials

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** (Polypectomy[Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR remov*[Title/Abstract]) **AND** ("hot snare"[Text Word] OR "Cold snare"[Text Word] OR "biopsy forceps"[Text Word] OR snare[Title/Abstract] OR "biopsy forcep"[Text Word] OR biopsy[Text Word] OR "Biopsy"[Mesh] OR "polypectomy techniques" [Text Word] OR "polypectomy technique" [Text Word] OR "methods" [Subheading] OR EMR[Text Word] OR ESD[Text Word] OR "Endoscopic submucosal dissection"[Text Word] OR "Endoscopic mucosal resection"[Text Word]) AND ((Randomized Controlled Trial[ptyp] OR Controlled Clinical Trial[ptyp] OR randomized[Title/Abstract] OR placebo[Title/Abstract] OR "drug therapy" [Subheading] OR randomly [Title/Abstract] OR trial[Title/Abstract] OR group[Title/Abstract]) NOT ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]))

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** ('hot snare':ab,ti OR 'Cold snare':ab,ti OR 'biopsy forceps':ab,ti OR snare:ab,ti OR 'biopsy forcep':ab,ti OR biopsy:ab,ti OR 'polypectomy techniques':ab,ti OR 'polypectomy technique':ab,ti OR EMR:ab,ti OR ESD:ab,ti OR "Endoscopic submucosal dissection":ab,ti OR "Endoscopic mucosal

resection":ab,ti) AND ('randomized controlled trial'/exp OR 'crossover procedure'/exp OR 'double blind procedure'/exp OR 'single blind procedure'/exp OR 'controlled clinical trial'/exp OR 'clinical trial'/exp OR placebo:ab,ti OR 'double blind':ab,ti OR 'single blind':ab,ti OR assign*:ab,ti OR allocat*:ab,ti OR volunteer*:ab,ti OR random*:ab,ti OR factorial*:ab,ti OR crossover:ab,ti OR (cross:ab,ti AND over:ab,ti))

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#5 #3 and #4
#6 MeSH descriptor: [Biopsy] explode all trees
#7 hot snare or Cold snare OR biopsy forceps or polypectomy techniques or EMR or ESD or "Endoscopic submucosal dissection" or "Endoscopic mucosal resection":ti,ab,kw (Word variations have been searched)
#8 #6 or #7
#9 #8 and #5 Publication Year from 2000 to 2015

RESULTS

Results of bibliographic search

Results of the bibliographic searches: after removing duplicates, 36 reviews and 546 primary studies were found. One systematic review was found addressing any of the clinical questions; 55 primary studies were considered potentially relevant and acquired in full text. (See flow chart).

Awaiting classification

For 5 studies potentially relevant (Hurlstone 2005, Imai 2014, Poida 2011,Wang 2014, Zhi 2002) we were unable to retrieve the full text.

Excluded studies

41 studies were excluded because they were not RCTs (Agrawal 2010, Aslan 2014, Byeon 2011, Choi 2013, Dauser 2010, De Melo 2011, Deenadayalu 2005, Heldwein 2005, Hon 2011, Hurlstone 2005, Hurlstone 2007, Jameel 2006, Jung 2013, Katsinelos 2014, Kawaguti 2014, Kim 2013, Kobayashi 2012, Lee 2010, Liang 2013, Lin 2005, Nakajima 2013, Nawata 2014, Nishiyama 2010, Oka 2010, Ono 2003, Repici 2011, Saito 2010, Smith 2008, Spychalski 2011, Spychalski 2015, Su 2008, Tamai 2012, Terasaki 2012, Toyonaga 2010, Uraoka 2011, Uraoka 2005, Uraoka 2010, Yoshida 2010, Yoshida 2013, Zhou 2010, Zhou 2013).

Included studies

10 studies were included: 1 systematic review (Wang 2014) and 9 primary studies (Fasoulas 2012, Horiuchi 2014, Ichise 2011, Kouklakis 2009, Lee 2013, Paspatis 201, Sukata 2006, Takeuchi 2010, Yoshida 2012).

The systematic review (Wang 2014) aimed to compare the efficacy and safety of endoscopic sub-mucosal dissection (ESD) and endoscopic mucosal resection (EMR) for the treatment of colorectal tumors. Six non randomized controlled trials were identified and a total of 1642 lesions were included, and only four studies were meta-analyzed for the outcome Procedure-related complications. Results showed that there was no significant difference in procedure-related complication rate between the two groups (OR = 1.59; 95%CI: 0.92-2.73).

The nine primary studies enrolled a total of 991 patients.

Two studies (Horiuchi 2014, Ichise 2011) compared cold snare polypectomy versus traditional polypectomy (polyp removal).
One study compared cold snare polypectomy versus hot snare polypectomy (Paspatis 2011).
One study compared cold snare polypectomy versus cold forceps polypectomy (Lee 2013).
One study (Fasoulas 2012) evaluated the safety of using HES (hydroxyethyl starch) plus epinephrine (E) for the first time in humans for sub-mucosal lifting of giant colorectal LSTs (lateral spreading tumors) compared with the standard solution of NS (normal saline) plus epinephrine (E).
One study (Yoshida 2012) compared the efficacy of 0.13% hyaluronic acid group versus normal saline in endoscopic mucosal resection (EMR) to colorectal tumor of < 20 mm diameter.
One study (Takeuchi 2010) assessed the resection rate and complications of the water-jet function of Flushknife against Flexknife, which is one of the standard endo-knives for colorectal endoscopic sub-mucosal dissection (ESD).
One study (Kouklakis 2009) evaluated complications of adrenaline injection versus endoloop and clip placement in large (2 <cm) pedunculated colonic polyps regarding early and late post-polypectomy bleeding rates.
One study (Sakata 2006) evaluate the endoscopic mucosal resection with a ligation device.

Study	**Number of subjects, technique**	**Complete resection rate**	**Complications**
ESD vs EMR			
Wang 2012	4 studies, 913 participants (ESD: n= 347; EMR: n= 566)		OR = 1.59; 95%CI: 0.92-2.73
HES (hydroxyethyl starch) plus epinephrine (E) versus standard solution of NS (normal saline) plus epinephrine (E) for lateral spreading tumours.			
Fasoulas 2012	N=49 (group HES + E: n=25; group NS + E: n=24)	Resection: *p*= 0.943 <u>En block</u> group HES + E =6/25(24%) group NS + E =5/24(21%) <u>Endoscopically complete</u> group HES + E =24/25(96%) group NS + E =23/24(92%) <u>Partial colectomy (removes a diseased or damaged part of the colon or rectum):</u> group HES + E =1/25(4%) group NS + E=1/24(4.1%)	Complications: *p*= 0.079 <u>Haemorrhage</u> group A=1/25; group B=6/24 <u>Intra-procedural Delayed</u> group A=1/25; group B=5/24 <u>Perforation</u> group A=1/25; group B=0/24 <u>Post-polypectomy syndrome</u> group A=2/25; group B=0/24 <u>Recurrences</u> group A=525; group B=7/24

Cold snare polypectomy versus traditional polypectomy			
Horiuchi 2014	N=70 anticoagulated (cold group n=35; conventional group n=35)	cold group: 94% (73/78) conventional group: 93% (75/81)	<u>Immediate bleeding</u> cold group: 5.7% (2/35) conventional group: 23% (8/35) *p*=0.042, OR(95%CI)=4.9 (0.96-25.0) <u>Haematochezia</u> cold group: 5.7% (2/35) conventional group: 8.6% (3/35) *p*=0.500, OR(95%CI)=1.5 (0.24-9.9) <u>Delay bleeding</u> cold group: 0% (0/35) conventional group: 14%(5/35) *p*=0.027, OR(95%CI)=1.5 (0.24-9.9) <u>Total</u> cold group: 11% (4/35) conventional group: 46% (16/35) p=0.0015, OR(95%CI)=6.5 (1.9-22.5)
Ichise 2011	N=80 (cold group n=40; conventional polypectomy n=40)	cold group: 96% (97/101) conventional group: 96% (100/104) Histopathological evaluation showed that the remaining 4 polyps in each group were low-grade adenomas which were removed incompletely	No perforation or bleeding requiring haemostasis occurred in either group <u>Abdominal symptoms after polypectomy</u> conventional group: 20% (8/40) cold group: 2.5% (1/40) *p*=0.029
Cold snare polypectomy (CSP) versus hot snare polypectomy (HSP)			
Paspatis 2011	N= 414 patients (group CSP n=208; group HSP n=206)	size polyp removed mean CSP: = 5.3±1.4 HSP: 5.67±1.3 Retrieval rate of small polyps CSP: = 96% HSP: 96% P=0.67	There was no early or late post-polypectomy bleeding in either group. Intra-procedural bleeding CSP:19／208 HSP= 2／206 P < 0.001 No other complications associated with small polyp removal technique occurred in either group.

Adrenaline injection versus endoloop placement, polypectomy, and clip application			
Kouklakis 2009	N= 64 (Adrenaline injection alone: group A, n=32 patients; endoloop and clip placement: group B, n=32 patients)		Early bleeding: *p*=0.001 group A=2/32 (mild) group B=0/32 Mild: Group A=2; Group B=0 Late bleeding: *p*=0.03 group A=2/32 - group B=1/32 Moderate: Group A= 1; Group B=1 Severe: Group A=1; Group B=0 Overall bleeding: *P*=0.02 Group A=4 (12.5%) Group B=1 (3.12%)
CSP (cold snare polypectomy) versus CFP (cold forceps polypectomy)			
Lee 2013	54 patients (CSP: n=26; 59 polyps; CFP: n=28; 58 polyps)	Histological polyp eradication, n (%) CSP=55(93.2); CFP=44(75.9) *p*=0.009 Polyp size; the histologic eradication rate by CFP: 1 – 3 mm =91.7 % (33 / 36) 4 – 5 mm =50.0 % (11 / 22) Mean polyp size by incomplete histologic eradication vs complete histologic eradication subgroup 4.44 vs. 3.51 mm, ; *p*= 0.001 Multivariate logistic regression analysis: CFP= OR:4.750 (95 % CI: 1.459 -15.466) p< 0.05 Polyp size (≥4 mm) OR: 4.375 (95 % CI: 1.35 – 14.24) *p* < 0.05 Independent predictors of incomplete histologic polyp eradication Visual polyp eradication, n (%) CSP=54(91.5); CFP=40(69.0) *p*=0.002 Failure of tissue retrieval, n(%) CSP=4/59(6.8); CFP=0(0) *p*=0.119	Post-polypectomy bleeding CSP=0 CFP=0 Perforation CSP=0 CFP=0

EMR using a snare with a conventional single-channel colonoscopy versus EMR using a ligation device			
Sakata 2006	N=15 patients (EMR using a snare with a conventional single-channel colonoscopy: group 1: =7; EMR using a ligation device: group 2=8)	group 1= 42.9% (3/7) group 2= 100%, 8/8; *P* = 0.024 3 patients had tumour involvement of deep margin without lateral resection margin. These patients of carcinoid tumour in group 1 were treated with additional treatment: one patient was treated by trans-anal resection and two patients were resected with a ligation device	
Water-jet function of Flushknife versus Flexknife			
Takeuchi 2010	N=49 patients, 51 lesions (Flushknife =24; Flexknife=26)	<u>Resectability</u> R0, extension of tumour with complete resection Flexknife: 20/26 (77%) Flushknife:20/24(82%) p=0.700 R1, extension of tumour with incomplete resection Flexknife: 6/26 (23%) Flushknife: 4/24(18%) 8 Rx, extension of tumour with non-evaluable resection Flexknife: 0 Flushknife: 0	<u>Perforation</u> Flexknife: 0 Flushknife: 1/24(4%) <u>Bleeding</u> Flexknife: 2/ 26(8%) Flushknife: 1/24(4%) <u>Abdominal pain</u> Flexknife:1/ 26(4%) Flushknife: 2/24(8%) <u>Hypotension</u> Flexknife:0 Flushknife:1/24(4%)
0.13% hyaluronic acid group versus normal saline in EMR			
Yoshida 2012	N=196 patients (Hyaluronic acid group, n=98; Normal saline, n=98)	Hyaluronic Acid group 79.5%, 74/93 Normal saline = 65.6%, 63/96 ; p < 0.05 In the view of the proportions of lateral and vertical margin positive, all 19 cases of incomplete resection in the 0.13% HA group and all 33 cases of incomplete resection in the NS groups were positive of lateral margin. There were no positive of vertical margin in the 0.13% HA group and the NS group	<u>Perforation</u> 0.13% hyaluronic acid group =0 Normal saline =0 <u>Postoperative haemorrhage</u> (%) 0.13% hyaluronic acid group 1.1% (1/93) Normal saline 1.0% (1/96)

Quality of evidence

ESD vs EMR
Study limitations (risk of bias):.the review was judged as of medium quality. None of the included studies were randomized.
Inconsistency of results: No for Complications.
Indirectness of evidence: No
Imprecision: No
Publication bias not assessed: Yes

Overall quality of evidence
The overall quality of evidence was judged as low because the primary studies were not RCTs

HES (hydroxyethyl starch) plus epinephrine (E) versus standard solution of NS (normal saline) plus epinephrine (E) for lateral spreading tumors.
Study limitations (risk of bias): No serious limitations, Fasoulas 2012 was judged unclear risk for selection bias.
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

Cold snare polypectomy versus traditional polypectomy
Study limitations (risk of bias): No serious limitations, Ichise 2011was judged unclear risk for selection bias.
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes (two studies with 150 participants)
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

Cold snare polypectomy (CSP) versus hot snare polypectomy (HSP)
Study limitations (risk of bias): No
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

Adrenaline injection versus endoloop placement, polypectomy, and clip application
Study limitations (risk of bias): Kouklakis 2009 was judged as unclear risk in selection bias, performance bias and detection bias
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

CSP (cold snare polypectomy) versus CFP (cold forceps polypectomy)
Study limitations (risk of bias): Lee 2013 was judged as unclear risk in selection bias (allocation concealment).
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

EMR using a snare with a conventional single-channel colonoscopy versus EMR using a ligation device
Study limitations (risk of bias): Sakata 2006 was judged unclear risk in selection bias (random sequence generation) and performance bias.
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

Water-jet function of Flushknife versus Flexknife
Study limitations (risk of bias): Takeuchi 2010 was judged as high risk in performance bias and unclear risk in detection bias
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

0.13% hyaluronic acid group versus normal saline in EMR
Study limitations (risk of bias): Yoshida 2012 was judged as unclear risk in performance bias
Inconsistency of results: No
Indirectness of evidence: No
Imprecision: Yes
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of imprecision.

CONCLUSIONS

Complications

ESD vs EMR: No statistically significant difference between ESD and EMR in procedure-related complication rate (Wang 2014)
(LOW QUALITY OF EVIDENCE).

HES (hydroxyethyl starch) plus epinephrine (E) versus standard solution of NS (normal saline) plus epinephrine (E) for lateral spreading tumors: There were no statically significant differences in the complications rate between HES+E and NS+E (Fasoulas 2012)
(MODERATE QUALITY OF EVIDENCE).

Cold snare polypectomy versus traditional polypectomy: The CSP technique is preferred for removal of polyps because it was associated with lower bleeding risk than conventional polypectomy and CFP
(MODERATE QUALITY OF EVIDENCE).

Adrenaline injection versus endoloop placement, polypectomy and clip application: Combined endoscopic techniques seem to be more effective in preventing postpolypectomy bleeding in large pedunculated colonic polyps (Kouklakis 2009)
(MODERATE QUALITY OF EVIDENCE).

Water-jet function of Flushknife versus Flexknife: There were no statically significant differences between water-jet function of Flushknife and Flexknife (Takeuchi 2010).
(MODERATE QUALITY OF EVIDENCE)

0.13% hyaluronic acid group versus normal saline in EMR: There were no statically significant differences in the complications rate between endoscopic mucosal resection using 0.13% HA versus NS (Yoshida 2012)
(MODERATE QUALITY OF EVIDENCE)

Complete resection rate
HES (hydroxyethyl starch) plus epinephrine (E) versus standard solution of NS (normal saline) plus epinephrine (E) for lateral spreading tumors: There were no statically significant differences in the rate of complete resection between HES+E and NS+E (Fasoulas 2012)
(MODERATE QUALITY OF EVIDENCE).

Cold snare polypectomy versus traditional polypectomy: There were no statically significant differences between studies that compared cold snare polypectomy (CSP) versus traditional polypectomy
(MODERATE QUALITY OF EVIDENCE).

CSP (cold snare polypectomy) versus CFP (cold forceps polypectomy): Lee 2013 concluded that CSP is superior to cold forceps polypectomy (CFP) for the endoscopic removal of DCPs with regard to completeness of polypectomy
(MODERATE QUALITY OF EVIDENCE).

EMR using a snare with a conventional single-channel colonoscopy versus EMR using a ligation device: Sakata 2006 concluded that endoscopic resection with a ligation device might be the most applicable procedure for rectal carcinoid tumors less than 10 mm not estended beyond the sub-mucosal layer
(MODERATE QUALITY OF EVIDENCE)

0.13% hyaluronic acid group versus normal saline in EMR: One study (Yoshida 2012) concluded Endoscopic mucosal resection using 0.13% HA to colon polyps of less than 20 mm diameter is more effective than NS for complete resection.
(MODERATE QUALITY OF EVIDENCE)

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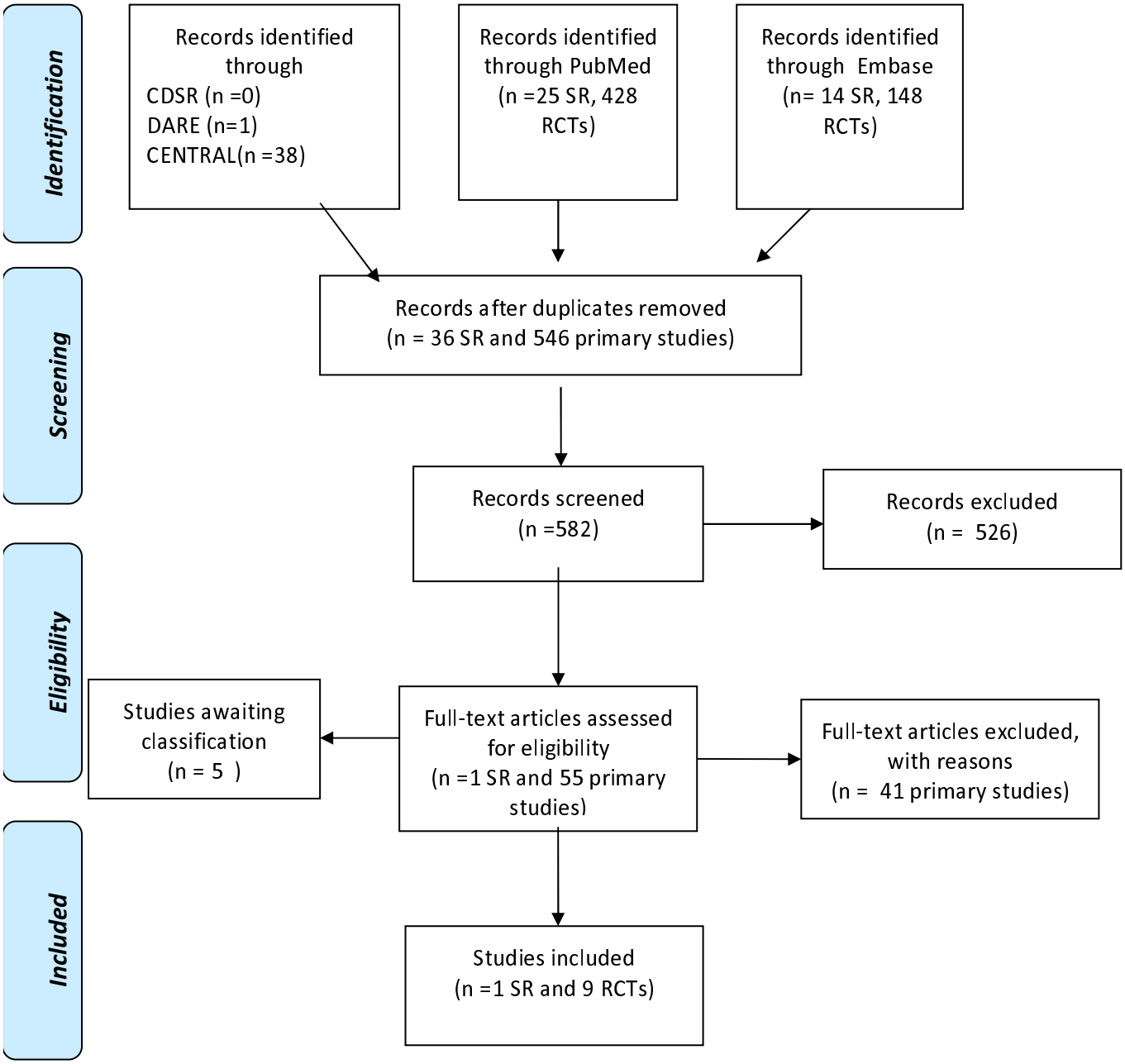
PRISMA 2009 Flow Diagram



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e la Prevenzione Oncologica ir

MINIMUM RATE OF EN-BLOC RESECTION RATE

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Cristina Bellisario, MSc, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte
Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical question

4.7 In patients undergoing removal of non-stalked colorectal polyps up to (1) 2cm what is the minimum rate of en-bloc resection rate?

P: Patients undergoing removal of non-stalked colorectal polyps up to (1) 2cm

I: En-bloc resection rate

C: Piecemeal resection rate

O: Incomplete resection rate/need for repeated procedure/rate of recurrence/complications

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

(Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** (en-bloc [Text Word] OR piecemeal [Text Word] OR "methods" [Subheading]) **AND** ((flat[Text Word] OR depressed[Text Word] OR "non stalked"[Text Word] OR nonpedunculated[Text Word] OR nonpolypoid[Text Word] OR sessile[Text Word] OR "non pedunculated" [Text Word] OR "non polypoid"[Text Word]) AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh])) **AND** ("complications" [Subheading] OR complete*[Text Word] OR incomplete*[Text Word] OR complication[Text Word] OR complications[Title/Abstract] OR "Recurrence"[Text Word] OR recurrences[Title/Abstract] OR "Intestinal Perforation"[Mesh] OR perforation[Text Word] OR bleeding [Text Word] OR "Gastrointestinal Hemorrhage"[Mesh] OR hemorrhage [Title/Abstract] OR haemorrhage [Title/Abstract] OR "adverse effects" [Subheading]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR

meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'surgery'/exp OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** (en-bloc:ab,ti OR piecemeal:ab,ti OR 'procedures'/exp) **AND** ((flat:ab,ti OR depressed:ab,ti OR "non stalked":ab,ti OR nonpedunculated:ab,ti OR nonpolypoid:ab,ti OR "non pedunculated":ab,ti OR "non polypoid":ab,ti OR sessile:ab,ti) AND ('adenoma'/exp OR adenoma:ab,ti OR polyp:ab,ti OR lesion:ab,ti OR polyps:ab,ti OR lesions:ab,ti OR 'colon polyp'/exp)) **AND** ('adverse outcome'/exp OR Complete*:ab,ti OR incomplete*:ab,ti OR 'complication'/exp OR complication:ab,ti OR complications:ab,ti OR 'intestine perforation'/exp OR perforation:ab,ti OR 'gastrointestinal hemorrhage'/exp OR hemorrhage:ab,ti OR haemorrhage:ab,ti OR 'bleeding'/exp OR bleeding:ab,ti OR 'recurrence risk'/exp OR recurrence:ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Dissection] explode all trees
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU]
#3 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#4 #1 or #2 or #3
#5 Any MeSH descriptor with qualifier(s): [Methods - MT]
#6 en-bloc or piecemeal:ti,ab,kw (Word variations have been searched)
#7 #5 or #6
#8 Flat or depressed or non-stalked or nonpedunculated or nonpolypoid or sessile:ti,ab,kw (Word variations have been searched)
#9 MeSH descriptor: [Colonic Polyps] explode all trees
#10 MeSH descriptor: [Adenoma] explode all trees
#11 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#12 #10 or #11 or #9
#13 #12 and #8
#14 Any MeSH descriptor with qualifier(s): [Adverse effects - AE, Complications - CO]
#15 MeSH descriptor: [Intestinal Perforation] explode all trees
#16 MeSH descriptor: [Gastrointestinal Hemorrhage] explode all trees
#17 MeSH descriptor: [Recurrence] explode all trees
#18 complete or incomplete or complication or Recurrence or perforation or bleeding or hemorrhage:ti,ab,kw (Word variations have been searched)
#19 #14 or #15 or #16 or #17 or #18
#20 #4 and #7 and #13 and #19 Publication Year from 2000 to 2015

Primary studies

PubMed

(Polypectomy [Text Word] OR polypectomies[Title/Abstract] OR resection[Text Word] OR "surgery" [Subheading] OR remov*[Title/Abstract] OR "Dissection"[Mesh]) **AND** (en-bloc [Text Word] OR piecemeal[Text Word] OR "methods" [Subheading]) **AND** ((flat[Text Word] OR depressed[Text Word] OR "non stalked"[Text Word] OR nonpedunculated[Text Word] OR

nonpolypoid[Text Word] OR sessile[Text Word] OR "non pedunculated" [Text Word] OR "non polypoid"[Text Word]) AND ("Adenoma"[Text Word] OR polyp[Text Word] OR lesion[Text Word] OR polyps[Title/Abstract] OR lesions[Title/Abstract] OR "Colonic Polyps"[Mesh])) **AND** ("complications" [Subheading] OR complete*[Text Word] OR incomplete*[Text Word] OR complication[Text Word] OR complications[Title/Abstract] OR "Recurrence"[Text Word] OR recurrences[Title/Abstract] OR "Intestinal Perforation"[Mesh] OR perforation[Text Word] OR bleeding [Text Word] OR "Gastrointestinal Hemorrhage"[Mesh] OR hemorrhage [Title/Abstract] OR haemorrhage [Title/Abstract] OR "adverse effects" [Subheading]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('endoscopic polypectomy'/exp OR polipectomy:ab,ti OR polipectomies:ab,ti OR 'surgery'/exp OR 'dissection'/exp OR dissection:ab,ti OR resection:ab,ti OR remove*:ab,ti) **AND** (en-bloc:ab,ti OR piecemeal:ab,ti OR 'procedures'/exp) **AND** ((flat:ab,ti OR depressed:ab,ti OR "non stalked":ab,ti OR nonpedunculated:ab,ti OR nonpolypoid:ab,ti OR "non pedunculated":ab,ti OR "non polypoid":ab,ti OR sessile:ab,ti) AND ('adenoma'/exp OR adenoma:ab,ti OR polyp:ab,ti OR lesion:ab,ti OR polyps:ab,ti OR lesions:ab,ti OR 'colon polyp'/exp)) **AND** ('adverse outcome'/exp OR Complete*:ab,ti OR incomplete*:ab,ti OR 'complication'/exp OR complication:ab,ti OR complications:ab,ti OR 'intestine perforation'/exp OR perforation:ab,ti OR 'gastrointestinal hemorrhage'/exp OR hemorrhage:ab,ti OR haemorrhage:ab,ti OR 'bleeding'/exp OR bleeding:ab,ti OR 'recurrence risk'/exp OR recurrence:ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Dissection] explode all trees
#2 Any MeSH descriptor with qualifier(s): [Surgery - SU]
#3 Polypectomy or resection or remove:ti,ab,kw (Word variations have been searched)
#4 #1 or #2 or #3
#5 Any MeSH descriptor with qualifier(s): [Methods - MT]
#6 en-bloc or piecemeal:ti,ab,kw (Word variations have been searched)
#7 #5 or #6
#8 Flat or depressed or non-stalked or nonpedunculated or nonpolypoid or sessile:ti,ab,kw (Word variations have been searched)
#9 MeSH descriptor: [Colonic Polyps] explode all trees
#10 MeSH descriptor: [Adenoma] explode all trees
#11 Adenoma or polyp or lesion:ti,ab,kw (Word variations have been searched)
#12 #10 or #11 or #9
#13 #12 and #8
#14 Any MeSH descriptor with qualifier(s): [Adverse effects - AE, Complications - CO]
#15 MeSH descriptor: [Intestinal Perforation] explode all trees
#16 MeSH descriptor: [Gastrointestinal Hemorrhage] explode all trees
#17 MeSH descriptor: [Recurrence] explode all trees
#18 complete or incomplete or complication or Recurrence or perforation or bleeding or hemorrhage:ti,ab,kw (Word variations have been searched)
#19 #14 or #15 or #16 or #17 or #18
#20 #4 and #7 and #13 and #19 Publication Year from 2000 to 2015

RESULTS

Results of bibliographic search

Results of the bibliographic searches: after removing duplicates, 1289 articles (21 reviews and 1268 primary studies) were found.

Four systematic reviews were found and acquired in full text; 26 primary studies were considered potentially relevant and acquired in full text (See flow chart)

Excluded studies

All the systematic reviews were excluded: two (Puli 2009, Liggi 2014) because they included only patients with large (> 2 cm) non pedunculated polyps; one (Belderbos 2014) because the vast majority of included studies enrolled patients with large (> 2 cm) non pedunculated polyps and no separate data for lesions ≤ 2 cm were reported; one (Belle 2014) because it is a summary of the Belderbos 2014 review.

About 26 primary study, 18 were excluded for the following reasons: 7 did not report results for the comparison of interest (East 2013, Masci 2013, Grov 2014, Wang 2014, Draganov 2012, Mahadeva 2009, Su 2005); 3 involved patients not meeting the inclusion criteria (e.g, patients with polyps > 2 cm, or polyps located in other organs) (Probs 2009, Fujishiro 2007, Navaneethan,2014), 1 did not consider the outcome of interest for lesion smaller than 2 cm (Santos 2011) and 7 did non presented the outcome of interest separate for en-bloc and piecemeal resections (Cipolletta 2014, Curcio 2015,Park 2005, Kim 2013, Barros 2014, Byeon 2011, Bergman 2003).

Awaiting assessment

Two studies were not retrieved (Heldwein 2005, Higaki 2003).

Included studies

Finally, six primary studies were included (Belle 2014, Kaltenbach 2007, Mannath 2011, Pohl 2013, Serrano 2012, Woodward 2012).

All the studies included patients undergoing removal of non-stalked colorectal polyps up to 1-2 cm and compared the incidence of polyp recurrence after en bloc resection and piecemeal resection.

A total number of 1067 patients were included with 684 en-bloc and 370 piecemeal resections.

All studies were cohort studies: two were prospective studies (Pohl 2013, Belle 2014), of which one (Belle 2014) enrolled consecutive patients. Four studies presented data prospectively collected and audited retrospectively (Mannath 2011 Kaltenbach 2007,Woodward 2012, Serrano 2012).

All studies are representative of the average population of the exposed and non-exposed cohorts. The assessment of outcome was made by record linkage and the follow-up was enough adequate. The follow-up ranged between 3–6 months (Woodward 2012) and 6 years (Belle 2014) after the initial resection. Three studies did not report on the adequacy of follow up of cohorts, one study had a complete follow up (Pohl 2013) and two studies described by flow-chart the dropouts reporting follow up >70 % of patients (Belle 2014, Kaltenbach 2007).

	N of en bloc resection	**N of piecemeal resection**	**Incomplete resection rate**	**Polyp recurrence n (%) Follow-up (FU)**	**Complications**
Belle 2014	102 lesions	42 lesions		En bloc: 10/102 (10%) Piecemeal: 5/42 (12%) Adjunctive APC ablation: 12/24 (50%) Resection in two procedures:2/9 (22%) (FU:6 years) Multivariate analysis: OR: 1.930 [95%CI 1.326; 2.809] No patient in the study cohort developed colorectal cancer after EMR	Bleeding in 14 %; Perforation occurred in 13 cases.
Kaltenbach 2007	49 lesions	67 lesions	All residual tissue occurred in lesions that were initially resected in the piecemeal technique, (FU: 4.5 ±1.4 years)	No patient developed or died of advanced colorectal cancer or distant metastasis.	2 cases of early bleeding (1.8%, 95% CI 0.2%-6.2%) within 24 hours of the procedure
Mannath 2011	54	67		En-bloc: 2/54 (3.47%) piecemeal :12/67 (17.9%) *The incidence density of polyp recurrence:* piecemeal =13.1 (95% CI 7.43–23.03) En-bloc= 2.7 (95% CI 0.67–10.78) per 100 person-years of follow-up. *The incidence rate ratio (IRR)* piecemeal group vs en-bloc group =4.85 (95% CI 1.09–21.68, P = 0.038). (FU: 12 months (IQR 8–24))	Four patients (3.3%) in the piecemeal group and 3 (2.5%) in the en-bloc group had minor bleeding

Pohl 2013	286	54	En bloc:24/286 (8.4%) Piecemeal: 11/54 (20.4%) RR (95% CI) Piecemeal vs En-bloc Univariate analysis(reference en bloc): 2.43 (1.27–4.66) *Multivariate(reference en bloc): 1.41 (0.66–2.98)	(FU: not reported)	
Serrano 2012	79 (76 < 2 cm)	61 (36 < 2 cm)		En bloc: 9 /79 (11.4%) Piecemeal: 8 /61 (13%) (FU:15.9 ± 8.9 months)	Complications occurred in 8 of the 140 procedures (5.7%). There were 6 intra-procedure minor bleeding (4.3%) and 1 delayed bleeding (0.7%). Perforation occurred in one (0.7%) case following the EMR of a 15mm 0–IIa lesion in the sigmoid colon
Woodward 2012	117	104	En bloc:2/117 (2%) Piecemeal:16/104 (15%). At multivariate analysis adjusting for polyps site and lifting sign the risk of residual neoplasia at follow up colonoscopy was significantly higher with piecemeal resection: OR 3.21 (95%CI 1.48-6.99)	(FU: 3–6 months after the initial resection)	

Quality of evidence

Study limitations (risk of bias): one study (Serrano 2012) did not adjust for confounding; three studies did not reported number of subjects lost at follow up.
Inconsistency of results: yes for incomplete resection
Indirectness of evidence: no
Imprecision: no for recurrence and incomplete resection but yes for complication
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low for all outcomes. All primary studies were cohort studies and in three out of six cases did not report the dropout and follow-up for all outcomes.
For incomplete resection there was inconsistency of results. For complication only one study reported separate results for en-bloc and piecemeal resections.

CONCLUSIONS:

Incomplete resection rate: two out of three studies that assessed this outcome found that incomplete resection is more common with piecemeal resection.
(VERY LOW QUALITY OF EVIDENCE)

Recurrence: all the three studies that assessed this outcome shown more recurrence in en-bloc resection
(VERY LOW QUALITY OF EVIDENCE)

Complications: no serious complications occurred. Data available for en-bloc vs piecemeal resection are only from one study which assessed 121 resections: four patients (3.3%) in the piecemeal group and 3 (2.5%) in the en-bloc group had minor bleeding
(VERY LOW QUALITY OF EVIDENCE)

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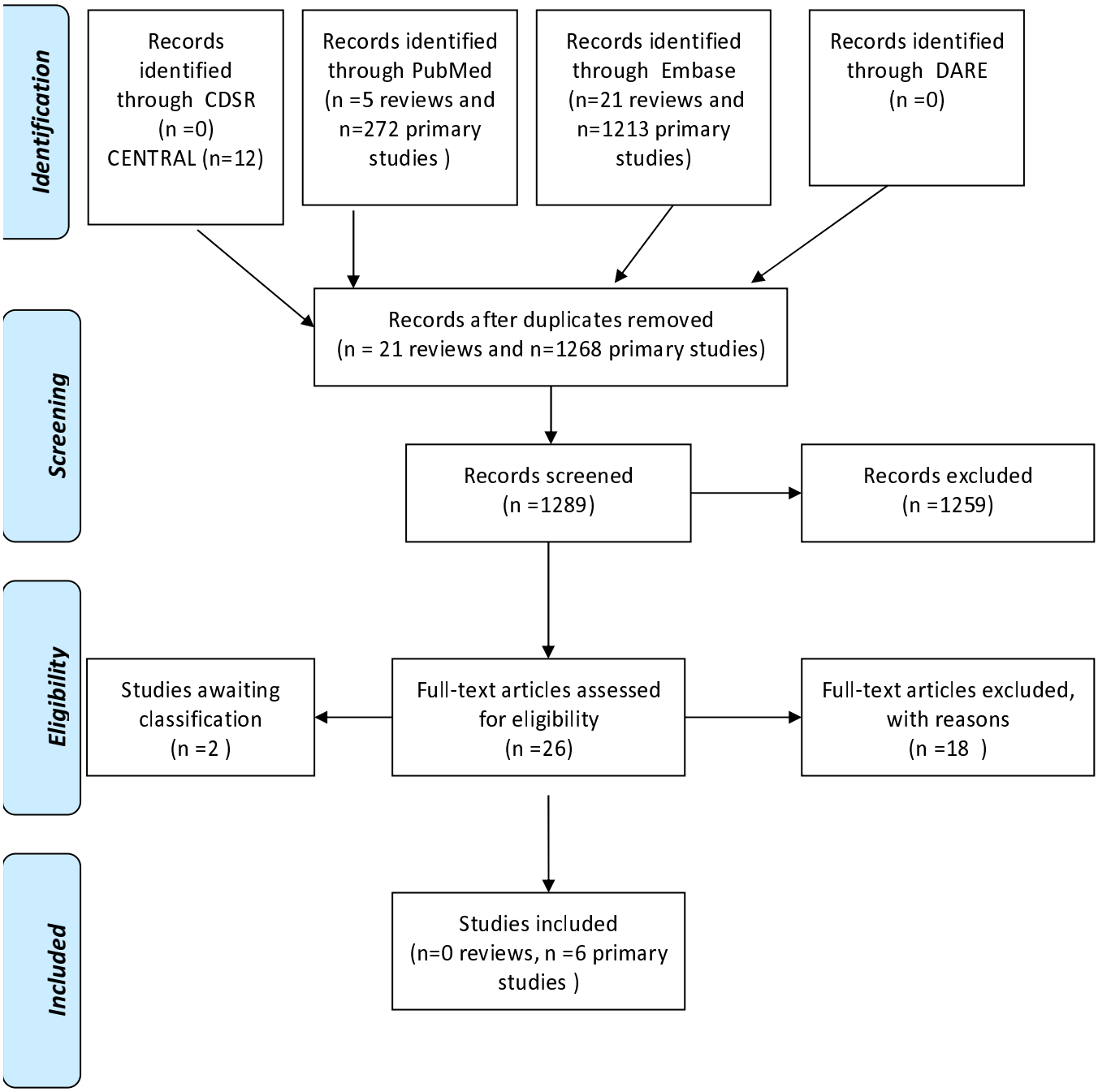
PRISMA 2009 Flow Diagram –



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5. ACCURATE MEASURE OF COMPLICATIONS

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Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical questions

5.1 **In patients undergoing screening/diagnostic/diagnostic + biopsy/therapeutic colonoscopy what is the most accurate measure of complications?**

P: Patients undergoing screening/diagnostic/diagnostic + biopsy/therapeutic colonoscopy

I: Phone call/paper or electronic survey after 30 days on bleeding/perforation/ hospital records review

C: Patient reporting on bleeding/perforation

O: Mortality/ access to emergency department/Hospital stay/frequency of complications/ 30 days readmission rate

5.2 In patients undergoing screening/diagnostic/diagnostic + biopsy/therapeutic colonoscopy what is the most accurate measure of complications?

P: Patients undergoing screening/diagnostic/diagnostic + biopsy/therapeutic colonoscopy

I: 30-day readmission rate using healthcare registries/hospital records review

C: Patient reporting on bleeding/perforation

O: Mortality/Hospital stay/Patient experience

Bibliographic searches

Bibliographic searches were performed on Cochrane library, Pubmed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Hospitalization"[Mesh] OR "Hospital stay"[Title/Abstract] OR Hospitalization[Title/Abstract] OR "Emergency Service, Hospital"[Mesh] OR readmission[Title/Abstract] OR "mortality"[Subheading] OR "Mortality"[Mesh] OR mortality[Title/Abstract] OR "Patient experience"[Text Word] OR "complications" [Subheading] complication[Text Word] OR complications[Title/Abstract] OR "Intestinal Perforation"[Mesh] OR perforation[Text Word] OR bleeding [Text Word] OR "Gastrointestinal Hemorrhage"[Mesh] OR hemorrhage [Title/Abstract] OR haemorrhage [Title/Abstract] OR "adverse effects" [Subheading]) **AND** ("Questionnaires"[Mesh] OR survey[Text Word] OR "Outcome and Process Assessment (Health Care)"[Mesh] OR self-reported[Text Word] OR "Medical Records"[Mesh] OR Phone[Title/Abstract] OR telephone[Title/Abstract] OR record[Title/Abstract] OR records[Title/Abstract] OR registry[Title/Abstract] OR registries[Title/Abstract]) **AND** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('hospitalization'/exp OR hospitalization:ab,ti OR 'hospital stay' OR 'emergency ward'/exp OR readmission:ab,ti OR 'mortality'/exp OR mortality:ab,ti OR 'adverse outcome'/exp OR 'complication'/exp OR complication:ab,ti OR complications:ab,ti OR 'intestine perforation'/exp OR perforation:ab,ti OR 'gastrointestinal hemorrhage'/exp OR hemorrhage:ab,ti OR haemorrhage:ab,ti OR 'bleeding'/exp OR bleeding:ab,ti) **AND** ('questionnaire'/exp OR questionnaire:ab,ti OR survey:ab,ti OR 'medical assessment'/exp OR 'self report':ab,ti OR Phone:ab,ti OR telephone:ab,ti OR record:ab,ti OR records:ab,ti OR registry:ab,ti OR registries:ab,ti) **AND** (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 colonoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Colonoscopy] explode all trees
#3 #1 or #2
#4 MeSH descriptor: [Hospitalization] explode all trees 12412
#5 MeSH descriptor: [Emergency Service, Hospital] explode all trees
#6 MeSH descriptor: [Intestinal Perforation] explode all trees
#7 MeSH descriptor: [Gastrointestinal Hemorrhage] explode all trees
#8 Any MeSH descriptor with qualifier(s): [Adverse effects - AE, Complications - CO]
#9 mortality or complicationor perforation or bleeding or hemorrhage or hospital stay or readmission or hospitalization:ti,ab,kw (Word variations have been searched)
#10 #4 or #5 or #6 or #8 or #9 or #7
#11 MeSH descriptor: [Questionnaires] explode all trees
#12 MeSH descriptor: [Outcome and Process Assessment (Health Care)] explode all trees
#13 MeSH descriptor: [Medical Records] explode all trees
#14 questionnaire or self-reported or survey or telephone or record or registry:ti,ab,kw (Word variations have been searched)
#15 #11 or #13 or #12 or #14
#16 #15 and #10 and #3 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word]) **AND** ("Hospitalization"[Mesh] OR "Hospital stay"[Title/Abstract] OR Hospitalization[Title/Abstract] OR "Emergency Service, Hospital"[Mesh] OR readmission[Title/Abstract] OR "mortality"[Subheading] OR "Mortality"[Mesh] OR mortality[Title/Abstract] OR "Patient experience"[Text Word] OR "complications" [Subheading] complication[Text Word] OR complications[Title/Abstract] OR "Intestinal Perforation"[Mesh] OR perforation[Text Word] OR bleeding [Text Word] OR "Gastrointestinal Hemorrhage"[Mesh] OR hemorrhage [Title/Abstract] OR haemorrhage [Title/Abstract] OR "adverse effects" [Subheading]) **AND** ("Questionnaires"[Mesh] OR survey[Text Word] OR "Outcome and Process Assessment (Health Care)"[Mesh] OR self-reported[Text Word] OR "Medical Records"[Mesh] OR Phone[Title/Abstract] OR telephone[Title/Abstract] OR record[Title/Abstract] OR records[Title/Abstract] OR registry[Title/Abstract] OR registries[Title/Abstract]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('hospitalization'/exp OR hospitalization:ab,ti OR 'hospital stay' OR 'emergency ward'/exp OR readmission:ab,ti OR 'mortality'/exp OR mortality:ab,ti OR 'adverse outcome'/exp OR 'complication'/exp OR complication:ab,ti OR complications:ab,ti OR 'intestine perforation'/exp OR perforation:ab,ti OR 'gastrointestinal hemorrhage'/exp OR hemorrhage:ab,ti OR haemorrhage:ab,ti OR 'bleeding'/exp OR bleeding:ab,ti) **AND** ('questionnaire'/exp OR questionnaire:ab,ti OR survey:ab,ti OR 'medical assessment'/exp OR 'self report':ab,ti OR Phone:ab,ti OR telephone:ab,ti OR record:ab,ti OR records:ab,ti OR registry:ab,ti OR registries:ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 colonoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Colonoscopy] explode all trees
#3 #1 or #2
#4 MeSH descriptor: [Hospitalization] explode all trees
#5 MeSH descriptor: [Emergency Service, Hospital] explode all trees
#6 MeSH descriptor: [Intestinal Perforation] explode all trees
#7 MeSH descriptor: [Gastrointestinal Hemorrhage] explode all trees
#8 Any MeSH descriptor with qualifier(s): [Adverse effects - AE, Complications - CO]
#9 mortality or complicationor perforation or bleeding or hemorrhage or hospital stay or readmission or hospitalization:ti,ab,kw (Word variations have been searched)
#10 #4 or #5 or #6 or #8 or #9 or #7
#11 MeSH descriptor: [Questionnaires] explode all trees
#12 MeSH descriptor: [Outcome and Process Assessment (Health Care)] explode all trees
#13 MeSH descriptor: [Medical Records] explode all trees
#14 questionnaire or self-reported or survey or telephone or record or registry:ti,ab,kw (Word variations have been searched)
#15 #11 or #13 or #12 or #14
#16 #15 and #10 and #3 Publication Year from 2000 to 2015

RESULTS

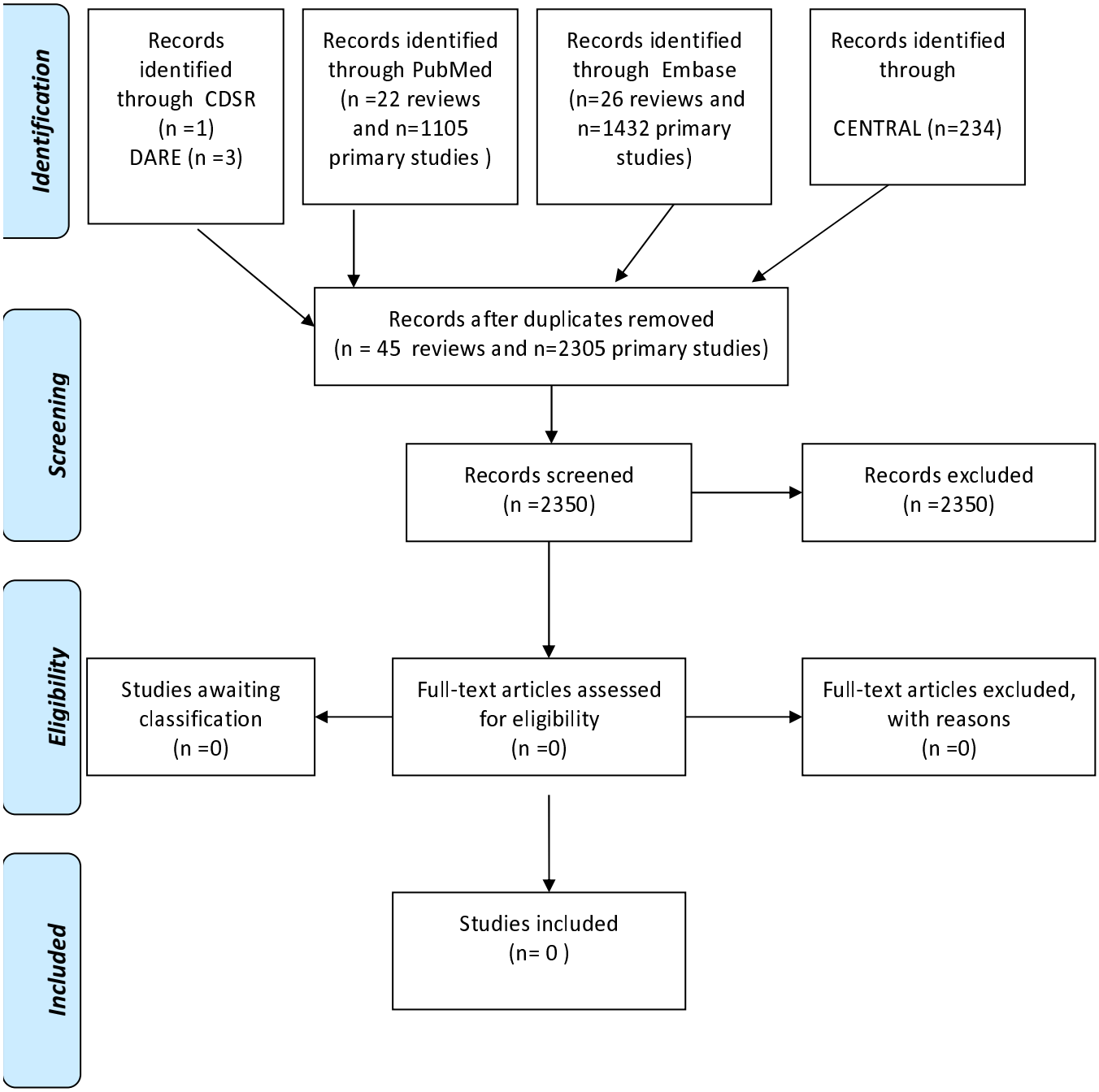
Results of the bibliographic searches

After removing duplicates, 2350 articles (45 systematic reviews and 2305 primary studies) were found. No relevant studies were found addressing these questions.

CONCLUSIONS

No conclusion can be drawn about what is the most accurate measure of complications comparing spontaneous self-reporting of complications with phone call/survey/hospital records review/general health care registries.

PRISMA 2009 Flow Diagram –



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Competence in screening/diagnostic colonoscopies and polypectomies

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Literature Group Coordinator: Carlo Senore, MD, S.C. Epidemiologia, Screening e Registro Tumori- CPO Piemonte

Clinical questions

6.1 What is the minimum number (overall or annual) of screening/diagnostic colonoscopies to achieve competence?

P: Endoscopists performing screening/diagnostic colonoscopies

I: Minimum number of colonoscopies (overall or annual)

C: Lower than "I"

O: Caecal intubation rate/adenoma detection rate/need for assistance from colleagues / patient experience

6.2 What is the most appropriate measurement method to assess competence in screening/diagnostic colonoscopy?

P: Endoscopists performing screening/diagnostic colonoscopies

I: Learning curves/semi-objective assessment tools (like DOPS)

C: Minimum number of colonoscopies

O: Caecal intubation rate/adenoma detection rate/need for assistance from colleagues / patient experience

6.3 What is the minimum number of polypectomies to achieve competence?

P: Endoscopists performing polypectomies during colonoscopy

I: Minimum number of polypectomies

C: Lower than "I"

O: Complete resection rate/ en-bloc resection rate/need for assistance from colleagues

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 using the following search strategies:

Systematic reviews and meta-analysis

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word] OR polipectom* [Text Word] OR "Colonic Polyps"[Mesh] OR "Adenomatous Polyps"[Mesh] OR adenoma[Text Word] OR Polyp[Text Word]) AND ("Quality of Health Care"[Mesh] OR competence[Text Word] OR "Patient Acceptance of Health Care"[Mesh] OR acceptance [Text Word] OR resection[Text Word] OR performance [Text Word] OR quality[Text Word] OR volume [Text Word] OR "caecal intubation" [Text Word] OR "Patient experience" [Text Word] OR "completion rate" [Text Word] OR "detection rate" [Text Word]) AND ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'endoscopic polypectomy'/exp OR polipectom*:ab,ti OR 'colon polyp'/exp OR 'adenomatous polyp'/exp) AND ('health care quality'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR competence:ab,ti OR acceptance:ab,ti OR resection:ab,ti OR performance:ab,ti OR quality:ab,ti OR volume:ab,ti OR 'caecal intubation':ab,ti OR 'completion rate':ab,ti OR 'detection rate':ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy or polipectomy or adenoma or polyp:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Quality of Health Care] explode all trees
#5 MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6 competence or acceptance or resection or performance or quality or volume:ti,ab,kw (Word variations have been searched)
#7 "caecal intubation" or "patient experience" or "completion rate" or "detection rate"
#8 #4 or #5 or #6 or #7
#9 #8 and #3 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop*[Text Word] OR polipectom* [Text Word] OR "Colonic Polyps"[Mesh] OR "Adenomatous Polyps"[Mesh] OR adenoma[Text Word] OR Polyp[Text Word]) AND ("Quality of Health Care"[Mesh] OR competence[Text Word] OR "Patient Acceptance of Health Care"[Mesh] OR acceptance [Text Word] OR resection[Text Word] OR performance [Text Word] OR quality[Text Word] OR volume [Text Word] OR

"caecal intubation" [Text Word] OR "Patient experience" [Text Word] OR "completion rate" [Text Word] OR "detection rate" [Text Word]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'endoscopic polypectomy'/exp OR polipectom*:ab,ti OR 'colon polyp'/exp OR 'adenomatous polyp'/exp) AND ('health care quality'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR competence:ab,ti OR acceptance:ab,ti OR resection:ab,ti OR performance:ab,ti OR quality:ab,ti OR volume:ab,ti OR 'caecal intubation':ab,ti OR 'completion rate':ab,ti OR 'detection rate':ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy or polipectomy or adenoma or polyp:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Quality of Health Care] explode all trees
#5 MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6 competence or acceptance or resection or performance or quality or volume:ti,ab,kw (Word variations have been searched)
#7 "caecal intubation" or "patient experience" or "completion rate" or "detection rate"
#8 #4 or #5 or #6 or #7
#9 #8 and #3 Publication Year from 2013 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 1038 reviews were found. Five of them were considered potentially relevant and acquired in full text (See flow chart). Search of primary studies were limited from August 2013 (the date of the most updated searches of the retrieved systematic reviews); after removing duplicates, 5108 primary studies were found. Twelve primary studies were judged as potentially relevant and acquired in full text.

Awaiting classification

For one study we were unable to retrieve the full text so it was classified as awaiting classification (Verna 2014).

Excluded studies

Three reviews were excluded (Corley 2011, McLachlan 2012, Tinmouth 2014) because the intervention and outcome of interest were not assessed.

Six primary studies were excluded: one (ASGE 2014) because description of a new version of two ACE evaluation tools (for colonoscopy and EGD) developed by ASGE, but without evaluation, one (Park 2013) as already included in the systematic review, one (Cohen 2015) as t was an

editorial without useful data, one (Harewood 2015) as it was a letter without useful data, one (Mueller 2014) as it did not report on the outcome of interest and one (Rex 2015) as the intervention of interest had not been assessed.

Included studies

Two reviews were included (Ekkelenkamp 2015, Shahidi 2014). Five primary studies published after the systematic review were included (Barnes 2014, Boo 2015, Choi 2014, Ritter 2013, Ward 2014)

Clinical question 6.1: What is the minimum number (overall or annual) of screening/diagnostic colonoscopies to achieve competence?

Two systematic reviews (Ekkelenkamp 2015, Shahidi 2014) and two primary studies (Barnes 2014, Ward 2014) addressed this question.

Ekkelenkamp 2015 included 50 studies on colonoscopy 12 of which addressed this question.

Shahidi 2014 included 10 studies which addressed this question. The overlapping of the included studies was of 50%.

In the studies included by Ekkelenkamp 2015 the number of colonoscopies that trainees needed to perform in order to achieve a CIR of >85–90% varied from 100 to 280 procedures. The two studies of the highest quality reported 275 and 280 procedures needed to achieve a 90% CIR.

In the studies included by Shahidi 2014, 10 studies used ≥ 90% cecal intubation rate (CIR) as marker of competence and 5 reported that a range of 141 to 305 colonoscopies were necessary . 6 studies used CIR in conjunction with a caecal intubation time (CIT) limit, and 1 study used CIR with a total procedural time (TPT) limit as markers of competence. Time limit ranged between 15 and 30 minutes. Competency was achieved using their respective CIT limits in 5 studies between a range of 101 and 300 Colonoscopies. Two studies provided more comprehensive definitions of competence. One study used a definition of "completely independent CSPY" that incorporated multiple aspects of CSPY, including caecal intubation, polypectomy and haemostasis: 500 colonoscopies were necessary to achieve competence. One study used the Mayo Colonoscopy Skills Assessment Tool (MCSAT) to establish both definitions of competency and competency thresholds: 400 colonoscopies were necessary to achieve competence.

Ward 2014 was a retrospective case series assessing the range of experience required by individuals to attain a caecal intubation rate (CIR) greater-than or equal to 90%, by the Moving Average method and the learning curve cumulative summation (LC-Cusum) method on 297 trainees undertook 36730 colonoscopies. 233 procedures were necessary to achieve a caecal intubation rate of 90% according to the moving average method; 41% trainees were judged competent after 200 procedures according to the LC-Cusum method.

Barnes 2014 was a retrospective case series assessing the number of colonoscopies necessary to achieve competence on 29 surgery residents. The quality standards used as reference were the ones set forth ASGE/ACG Taskforce on Quality in Endoscopy:

1. cecal intubation rate of 90%.;
2. adenoma detection rate in screening colonoscopies of 25% for male and 15% for females;
3. Length of time to remove the colonoscope of 6 minutes.

The study found that general surgery residents can obtain proficiency in colonoscopy in fewer than 140 procedures.

Quality of evidence
Study limitations (risk of bias): Ekkelenkamp 2015 was judged of high quality whereas Shahidi 2014 was judges of low quality according to AMSTAR checklist. The two case series had no serious limitations
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed

CONCLUSIONS

The number of colonoscopies that trainees needed to perform in order to achieve a CIR of >85–90% varied from 100 to 280 procedures
(**QUALITY OF EVIDENCE FROM HIGH TO LOW**).
The two studies of the highest quality reported 275 and 280 procedures needed to achieve a 90% CIR
(**HIGH QUALITY OF EVIDENCE**)

Clinical question 6.2: What is the most appropriate measurement method to assess competence in screening/diagnostic colonoscopy?

One systematic review addressed this question (Ekkelenkamp 2015). Four studies included in the review assessed competence by learning curves or other measurement tool: the three of higher quality showed that GAGES displayed a plateau score at n=75 procedures (GRADE quality of evidence: moderate), with the MCSAT scale competence was reached after 275 procedure; in the same study CIR >85% was reached after 275 procedures as well (GRADE quality of evidence: high); with the RAFC assessment tool competence was reached after 150 colonoscopies; in the same study CIR of 91% was reached after 150 procedures as well (GRADE quality of evidence high) .
Moreover six studies which assessed validity and reliability of the assessment tools and scales were included. One of the two studies of highest quality reported that DOPS has a reliability of 0.81 (high) and that 72.6% of candidates and 92.9% of assessors experienced DOPS as valid. (GRADE quality of evidence high). The other study reported that with MCSAT, the correlation between average and overall cognitive and motor scores was 0.79 and 0.88, respectively, ($p<0.01$) and that difference in scores were related to experience ($p<0.01$).

One primary study (Ritter 2013) was found which evaluated the ability of the SCOPE tool to assess endoscopic skills objectively. The study included 35 endoscopists stratified into three cohorts, based on self reported colonoscopy experience: N: novice (0–50 colonoscopies; n: 11), I: intermediate (51–139 colonoscopies; n :13), E: experienced (>140 colonoscopies; n: 11). Two trials of simulation colonoscopy were performed by each participant. An investigator, not blinded, assigned the scores to each participants. This preliminary study showed that the SCOPE tasks can differentiate between groups expected to have different levels of technical skill (Total score: N (218; range, 155–280), I (335; range, 299–371), E (395; range, 371–419) ($p < 0.0001$).

Quality of evidence
Study limitations (risk of bias): Ekkelenkamp 2015 was judged of high quality according to AMSTAR checklist ;
high risk of bias for Ritter 2013 due to possible selection bias, detection bias (no blinding)
Inconsistency of results: no
Indirectness of evidence: no
Imprecision: no for MCSAT and DOPS, yes for SCOPE
Publication bias: not assessed

CONCLUSIONS

The MCSAT and DOPS assessment forms seem to be the best forms to document progress or proficiency levels
(**HIGH QUALITY OF EVIDENCE**).
No conclusion can be drawn for the SCOPE assessment tool because only one small simulation study was found

Clinical question 6.3: What is the minimum number of polypectomies to achieve competence?

None of the retrieved systematic reviews addressed this question
Two primary studies were found addressing this question (Bo 2015, Choi 2014).
Bo 2015 was a prospective cohort study comparing endoscopic en bloc resection rates, adverse events rate and polypectomy time between 3 experienced and 3 trainees endoscopist and assessing number of cases that need to be performed to achieve adequate technical competence in the procedure. Technical competence with CP improved gradually and its achievement was associated with an accumulation of approximately 250 procedures
Choi 2014 was a retrospective cohort study comparing completeness of polypectomies between 2 experienced and 7 fellows endoscopists and assessing the experience level of fellows who achieve competence. After 300 polypectomies, the complete resection rate of the fellows was comparable to that of the experts.

Quality of evidence
Study limitations (risk of bias): no serious limitations were found
Inconsistency of results :no
Indirectness of evidence: no
Imprecision: yes (only two studies with 10 trainees endoscopists who performed 750 CP procedures in 405 patients in one study and 2080 polypectomies in the second study)
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as vey low because of imprecision

CONCLUSIONS

A minimum of 250 -300 polypectomies are necessary to achieve competence measured by complete resection and en bloc resection
(**VERY LOW QUALITY OF EVIDENCE**) .

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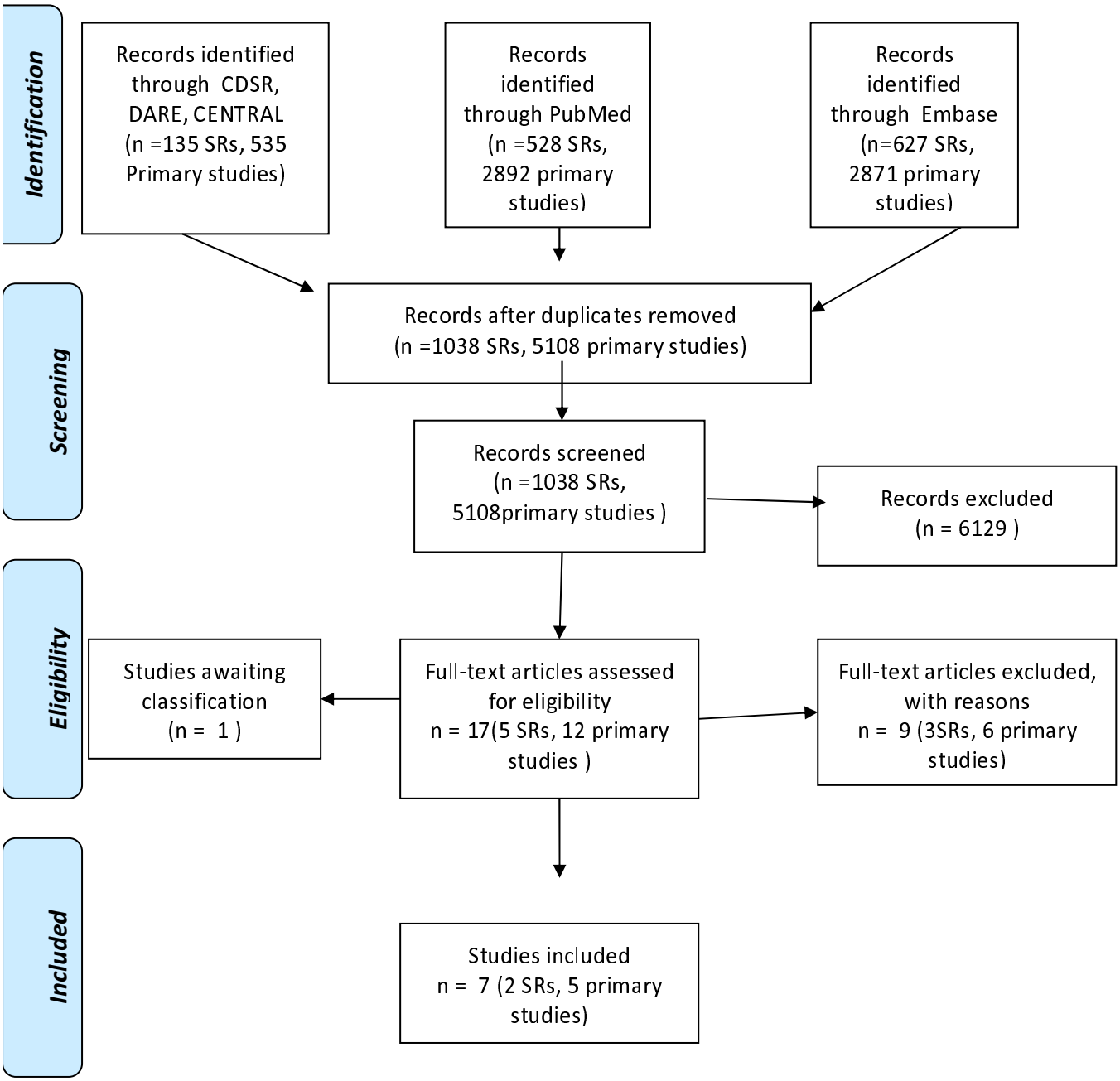
PRISMA 2009 Flow Diagram



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ACCURATE MEASURE OF PATIENT'S EXPERIENCE

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Clinical questions

7.1 In patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy what is the most accurate measure of patient experience?

P: Patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy with moderate/no sedation

I: Assessed by endoscopist/nurse (questionnaire)

C: Self-reported

O: Rate of severe/moderate pain or no pain/ patient experience (i.e. anxiety, discomfort, rate of patients reporting to be prepared for repeat procedure)

7.3 In patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy what is the most accurate measure of patient experience?

P: Patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy

I: Assessed by the patients on the day after the procedure (phone/mailed survey)

C: Self-reported immediately after the procedure

O: Rate of patients reporting to be prepared for repeat procedure, Rate of severe/moderate pain or no pain/ anxiety, discomfort

Bibliographic searches

Bibliographic searches were performed on Cochrane Library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews

PubMed

("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract] OR "Sigmoidoscopy" [Mesh] OR sigmoidoscop* [Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) AND ("Patient Acceptance of Health Care"[Mesh] OR pain [Text Word] OR Anxiety [Text Word] OR worry [Text Word] OR worries [Text Word] OR distress [Text Word] OR acceptability [Text Word] OR acceptance [Text Word] OR "psychology" [Subheading] OR discomfort[Text Word] OR comfort[Text Word] OR "Patient experience" [Text Word]) AND ("Questionnaires"[Text Word] OR "Questionnaire"[Text Word] OR survey[Text Word] OR "Outcome and Process Assessment (Health Care)"[Mesh] OR "Nursing Assessment"[Mesh] OR self-reported[Text Word]) AND ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) AND ('anxiety'/exp OR anxiety:ab,ti OR worry:ab,ti OR worries:ab,ti OR distress:ab,ti OR 'patient preference'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR acceptability:ab,ti OR discomfort:ab,ti OR comfort:ab,ti) AND ('questionnaire'/exp OR questionnaire:ab,ti OR survey:ab,ti OR 'medical assessment'/exp OR 'self report':ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE)

#1 colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Colonoscopy] explode all trees
#3 MeSH descriptor: [Sigmoidoscopy] explode all trees
#4 #1 or #2 or #3
#5 MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6 MeSH descriptor: [Pain] explode all trees
#7 MeSH descriptor: [Anxiety] explode all trees
#8 pain or Anxiety or worry or worries or distress or acceptability or acceptance or discomfort or comfort:ti,ab,kw (Word variations have been searched)
#9 Any MeSH descriptor with qualifier(s): [Psychology - PX]
#10 #5 or #6 or #7 or #8 or #9
#11 MeSH descriptor: [Questionnaires] explode all trees
#12 MeSH descriptor: [Outcome and Process Assessment (Health Care)] explode all trees
#13 MeSH descriptor: [Nursing Assessment] explode all trees
#14 questionnaire or self-reported or survey:ti,ab,kw (Word variations have been searched)
#15 #11 or #12 or #13 or #14
#16 #4 and #10 and #15 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract] OR "Sigmoidoscopy" [Mesh] OR sigmoidoscop* [Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) AND ("Patient Acceptance of Health Care"[Mesh] OR pain [Text Word] OR Anxiety [Text Word] OR worry [Text Word] OR worries [Text Word] OR distress [Text Word] OR acceptability [Text Word] OR acceptance [Text Word] OR "psychology" [Subheading] OR discomfort[Text Word] OR comfort[Text Word] OR "Patient experience" [Text Word]) AND ("Questionnaires"[Text Word] OR "Questionnaire"[Text Word] OR survey[Text Word] OR "Outcome and Process Assessment (Health Care)"[Mesh] OR "Nursing Assessment"[Mesh] OR self-reported[Text Word]) NOT ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) AND ('anxiety'/exp OR anxiety:ab,ti OR worry:ab,ti OR worries:ab,ti OR distress:ab,ti OR 'patient preference'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR acceptability:ab,ti OR discomfort:ab,ti OR comfort:ab,ti) AND ('questionnaire'/exp OR questionnaire:ab,ti OR survey:ab,ti OR 'medical assessment'/exp OR 'self report':ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Central Register of Controlled Trials (CENTRAL)

#1	colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
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#3	MeSH descriptor: [Sigmoidoscopy] explode all trees
#4	#1 or #2 or #3
#5	MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6	MeSH descriptor: [Pain] explode all trees
#7	MeSH descriptor: [Anxiety] explode all trees
#8	pain or Anxiety or worry or worries or distress or acceptability or acceptance or discomfort or comfort:ti,ab,kw (Word variations have been searched)
#9	Any MeSH descriptor with qualifier(s): [Psychology - PX]
#10	#5 or #6 or #7 or #8 or #9
#11	MeSH descriptor: [Questionnaires] explode all trees
#12	MeSH descriptor: [Outcome and Process Assessment (Health Care)] explode all trees
#13	MeSH descriptor: [Nursing Assessment] explode all trees
#14	questionnaire or self-reported or survey:ti,ab,kw (Word variations have been searched)
#15	#11 or #12 or #13 or #14
#16	#4 and #10 and #15 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 1447 articles (19 reviews and 1428 primary studies) were found. No relevant systematic reviews were found; six primary studies were considered potentially relevant and acquired in full text. (See flow chart)

Excluded studies

Three studies were excluded: Robb 2012 because patients received flexible sigmoidoscopy and different questions were given at post procedure and three months follow up questionnaire, so no comparison was possible; Altman 2006 because no comparison between different times or methods was performed; Carter 2013 compared high-anxiety patients (n=27) and low-anxiety patients (n=44) evaluated immediately after the procedure in outpatient endoscopy and 1 week later via telephone, but results of the comparison between the assessment immediately after the procedure and the one performed one week later was not reported .

Included studies

Three studies were finally included, performing four comparisons. Two (Harewood 2001, Ko 2009) compared two survey collection method, two studies (Lin 2007; Ko 2009) compared different time to assess patients satisfaction and complaint. In all the studies patients included in the studies were a mix of patients who had received upper endoscopy or colonoscopy

Clinical question 7.1: Survey-Collection Method

Harewood 2001 was a randomized controlled trial with 63 participants which compared three questionnaire distribution strategies (mail, phone, or e-mail) within 1 week after their procedure. For our purpose the email and traditional mail strategy were considered as a self report assessment methods and were compared to phone assessment done by endoscopist/nurse. The questionnaire used was ASGE (American Society for Gastrointestinal Endoscopy) patient satisfaction questionnaire. The mean satisfaction scores in each group (maximum possible total satisfaction score was 35) were 31.2 (SD =3.5, range =20–35) for e-mail, 29.5 (SD = 4.9, range = 19–35) for standard mail, and 31.8 (SD= 1.8, range = 27–34) for phone, with no significant differences in scores among the groups..

In Ko 2009 patients assessed at follow up were randomized to receive a telephone survey or a self report questionnaire sent by mail. Out of the 141 patients available for follow up assessment, patients randomized to telephone survey were more likely to give a higher satisfaction rating compared with patients randomized to the mail-out surveys (average rating increased by 0.26, P =0.047).No further data were reported.

Quality of evidence

Study limitations (risk of bias): no relevant limitation for Harewood 2001; the study was a low risk selection bias and attrition bias, at unclear risk of detection bias; blinding of participants was impossible and not applicable for this question.

Serious limitation for Ko 2009: the study was at unclear risk of selection bias and at high risk of performance, detection and attrition bias

Inconsistency of results one study did not find differences whereas the other found higher satisfaction rating over the telephone compared with the mail-out surveys

Indirectness of evidence: patients included in the studies were a mix of patients who had received upper endoscopy or colonoscopy

Imprecision: only two studies with 204 participants

Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low because of risk of bias, imprecision , inconsistency

CONCLUSIONS
Results of only two small studies, reported conflicting results, one showing no difference and the other higher satisfaction when survey were conducted by phone by a endoscopist/nurse. No conclusion can be drawn because of inconsistency of results
(**VERY LOW QUALITY**).

Clinical question 7.3: Survey-Collection time

Ko 2009 was an uncontrolled cohort study comparing satisfaction scores post-procedure questionnaires compiled on the procedure day an identical questionnaire (telephone or mail) administered at least 1 week later on 261 patients who underwent EGD, colonoscopy, or both (only 23.1% patients underwent only EGD). The questionnaire was a 9 item instrument (mGHAA-9) modified by the American Society for Gastrointestinal Endoscopy from the original Group Health Association of America patient satisfaction survey. The mGHAA-9 inspected the following
6 aspects of endoscopic experiences: (1) waiting time for an appointment, (2) waiting time before the procedure, (3) personal manner (courtesy, respect, sensitivity, friendliness) of the physician performing the procedure, (4) personal manner of the nurses and support staff, (5) technical skills (thoroughness, carefulness, competence) of the physician performing the procedure (6)adequacy of explanation of the procedure. The remaining 3 questions include the overall rating of the visit and inquiries into whether the patient would have the procedure done again by the same physician or at the same facility.
141 patients completed the follow up assessment. Follow-up time ranged from 7 to 84 days after the procedure, with a mean (SD) of 39±26 days. Patients were less satisfied (average rating decreased by mean 0.35 points, P=0.029) and recalled experiencing more pain during procedures (average rating increased by mean 0.44 points, P =0.012) when questioned at a later date (i.e. more than 14 days after the procedure). No further results were reported.

Lin 2007 is a quasi randomized trial that compared satisfaction scores obtained by using on-site (OS) surveys before leaving the recovery unit versus mail-back (MB) surveys 1 week later among 1336 patients who underwent routine elective upper endoscopies and colonoscopies. The questionnaire used was a 11-question survey on the patient's satisfaction with the nurses and the physician, the waiting time, the bowel-preparation process, the patient education, the procedural comfort and sedation. Patients answered each question with a numerical score on a Likert scale, which ranged from 1 (worst) to 7 (best).. There was a trend toward higher values for mean satisfaction scores in the OS group for 9 of 11 questions. The difference in scores was statistically significant (P<0.05 after Bonferroni correction) for 5 questions that concerned nurse satisfaction, physician satisfaction, bowel-preparation comfort, post-procedure education, and overall satisfaction. The differences for the other 6 questions, including pain during and after the procedure,, were not statistically significant. The authors considered also stratification by procedure type (upper endoscopy vs colonoscopy) and they evaluated that type of procedure did not affect scores.

Quality of evidence
Study limitations (risk of bias): One study had very serious limitation because of high risk of selection bias, detection and attrition bias. The second study had very serious limitation because of study design (uncontrolled study) and high risk of attrition bias .
Inconsistency of results: no
Indirectness of evidence: patients included in the studies were a mix of patients who had received upper endoscopy or colonoscopy: the delayed assessment were done 1 week later or more and not 1 day after the procedure
Imprecision: no
Publication bias: not assessed

Overall quality of evidence The overall quality of evidence was judged as very low because of study design and indirectness.

CONCLUSIONS
In one study patients were less satisfied and recalled experiencing more pain during procedures when questioned at a later date (i.e. more than 14 days after the procedure).In the second study a trend toward higher values for overall satisfaction scores in the post procedure assessment group and no significant difference for pain were found
(**VERY LOW QUALITY**)

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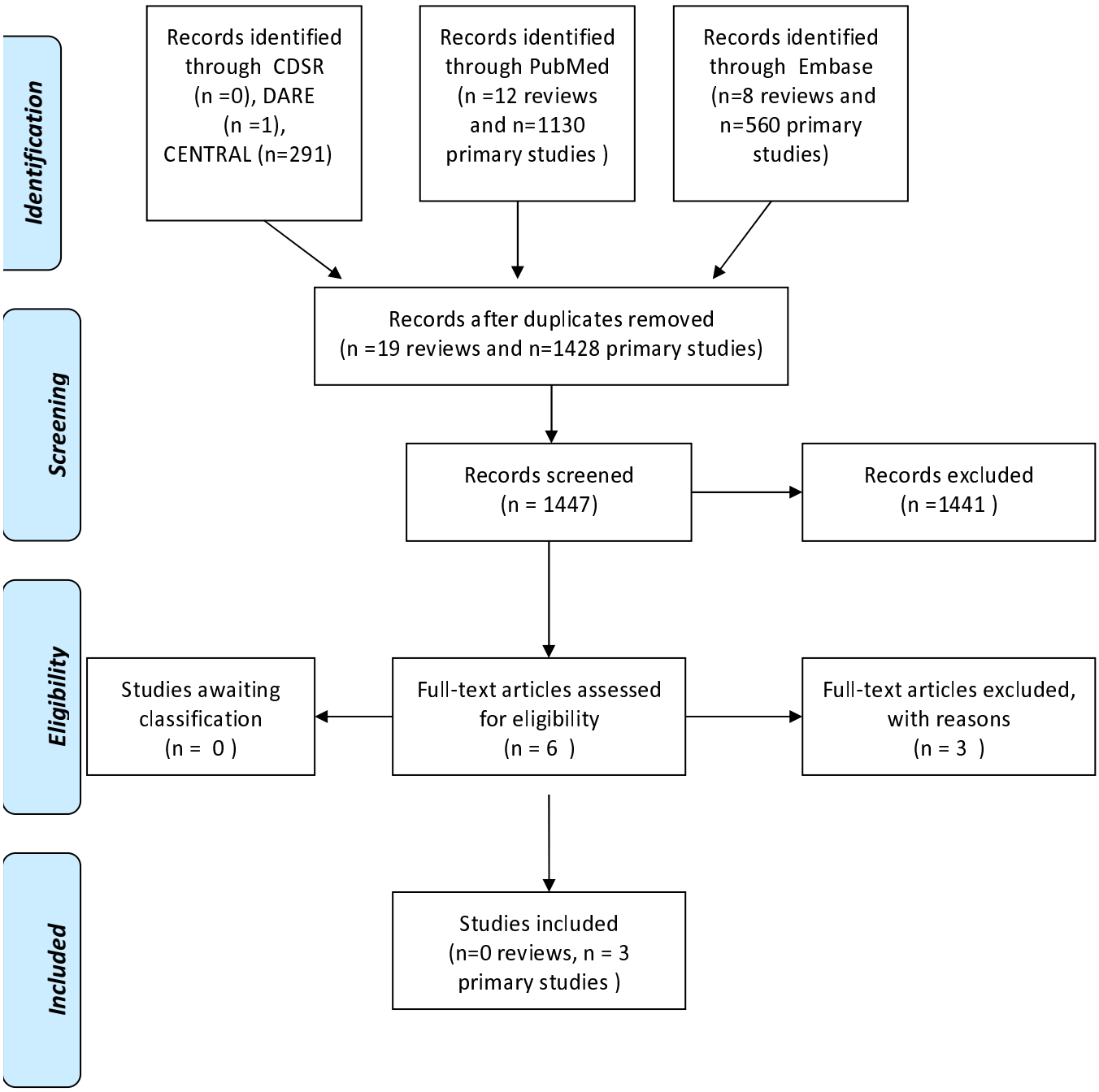
PRISMA 2009 Flow Diagram –



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ACCURATE SCALE OF PAIN/DISCOMFORT

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Clinical question

7.2 In patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy what is the most accurate scale to measure pain/discomfort?

P: Patients undergoing screening/diagnostic/therapeutic colonoscopy or sigmoidoscopy with moderate/no sedation

I: VRS

C: VAS

O: Rate of severe/moderate pain or no pain/other measures (validity, responsiveness etc).

Bibliographic searches

Bibliographic searches were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 separately for systematic reviews and primary studies using the following search strategies:

Systematic reviews

PubMed

("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract] OR "Sigmoidoscopy" [Mesh] OR sigmoidoscop* [Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) AND ("Patient Acceptance of Health Care"[Mesh] OR pain [Text Word] OR Anxiety [Text Word] OR worry [Text Word] OR worries [Text Word] OR distress [Text Word] OR acceptability [Text Word] OR acceptance [Text Word] OR "psychology" [Subheading] OR discomfort[Text Word] OR comfort[Text Word] OR "Patient experience" [Text Word]) AND ("VAS"[Text Word] OR "VRS"[Text Word] OR "verbal rating scale"[Text Word] OR "visual analogue scale"[Text Word] OR "Visual Analog Scale" [Text Word]) AND ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) AND ('anxiety'/exp OR anxiety:ab,ti OR worry:ab,ti OR worries:ab,ti OR distress:ab,ti OR 'patient preference'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR acceptability:ab,ti OR discomfort:ab,ti OR comfort:ab,ti) AND ('visual analog scale'/exp OR VAS:ab,ti OR VRS:ab,ti OR 'visual analog scale':ab,ti OR 'visual analog ue scale':ab,ti OR 'verbal rating scale':ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR), Database of Abstracts of Reviews of Effects (DARE)

#1 colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#2 MeSH descriptor: [Colonoscopy] explode all trees
#3 MeSH descriptor: [Sigmoidoscopy] explode all trees
#4 #1 or #2 or #3
#5 MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6 MeSH descriptor: [Pain] explode all trees
#7 MeSH descriptor: [Anxiety] explode all trees
#8 pain or Anxiety or worry or worries or distress or acceptability or acceptance or discomfort or comfort:ti,ab,kw (Word variations have been searched)
#9 Any MeSH descriptor with qualifier(s): [Psychology - PX]
#10 #5 or #6 or #7 or #8 or #9
#11 MeSH descriptor: [Visual Analog Scale] explode all trees
#12 "VAS" or "VRS" or "verbal rating scale" or "visual analogue scale" or "Visual Analog Scale":ti,ab,kw (Word variations have been searched)
#13 #11 or #12
#14 #4 and #10 and #13 Publication Year from 2000 to 2015

Primary studies

PubMed

("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract] OR "Sigmoidoscopy" [Mesh] OR sigmoidoscop* [Title/Abstract] OR rectosigmoidoscop*[Title/Abstract]) AND ("Patient Acceptance of Health Care"[Mesh] OR pain [Text Word] OR Anxiety [Text Word] OR worry [Text Word] OR worries [Text Word] OR distress [Text Word] OR acceptability [Text Word] OR acceptance [Text Word] OR "psychology" [Subheading] OR discomfort[Text Word] OR comfort[Text Word] OR "Patient experience" [Text Word]) AND ("VAS"[Text Word] OR "VRS"[Text Word] OR "verbal rating scale"[Text Word] OR "visual analogue scale"[Text Word] OR "Visual Analog Scale" [Text Word]) **NOT** ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract]) **NOT** ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]) **NOT** Case Reports[ptyp]

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti OR 'sigmoidoscopy'/exp OR sigmoidoscop*:ab,ti OR rectosigmoidoscop*:ab,ti) AND ('anxiety'/exp OR anxiety:ab,ti OR worry:ab,ti OR worries:ab,ti

OR distress:ab,ti OR 'patient preference'/exp OR 'patient preference':ab,ti OR 'patient satisfaction'/exp OR 'patient satisfaction':ab,ti OR acceptability:ab,ti OR discomfort:ab,ti OR comfort:ab,ti) AND ('visual analog scale'/exp OR VAS:ab,ti OR VRS:ab,ti OR 'visual analog scale':ab,ti OR 'visual analog ue scale':ab,ti OR 'verbal rating scale':ab,ti) NOT (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim OR [animals]/lim OR 'case report'/exp OR 'case report' OR 'report of case')

Cochrane Central Register of Controlled Trials (CENTRAL)

#1	colonoscopy or sigmoidoscopy or rectosigmoidoscopy:ti,ab,kw (Word variations have been searched)
#2	MeSH descriptor: [Colonoscopy] explode all trees
#3	MeSH descriptor: [Sigmoidoscopy] explode all trees
#4	#1 or #2 or #3
#5	MeSH descriptor: [Patient Acceptance of Health Care] explode all trees
#6	MeSH descriptor: [Pain] explode all trees
#7	MeSH descriptor: [Anxiety] explode all trees
#8	pain or Anxiety or worry or worries or distress or acceptability or acceptance or discomfort or comfort:ti,ab,kw (Word variations have been searched)
#9	Any MeSH descriptor with qualifier(s): [Psychology - PX]
#10	#5 or #6 or #7 or #8 or #9
#11	MeSH descriptor: [Visual Analog Scale] explode all trees
#12	"VAS" or "VRS" or "verbal rating scale" or "visual analogue scale" or "Visual Analog Scale":ti,ab,kw (Word variations have been searched)
#13	#11 or #12
#14	#4 and #10 and #13 Publication Year from 2000 to 2015

RESULTS

Results of the bibliographic searches

After removing duplicates, 227 articles (5 reviews and 222 primary studies) were found.
No systematic reviews were found addressing this question.
Two primary studies were judged as potentially relevant and acquired in full text; from the reference list of retrieved studies seven potentially relevant articles were found and acquired in full text (See flow chart).

Excluded studies

One study retrieved by the bibliographic search was excluded because no comparison of the results of the two scales was provided (Ylinen, 2011). Out of the seven studies found in the reference lists, five were excluded (Downie 1978, Kunst 1996, Joyce 1975, Ohnhaus 1975, Seymour 1982) because investigating the correlation between VRS and VAS scales, an aim which was out of our interest.

Included studies

Three primary studies addressed this question (Skovlund 2005, Skovlund 1995, Breivik 2000)
All included studies compared the sensitivity of two commonly used pain-rating scales, the Visual Analog Scale (VAS) and the 4-point verbal rating scale (VRS) using stochastic simulation.

Skovlund 1995 involved patients with migraine attacks and Breivik, 2000 patients with acute pain after oral surgery. Only Skovlund 2005 considered patients undergoing flexible sigmoidoscopy screening for colorectal neoplasia.
Anyway, VAS results not inferior to the VRS for two studies (Skovlund 1995; Breivik, 2000) in contrast to Skovlund study (Skovlund 2005) demonstrating a higher sensitivity of the VAS compared with the VRS. We did not evaluate the methodological quality since there are not validated checklists evaluating the quality of simulation studies.

Author, publication year	Participants	Outcome	Comparisons	Study Type	Methods	Sensitivity results
Skovlund, 1995	268 migraine patients One migraine attack was randomized to treatment with placebo (n=47), the other attacks were treated with sumatriptan (n=221). The patients were instructed to take one tablet of study medication to treat a migraine attack.	Pain	Visual Analog Scale (VAS) Vs the 4-point verbal rating scale (VRS)	Stochastic simulation	Observations were sampled randomly and with replacement from the two distributions consisting of 221 pairs of observations (one "success or failure", and one VAS score) on sumatriptan and 47 pairs of observations on placebo. The simulated treatment and control groups were of equal size.	The simulations showed that the two response measures resulted in approximately equal power. VAS is not inferior to the verbal rating scale. Both scales seem *equally reliable* when used in controlled clinical trials in migraine
Skovlund, 2005	491 individuals healthy men and women randomly drawn from the population registry and invited to undergo a flexible sigmoidoscopy to screen for colorectal neoplasia.	Experience of pain or discomfort during the procedure	A 100 mm Visual Analog Scale (VAS) Vs the 4-point verbal rating scale (VRS)	Stochastic simulation	The simulation model mimics a parallel group study with 2 independent samples of patients (subset A (VAS) and subset B (4 point verbal scale)).	The present simulation study demonstrates a *higher sensitivity* of the VAS compared with the VRS-4.

Breivik, 2000	Patients in acute pain after oral surgery	Pain	Four-category verbal rating scale (VRS-4) and an 11-point numeric rating scale (NRS-11) Vs a 100-mm visual analogue scale (VAS).	Stochastic simulation	True mean "treatment" differences are known. It is important to maintain the true observed pairing between observations on different scales scored by the same patient on the same occasion. Theoretic assumptions regarding the relation between scores are thus avoided. Pairs of scores are sampled randomly from empiric distributions of observations with a known mean. Each simulation is repeated a large number of times, and different samples are drawn in each simulation sequence. The power to detect increasing known differences between such samples can then be estimated.	The simulation results demonstrated *similar sensitivity* of the NRS-11 and VAS when comparing acute postoperative pain intensity. The choice between the VAS and NRS-11 can thus be based on subjective preferences.

Quality of evidence

Study limitations (risk of bias): not assessed
Inconsistency of results: yes
Indirectness of evidence: yes (simulation studies, two out three studies on patient not undergoing colonoscopy)
Imprecision: no
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as very low for pain intensity outcome mainly because of studies simulation with indirectness of evidence and inconsistent results. Moreover, publication bias and study limitations could not be assessed.

CONCLUSIONS

No conclusion can be drawn about the superiority of the VAS or the VRS scale in assessing pain during colonoscopy because only one simulation study addressed this question on the relevant population, and two other simulation studies compared the scales on patients with pain form other causes.

References

Included studies

1. Breivik EK, Bjørnsson G, Skovlund E. A comparison of pain rating scales by sampling from clinical trial data. Clin J Pain. 2000;16:22–28Downie WW, Leatham PA, Rhid VM, et al. Studies with pain rating scales. Ann Rheum Dis. 1978;37:378–381.

2. Skovlund E, Flaten O. Response measures in the acute treatment of migraine. Cephalalgia. 1995;15:519–522.

3. Skovlund E, Bretthauer M, Grotmol T, Larsen IK, Hoff G. Sensitivity of pain rating scales in an endoscopy trial. Clin J Pain. 2005 Jul-Aug;21(4):292-6.

Excluded studies

1. Downie WW, Leatham PA, Rhid VM, et al. Studies with pain rating scales. Ann Rheum Dis. 1978;37:378–381.

2. Kunst G, Chrubasik S, Black AMS, et al. Patient-controlled epidural morphine for post-operative pain: verbal rating and visual analogue assessments of pain. Eur J Anaesth. 1996;13:117–129.

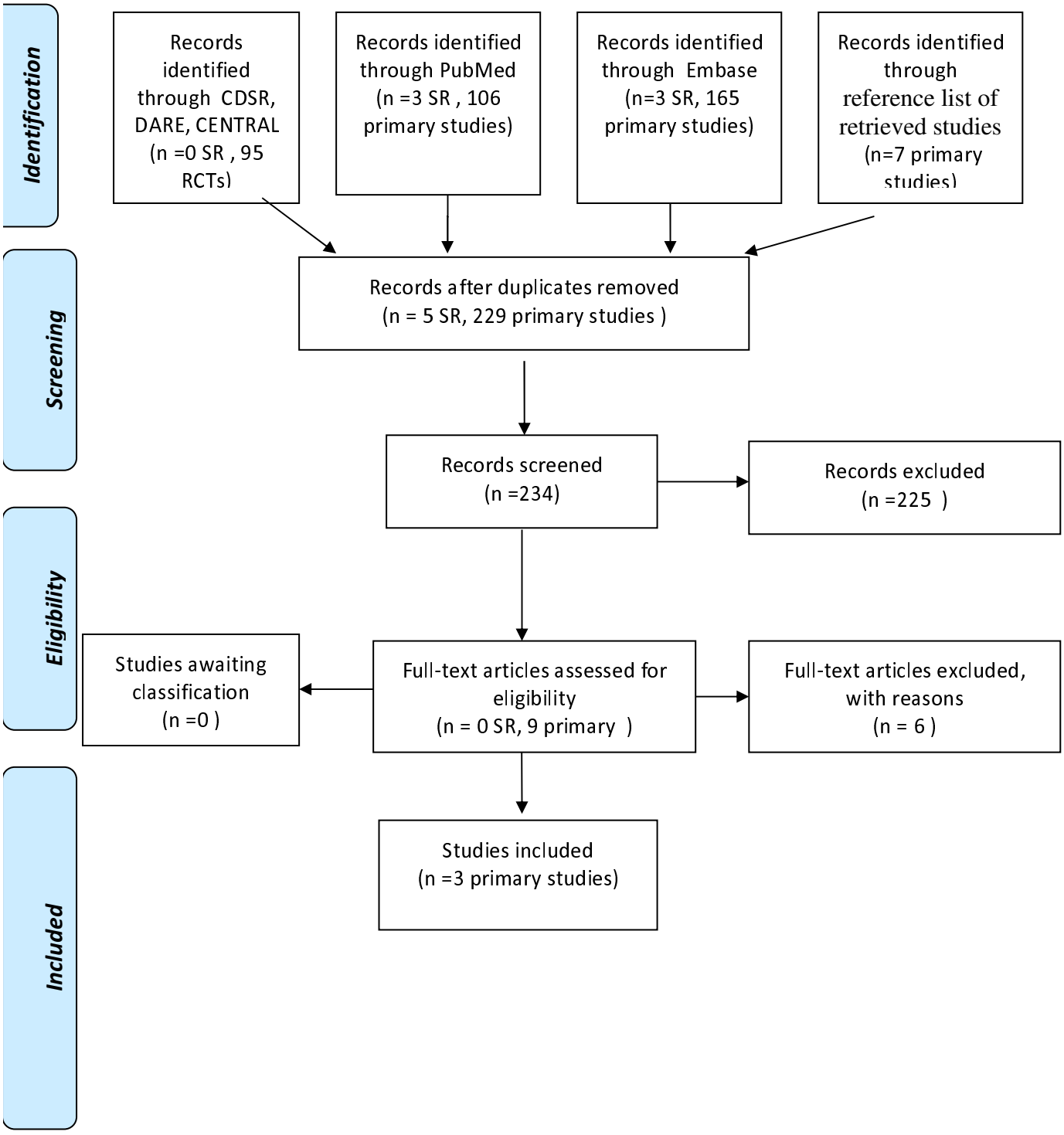
3. Joyce CRB, Zutshi DW, Hrubes V, et al. Comparison of fixed interval and visual analogue scales for rating chronic pain. Eur J Clin Pharmacol. 1975;8:415–420.

4. Ohnhaus EE, Adler R. Methodological problems in the measurement of pain: a comparison between the verbal rating scale and the visual analogue scale. Pain. 1975;1:379–384.

5. Seymour RA. The use of pain scales in assessing the efficacy of postoperative analgesics in post-operative dental pain. Eur J Clin Pharmacol. 1982;23:441–444

6. Ylinen ER, Vehviläinen-Julkunen K, Pietilä AM. The Colorado Behavioral Numerical Pain Scale in Assessing Medication-Free Colonoscopy Patients' Pain. Gastroenterol Nurs. 2011 Mar-Apr;34(2):136-43.

PRISMA 2009 Flow Diagram



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Appropriate sedation

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Clinical question

7.4 In patients undergoing screening/diagnostic colonoscopy what is the appropriate rate and type of sedation used?

P: Patients undergoing screening/diagnostic colonoscopy

I: Pre-procedure given sedation/Sedation on demand/Propofol sedation/conscious sedation

C: Unsedated colonoscopy

O: Rate of severe/moderate pain or no pain, patient satisfaction, willingness to repeat the procedure, caecal intubation rate / completion rate/ successful colonoscopy rate)

Bibliographic search

Bibliographic search strategies were performed on Cochrane library, PubMed, Embase, since 1/1/2000 to 28/2/2015 using the following search strategies:

Systematic reviews and meta-analysis

PubMed
("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract]) AND ("Conscious Sedation"[Mesh] OR "Deep Sedation"[Mesh] OR sedation[Text Word]) AND ("systematic review"[Title/Abstract] OR "systematic reviews"[Title/Abstract] OR cochrane[Title/Abstract] OR meta-analysis[Publication Type] OR "meta analysis"[Title/Abstract] OR metanalysis[Title/Abstract])

Embase
('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('conscious sedation'/exp OR 'deep sedation'/exp OR sedation:ab,ti) AND (cochrane OR 'systematic review'/de OR 'systematic review' OR 'systematic reviews'/de OR 'systematic reviews' OR 'meta analysis'/de OR 'meta analysis' OR metanalysis OR [cochrane review]/lim OR [meta analysis]/lim OR [systematic review]/lim)

Cochrane Database of Systematic Reviews (CDSR) and **Database of Abstracts of Reviews of Effects (DARE)**

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Conscious Sedation] explode all trees
#5 MeSH descriptor: [Deep Sedation] explode all trees
#6 sedation:ti,ab,kw (Word variations have been searched)
#7 #4 or #5 or #6
#8 #3 and #7 Publication Year from 2000 to 2015

Randomized controlled trials

PubMed

("Colonoscopy"[Mesh] OR colonoscop* [Title/Abstract]) AND ("Conscious Sedation"[Mesh] OR "Deep Sedation"[Mesh] OR sedation[Text Word]) AND ((Randomized Controlled Trial[ptyp] OR Controlled Clinical Trial[ptyp] OR randomized[Title/Abstract] OR placebo[Title/Abstract] OR "drug therapy" [Subheading] OR randomly [Title/Abstract] OR trial[Title/Abstract] OR group[Title/Abstract]) NOT ("animals"[MeSH Terms] NOT "humans"[MeSH Terms]))

Embase

('colonoscopy'/exp OR colonoscop*:ab,ti) AND ('conscious sedation'/exp OR 'deep sedation'/exp OR sedation:ab,ti) AND ('randomized controlled trial'/exp OR 'crossover procedure'/exp OR 'double blind procedure'/exp OR 'single blind procedure'/exp OR 'controlled clinical trial'/exp OR 'clinical trial'/exp OR placebo:ab,ti OR 'double blind':ab,ti OR 'single blind':ab,ti OR assign*:ab,ti OR allocat*:ab,ti OR volunteer*:ab,ti OR random*:ab,ti OR factorial*:ab,ti OR crossover:ab,ti OR (cross:ab,ti AND over:ab,ti))

Cochrane Central Register of Controlled Trials (CENTRAL)

#1 MeSH descriptor: [Colonoscopy] explode all trees
#2 colonoscopy:ti,ab,kw (Word variations have been searched)
#3 #2 or #1
#4 MeSH descriptor: [Conscious Sedation] explode all trees
#5 MeSH descriptor: [Deep Sedation] explode all trees
#6 sedation:ti,ab,kw (Word variations have been searched)
#7 #4 or #5 or #6
#8 #3 and #7 Publication Year from 2000 to 2015

RESULTS

The following comparison have been considered in selecting studies:

1. Any sedation vs no sedation
2. Proof sedation vs moderate sedation
3. Standard sedation vs sedation on demand/patient controlled sedation

Results of the bibliographic searches

After removing duplicates, 686 articles (43 reviews and 643 RCTs) were found. 2 systematic reviews and 18 RCTs were considered potentially relevant and acquired in full text. (See flow chart)

Excluded studies

The two reviews were excluded: one (McQuaid 2008) as it included studies both on upper and lower gastrointestinal endoscopy, without reporting separate results for colonoscopy; one (Werhmann 2009) because it is a summary of another already published systematic review.

Three primary studies were excluded: one (Pambianco 2011) because it compared a computer-assisted personalized sedation system integrating propofol delivery with patient monitoring versus standard care using a combination of a benzodiazepine and opioid; two (Stonell 2006, Tribonias 2010) because did they not assess our outcomes of interest.

Included studies

No systematic reviews were found fulfilling our inclusion criteria.

1. *Any sedation vs no sedation*

Two studies were found addressing this question (Cacho 2000, Petelenz 2004). We were unable to retrieve the full text of these studies so they were classified as awaiting classification.

2. *Proof sedation vs moderate sedation*

Five studies addressed this question (Amornyotin 2013, Paspatis 2011, Petelenz 2004, Rudner 2003, Van Natta 2006). For one of them we were unable to retrieve the full text, so it was classified as awaiting classification (Petelenz 2004); four studies enrolling total of 1852 adult patients who received colonoscopy were finally included. One study (Van Natta 2006) assessed pain during the procedure through a blinded research assistant recording the moans, grimaces and retreats (body movements that appeared to reflect pain).

Pain in the recovery room was assessed by a visual analogue scale from 0 to 100 in Van Natta 2006, by a visual analogue scale from 0 to 10 in Amornyotin 2013 and Rudner 2003.

Patients satisfaction was assessed by a visual analogue scale 0-100 in Van Natta 2006, by a four points scale in Amornyotin 2013 (1, very satisfied; 2, satisfied; 3, neutral; and 4, unsatisfied) and in Paspatis 2011 (1, unacceptable; 2, extremely uncomfortable; 3, slightly uncomfortable; 4, no discomfort).

	N of subjects	Caecal intubation rate	Pain assessed in the recovery room	Patients satisfaction	Complications
Amornyotin 2013			Proof sedation: Mean 0.86 (SD 1.18) Moderate sedation: Mean 2.41 (SD1.23), p<0.001	Proof sedation Very satisfied: 453/501 (90.4%) Moderate sedation Very satisfied: 288/481 (54.9%) p<0.001	No serious complications occurred. Any complications Proof sedation:280/518 (55.9%) Moderate sedation;60/514 (13.2%) p<0.001 Cardiovascular related Proof sedation:267/518 (53.3%) Moderate sedation;58/514 (12.7%) p<0.001 Respiratory related moderate sedation: none proof sedation: 0.8%<0.05
Paspatis 2011		Proof sedation: 257/258 (99.6%) Moderate sedation:257/262 (98 %) p=ns		Proof sedation no discomfort: 24/258 (9.3%) slightly uncomfortable:234/258(90.7%) Moderate sedation no discomfort: 21/262 (8%) slightly uncomfortable 241/262(92.%) p=ns	No serious complications occurred. All patients with significant respiratory depression were treated successfully with an increase in nasal oxygen to 5 l⁄ min
Rudner 2003			Moderate sedation group: mean: 0.4 (SD 0. 8) Proof sedation group: 0		

Van Natta 2006		100% in both group	Proof sedation: mean: 0.4 (SD 2) Moderate sedation F+P mean: 7.5 (SD 14.6) p<0.03 M+P mean: 5 (SD 16.7) p<0.06 F+M+P mean: 1.6 (SD 4.2) p<0.03	Proof sedation: mean: 99.4 (SD 1.3) Moderate sedation F+P mean: 98.2 (SD 3.8) p=ns M+P mean: 97.1 (SD 4.7) p=ns F+M+P mean: 98.6 (SD 3.7) p= ns	No serious complications occurred. No difference among the groups in the lowest systolic blood pressure, lowest diastolic blood pressure, lowest heart rate, or lowest oxygen saturation

Quality of evidence

Study limitations (risk of bias): no serious limitations were found for all but Rudner 2003 study which was judged at unclear risk for selection and detection bias
Inconsistency of results: no for caecal intubation rate and pain, yes for patients satisfaction
Indirectness of evidence: no
Imprecision: no
Publication bias not assessed

Overall quality of evidence
The overall quality of evidence was judged as high for all outcome but patient satisfaction, for which it was judged as moderate because of inconsistency

CONCLUSIONS

Caecal intubation rate: no significant difference were found in the two studies with 720 participants which assessed this outcome
(HIGH QUALITY OF EVIDENCE)

Pain assessed in the recovery room: proof sedation is associated with significant cant less pain , results coming from three studies with 1336 participants
(HIGH QUALITY OF EVIDENCE)

Patient's satisfaction: two studies with 720 participants reported no significant difference in overall satisfaction , whereas the third with 1032 participants found more satisfaction in patients who received proof sedation
(MODERATE QUALITY OF EVIDENCE)

Complications: no serious complications occurred. Complications, mainly cardiovascular and respiratory related, occurred in the propofol sedation groups. Data available form three studies with 1752 participants
(HIGH QUALITY OF EVIDENCE)

3. ***Standard sedation vs sedation on demand/patient controlled sedation***

Nine studies addressed this question (Bright 2003, Crepeau 2005, Heuss 2004, Kulling 2001, Lee 2002, Ng 2001, Nguyen 2013, Sterner 2000, Terruzzi 2001). For one of them we were unable to retrieve the full text, so it was classified as awaiting classification (Bright 2003); eight studies involving a total of 1040 adult patients undergoing colonoscopy were finally included.
Drug administered for sedation varied among studies: propofol in both group (Crepeau 2005, Heuss 2004), propofol and fentanyl in both group (Kulling 2001); propofol and fentanyl in the patient controlled sedation group and diazemuls and meperidine in the standard sedation group (Lee 2002); propofol in the patient controlled sedation group and intravenous midazolam in the standard sedation group (NG 2001); penthrox hand-held inhaler used for self-administration of methoxyflurane in the patient controlled sedation group and midazolam and fentanyl in the standard sedation group (Nguyen 2013); meperidine and midazolam in both group (Sterner 2000, Terruzzi 2001).

Pain and/or patient satisfaction were measured with a 0-100 mm VAS scale in 5 studies (Crepeau 2005, Heuss 2004, Kulling 2001, Lee 2002, Nguyen 2013) with a 4 point verbal score in 2 studies (Ng 2001, Terruzzi 2001), by a numeric rating scale from 0 to 10 in one (Sterner 2000).

	N of subiects	**Cecal intubation rate**	**Pain**	**Patients satisfaction**	**willingness to repeat the procedure**	**Complication**
Crepeau 2005	72			- *Patient controlled sedation* : 84.7 mm VAS scale - *Standard sedation*: 91.5 mm VAS scale No difference	*Patient controlled sedation* : 96.6% *Standard sedation*: 72.4% p = 0.03	Low oxygen saturation (< 94% under 6 LO2/min) episodes: - *Patient controlled sedation* : 8.5% - *Standard sedation* :37.1% p:0.05 Bradycardia - *Patient controlled sedation* : 17.4% - *Standard sedation* :25.7 % No difference None of the patients in the PCS group required special care while one patient in the control group was given an injection of atropine.
Heuss 2004	74	Colonoscopy completed successfully in all patients No difference	-*Patient controlled sedation*: 2.8(2.3) -*Standard sedation*: 2.0(2.2) No difference	-*Patient controlled sedation*: 1.6(2.1) -*Standard sedation*: 1.0(1.9) No difference	*Patient controlled sedation* :1.3(0.6) *Standard sedation*: 1.1(0.5) No difference	

Kulling 2001	150		*Patient controlled sedation with propofol and alfentanil*: 4.0, IQR 2.0-5.0 *continuous infusion of propofol and alfentanil:* 4.5, IQR 2.5-6.0 *midazolam and meperidine*: 3.0, IQR 1.0-5.0 No difference	*Patient controlled sedation with propofol and alfentanil*: 10, IQR 9.0-10.0) *continuous infusion of propofol and alfentanil* : 8.5, IQR 6.0-10.0, p vs PCS = 0.0033 *midazolam and meperidine* : 8.5, IQR 6.5-10.0, p vs PCS = 0.0094.		No serious respiratory or hemodynamic complications occurred with any drug regimen
Lee 2002	100	*Patient controlled sedation*: 92% *-standard sedation:* 90% No difference	- *Patient controlled sedation*: 4.9 (SD 3.1) cm - *standard sedation*: 3.7 (SD 2.9)cm No difference	- *Patient controlled sedation*: 7.7 (SD 2.4) cm -*standard sedation*: 7.6 (SD 2.1)cm No difference		Hypotension -PCS group :4% -standard sedation group: 28% p<0.01 Desaturation -PCS group :0% -standard sedation group: 8% p: 0.12
Ng 2001	88	Colonoscopy completed successfully in all patients	*Patient controlled sedation*: 1.1(1-1)	"very" or "mostly" satisfied - *Patient controlled sedation* 86.4%	*Patient controlled sedation* : 64% *Standard sedation* : 34%	

		No difference	range 1-2 *Standard sedation*: 1.1(1-1) range 1-5 No difference	- *Standard sedation*: 61.4% $p < 0.001$	$p = 0.006$.	
Nguyen 2013	251	*Patient controlled sedation*: 97% *Standard sedation*: 98% No difference	*Patient controlled sedation* vs *Standard sedation*: No statistically significant difference between two groups		*Patient controlled sedation* : 97% *Standard sedation*: results not given	Any adverse event *Patient controlled sedation*: 7% *Standard sedation* 7%
Sterner 2000	56		*Patient controlled sedation* : numeric rating score 4.68 ± 3.74 *Standard sedation*: numeric rating score 5.30 ± 3.53) No difference			No difference when comparing the cardiorespiratory parameters

Terruzzi 2001	249	-*On demand sedation:* 96% -*Standard sedation*: 63.6% No difference	-*On-demand sedation:* 34% -*Standard sedation*: 12.1% ($p < 0.001$)		-*On-demand sedation* 78% -*Standard sedation*: 90.3% ($p < 0.005$)	No major sedation-related complications occurred in either group vasovagal reaction: -*On-demand sedation* 2.4% -*Standard sedation*: 3.2% No difference

Quality of evidence

Study limitations (risk of bias): no serious limitation; for selection bias, in four studies method of random sequence generation was not reported and in six studies method for allocation concealment was not reported ; performance bias was not possible in all but two studies where a placebo patient controlled sedation was implemented; risk of detection bias was unclear in all but two studies, where outcome assessor was blinded; risk of attrition bias was low in all studies.
Inconsistency of results: no for cecal intubation rate yes for pain, patients satisfaction , willingness to repeat the procedure and complications
Indirectness of evidence: no
Imprecision: no
Publication bias: not assessed

Overall quality of evidence
The overall quality of evidence was judged as moderate because of inconsistency

CONCLUSIONS

Caecal intubation rate: no significant difference were found in the five studies with 762 participants which assessed this outcome
(HIGH QUALITY OF EVIDENCE)

Pain: no significant difference was found in four studies with 318 participants. One study with 249 participants reported more pain in the patient controlled sedation group.
(MODERATE QUALITY OF EVIDENCE)

Patient's satisfaction: three studies with 256 participants reported higher levels of patient's satisfaction with patient controlled sedation , whereas two studies with 238 participants found no significant difference
(MODERATE QUALITY OF EVIDENCE)

Complications: no serious complications occurred. Four studies, with 706 participants, did not fid significant difference. One study with 100 participants found significant more episodes of hypotension in the standard sedation group and another study, with 72 participants, found significant more episodes of low oxygen saturation
(HIGH QUALITY OF EVIDENCE)

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PRISMA 2009 Flow Diagram