# Colonic and Extracolonic Findings of CT Colonography in a Non-Screening Canadian Population at an Academic Centre

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# Introduction

- Optical colonoscopy (OC) is currently the gold standard for investigation of possible colorectal carcinoma (CRC)

- Computed tomographic colonography (CTC) is a minimally invasive alternative for CRC screening, with comparable performance to optical colonoscopy in a screening population[1-2]

- At our institution, CT colonography is reserved for patients unable to tolerate or have failed optical colonoscopy
  - Majority of patients are acutely symptomatic and referred following failed optical colonoscopy

[1]Johnson et al. Engl J Med 2008;359(12):1207-17.
[2]Pickhardt et al. N Engl J Med 2003;349(23):2191-200.

# Aim of Study

- Evaluate our institution's CT colonography performance in detecting colonic lesions and to assess the clinical and financial impact of extracolonic findings in a non-screening population at an academic centre

# Methodology

STEP 1 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Retrospective Review of All CTC Studies*

*completed between June 2012 and June 2013 at the University of British Columbia Hospital

STEP 2 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

Significant Colonic Findings?
(C-RADS C2, C3, C4, C0)

Significant Extracolonic Findings?
(E-RADS E3, E4)

Yes                    No                    No                    Yes

STEP 3 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
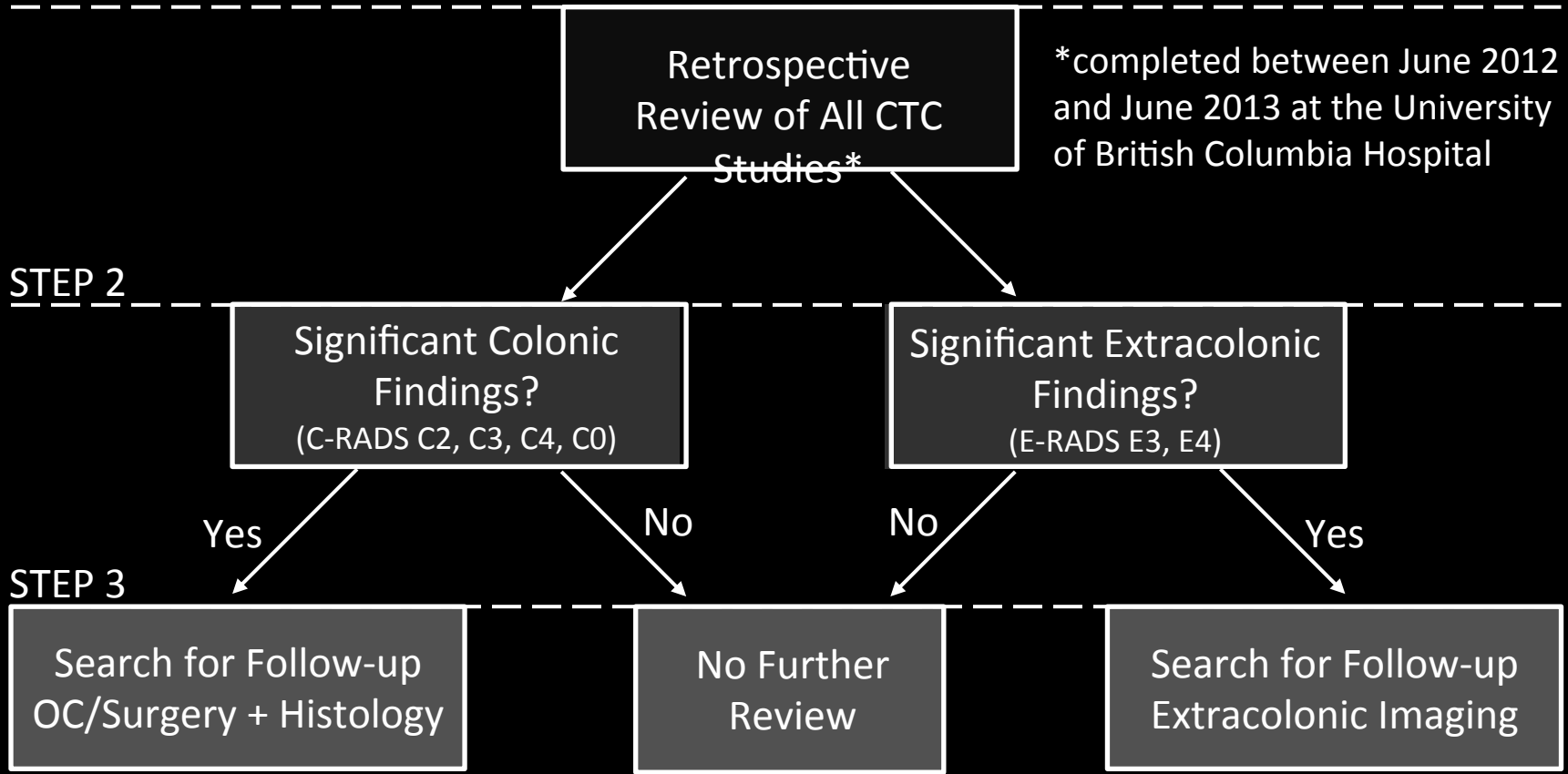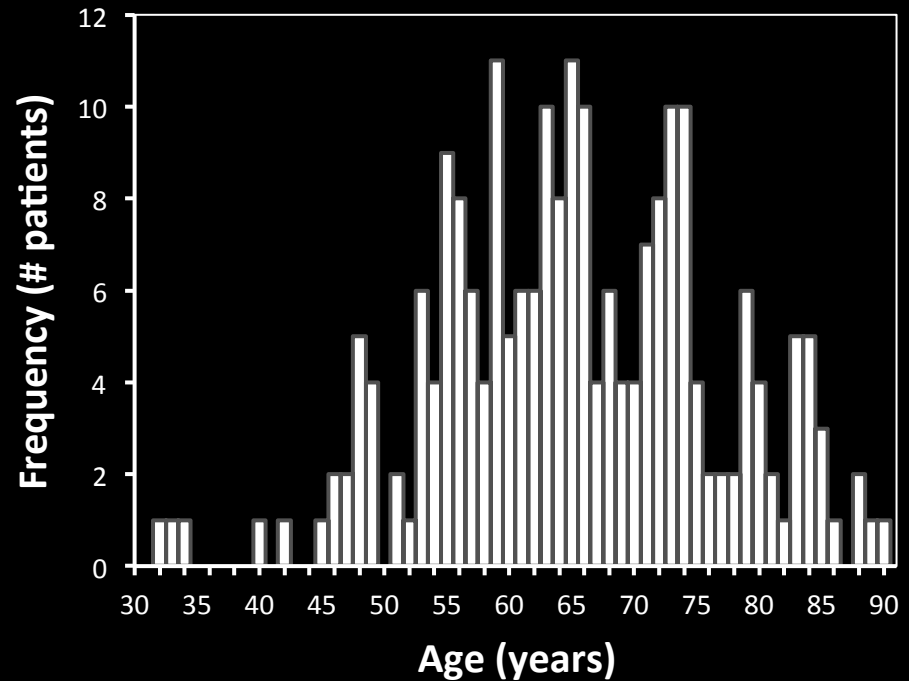
Search for Follow-up OC/Surgery + Histology

No Further Review

Search for Follow-up Extracolonic Imaging

# Results – Demographics

- **220 CTC studies found**
  - Between 06/2012 to 06/2013
  - Performed at UBC Hospital

- **Age**
  - Mean: 65.3 ± 11.1 years
  - Min: 32 years
  - Max: 90 years

- **Gender**
  - Male: 90
  - Female: 130

# Results – Indications

- 131 (59.5%) patients with known failed optical colonoscopy

- 89 (40.5%) patients without known failed optical colonoscopy
  - 54 (24.5%) symptomatic patients
  - 16 (7.3%) patients with past medical/family history of CRC or polyps
  - 14 (6.4%) patients with anatomical contraindications (e.g. diverticular stricture, redundant colon, etc)
  - 2 (0.9%) patients refused optical colonoscopy

| CTC Indication | No. (% total) |
|---|---|
| Hx of Failed OC | 131 (59.5%) |
| Unknown Hx of OC | 89 (40.5%) |
| Gastrointestinal Bleed | 15 (6.8%) |
| Change in Bowel Habits | 15 (6.8%) |
| Anatomical | 14 (6.4%) |
| Abdominal Pain | 12 (5.5%) |
| Anemia | 11 (5.0%) |
| Hx of Colonic Polyps | 9 (4.1%) |
| Family Hx of CRC | 7 (3.2%) |
| Refusal of OC | 2 (0.9%) |
| Weight Loss | 1 (0.5%) |
| Not Specified | 3 (1.4%) |
| Total | 220 (100%) |

# Results – CTC Quality

- 185 (84.1%) good quality CTC studies
  - Satisfactory distension and visualization of polyps (>6 mm)
- 35 (15.9%) suboptimal CTC studies
  - Primarily due to poor bowel preparation and distension
- 218 (99.1%) uncomplicated CTC studies
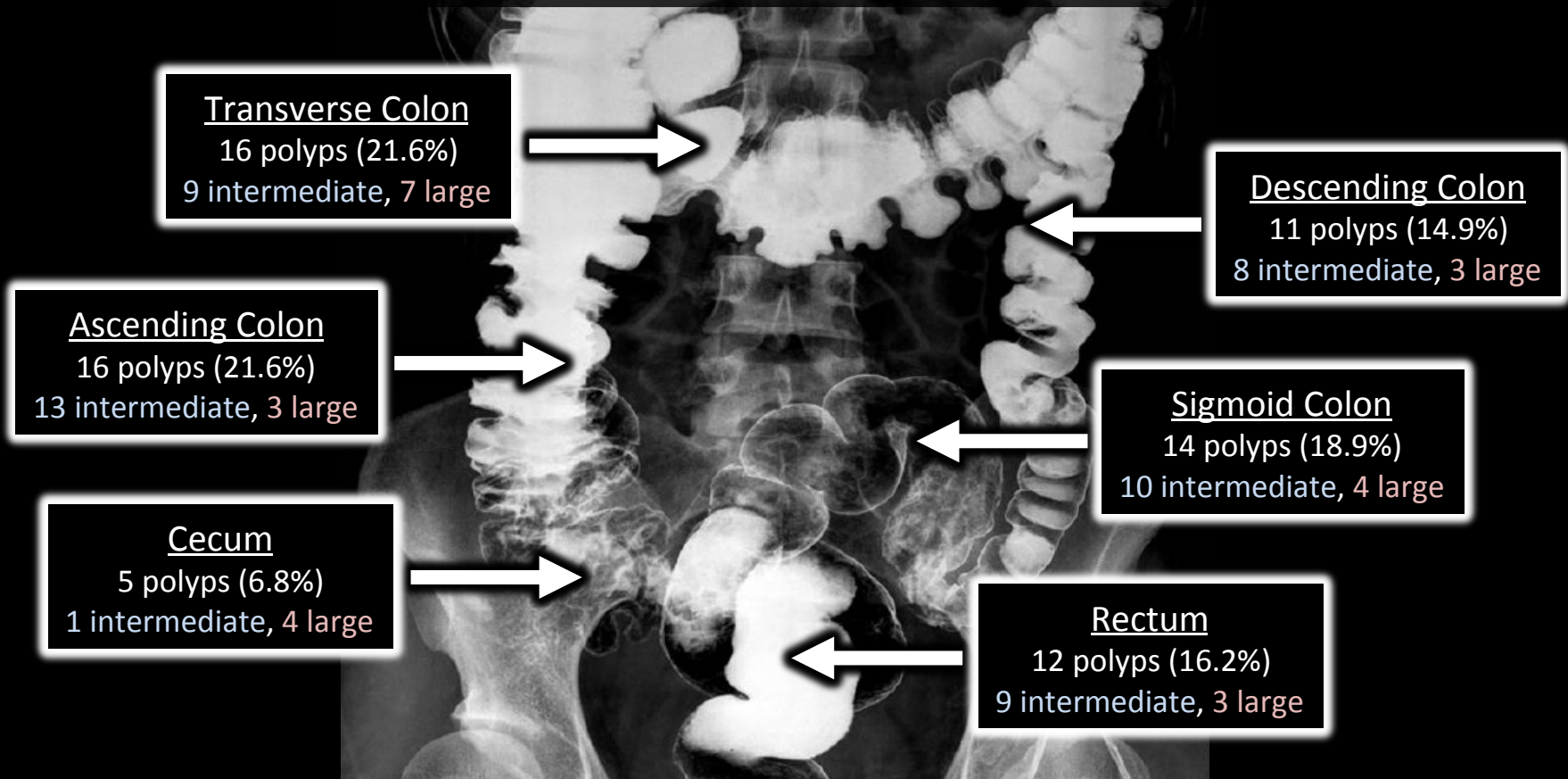  - 2 studies stopped due to excessive patient discomfort during insufflation

| CTC Quality | No. (% total) |
|---|---|
| Good | 185 (84.1%) |
| Fair | 22 (10.0%) |
| Poor | 13 (5.9%) |

| Causes of Suboptimal CTC Quality | No. (% total) |
|---|---|
| Poor Bowel Preparation | 15 (42.9%) |
| Poor Bowel Distension | 19 (54.3%) |
| Metallic Artifact | 1 (2.9%) |

| CTC Complications | No. (% total) |
|---|---|
| Uncomplicated | 218 (99.1%) |
| Incomplete Study due to Patient Discomfort | 2 (0.9%) |

# Results – Colonic Polyps

- CT colonography detected 74 polyps (>6 mm) in 52 (23.6%) studies
  - 50 intermediate polyps (6-9 mm), 24 large polyps/masses (≥10 mm)



**Transverse Colon**
16 polyps (21.6%)
9 intermediate, 7 large

**Descending Colon**
11 polyps (14.9%)
8 intermediate, 3 large

**Ascending Colon**
16 polyps (21.6%)
13 intermediate, 3 large

**Sigmoid Colon**
14 polyps (18.9%)
10 intermediate, 4 large

**Cecum**
5 polyps (6.8%)
1 intermediate, 4 large

**Rectum**
12 polyps (16.2%)
9 intermediate, 3 large

# Results – C-RADS Grading

- 146 (66.4%) unremarkable CT colonography studies (C-RADS C1)

- 74 (33.6%) CT colonography studies with potentially important colonic findings (C-RADS C0, C2, C3, C4)
  - 39 (out of 74) studies with follow-up colonoscopy/surgery
  - 35 (out of 74 studies) with no colonoscopy/surgery follow-up

- Optical colonoscopy was avoided in 181 (82.2%) patients

- C-RADS grade was reported in 71.8% of CT colonography reports

| C-RADS | No. (% total) |
|---|---|
| C0 | 13 (5.9%) |
| C1 | 146 (66.4%) |
| C2 | 38 (17.3%) |
| C3 | 14 (6.4%) |
| C4 | 9 (4.1%) |
| | |
| Reported | 158 (71.8%) |
| Unreported | 62 (21.2%) |

# Results – Colonic Findings

- 36 CT colonoscopy studies with colonoscopy/surgery and histology results
  - 33 polyps/lesions were identified
  - 7 adenocarcinomas
  - 2 advanced adenomas
- Per-patient positive predictive value (PPV) was 77.8%
  - 28/36 CTC studies were concordant for polyp/non-neoplastic findings
  - Includes studies with equivocal findings (e.g. mural thickening likely due to fecal material/poor distension, but cannot exclude polyp/neoplasia)

| Histologic Type | Intermediate Polyps (6-9 mm) | Large Polyps (≥10 mm) |
|---|---|---|
| Hyperplastic | 2 | 0 |
| Inflammatory | 1 | 0 |
| Lipoma | 1 | 0 |
| Serrated Adenoma | 3 | 0 |
| Tubular Adenoma | 15 | 1 |
| Tubulovillous Adenoma | 1 | 1 |
| High-grade Dysplasia | 0 | 0 |
| Adenocarcinoma | 1 | 6 |
| Metastasis | 0 | 1 |
| Total | 23 | 10 |

# Results – Colonic Findings

- **Overall per-polyp PPV was 78.8%, increases with greater polyp/mass size**

- **Per-polyp PPV meets the published standards (>75%)[1-3]**
  - CAR guidelines for carcinomas (>90% PPV) and large polyps (>85% PPV)

- **CT colonography yielded 2 false negatives (intermediate polyps), as detected on follow-up colonoscopy**

| CTC Finding | Lesion on OC/Surgery | No Lesion on OC | PPV |
|---|---|---|---|
| Intermediate Polyp (6-9 mm) | 9 | 5 | 64.2% |
| Large Polyp (≥10 mm) | 10 | 2 | 85.7% |
| Carcinoma | 7 | 0 | 100% |
| **Total** | **26** | **7** | **78.8%** |
| | | | |
| No Intermediate Polyp (6-9 mm) | 2 | | |
| No Large Polyp (≥10 mm) | 0 | | |
| No Carcinoma | 0 | | |
| **Total** | **2** | | |

[1]Behrens et al. Can Assoc Radiol J 2010 61(1):33-40.
[2]Yun et al. Korean J Radiol 2007 8(6):484-91.
[3]Iannaccone et al. Radiology 2005 237(3):927-37.

# Results – E-RADS Grading

- 157 (71.4%) CT colonography studies with unremarkable extracolonic findings (E-RADS E0, E1, E2)

- 63 (28.6%) CT colonography studies with potentially important extracolonic findings (E-RADS E3, E4)

- E-RADS grade was reported in 148 (67.3%) of CT colonography studies

| E-RADS | No. (% total) |
|---|---|
| E0 | 2 (0.9%) |
| E1 | 56 (25.5%) |
| E2 | 99 (45.0%) |
| E3 | 46 (20.9%) |
| E4 | 17 (7.7%) |
| | |
| Reported | 148 (67.3%) |
| Unreported | 72 (32.7%) |

# Results – Extracolonic Findings

- 464 extracolonic findings reported in 220 CT colonography studies (2.1 per study)

| Extracolonic Findings detected on CTC | No. (# of patients) |
|---|---|
| Normal or Clinically Unimportant (ERADS E0, E1, E2) | 387 (220) |
| Potentially Important (ERADS E3, E4) | 77 (26) |
| Prompted Further Imaging Investigation | 26 (26) |

| Extracolonic Findings Requiring Further Investigation | No. |
|---|---|
| Hepatic Lesion | 9 |
| Lung Nodule | 4 |
| Renal Cyst | 3 |
| Adrenal Incidentaloma | 2 |
| Bony Lesion | 2 |
| Perineural Cyst | 2 |
| Bronchiectasis | 1 |
| Pancreatic Mass | 1 |
| Peritoneal Mass | 1 |
| Mesenteric Panniculus | 1 |
| **Total** | **26** |

# Results – Extracolonic Follow-up

- In 220 CT colonography studies, 26 follow-up extracolonic imaging investigations on 26 patients

- Overall 0.12 follow-up extracolonic imaging investigations per CT colonography study performed

- Amounting to an additional cost of $36.89 per CT colonography study[1]

| Extracolonic Follow-up Imaging Investigations | No. |
|---|---|
| Ultrasound Abdo | 7 |
| CT Chest (without contrast) | 5 |
| CT Abdo Pelvis (with contrast) | 4 |
| CT Abdo Pelvis (with contrast) | 2 |
| Ultrasound Renal | 2 |
| Bone Scan | 2 |
| MRI Lumbar Spine | 2 |
| MRI Adrenals | 1 |
| Laparoscopy | 1 |
| **Total** | **26** |

# Recommendations & Conclusions

- Our institution's per-patient and per-polyp PPV of CT colonography examinations for colonic findings currently meets the published standards (>75%)

- Satisfactory study quality given our institution's non-screening patient population

- Increase rates of C-RADS and E-RADS reporting

- Extracolonic findings influence both patient management and additional hospital costs

- Future re-audit is recommended to ensure CT colonography quality metrics are continuing to be met

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