
1269

Final Decision
Analytic Protocol
(DAP) to guide the
assessment of
computed
tomography
colonography for the
diagnosis or exclusion
of colorectal
neoplasia

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MSAC and PASC

The Medical Services Advisory Committee (MSAC) is an independent expert committee appointed by the Australian Government Health Minister to strengthen the role of evidence in health financing decisions in Australia. MSAC advises the Commonwealth Minister for Health and Ageing on the evidence relating to the safety, effectiveness, and cost-effectiveness of new and existing medical technologies and procedures and under what circumstances public funding should be supported.

The Protocol Advisory Sub-Committee (PASC) is a standing sub-committee of MSAC. Its primary objective is the determination of protocols to guide clinical and economic assessments of medical interventions proposed for public funding.

Purpose of this document

This document is intended to provide a draft decision analytic protocol (DAP) that will be used to guide the assessment of computed tomography colonography for exclusion or diagnosis of colorectal neoplasia in symptomatic patients where a contraindication exists, or in high risk/symptomatic patients who have had an incomplete or technically difficult colonoscopy. The protocol was only finalised after inviting relevant stakeholders to provide input. The final protocol will provide the basis for the assessment of the intervention.

The protocol guiding the assessment of the health intervention has been developed using the widely accepted "PICO" approach. The PICO approach involves a clear articulation of the following aspects of the research question that the assessment is intended to answer:

- P**atients – specification of the characteristics of the patients in whom the intervention is to be considered for use;
- I**ntervention – specification of the proposed intervention;
- C**omparator – specification of the therapy most likely to be replaced by the proposed intervention; and
- O**utcomes – specification of the health outcomes and the healthcare resources likely to be affected by the introduction of the proposed intervention.

Purpose of application

An application requesting an extension of the indications for the Medicare Benefits Schedule (MBS) listing of computed tomography colonography (CTC) was received from the Abdominal Radiology Group of Australia and New Zealand (ARGANZ)¹ by the Department of Health and Ageing in December 2011. The application proposes a change to the descriptor of the current MBS item numbers (56552 and 56554) under which CTC is funded to allow for reimbursement of CTC services provided for the exclusion or diagnosis of colorectal neoplasia in symptomatic patients who have a contraindication to colonoscopy, or in high risk, asymptomatic patients who have had an incomplete or technically difficult colonoscopy. Under current listing arrangements, MBS item number 56552 stipulates incomplete colonoscopy must have occurred not more than three months prior to CTC, with the date of incomplete colonoscopy set out on the scan request. Item number 56554 limits contraindications specifically to suspected perforation of the colon and complete or high-grade obstruction that will not allow passage of the scope. In addition to MBS item changes, an additional new item has been proposed for patients with inadequate access to colonoscopy, such as to cause delay in diagnosis. Under the new item number arrangements, these patients will be eligible for CTC should the application be successful.

Adelaide Health Technology Assessment, School of Population Health, University of Adelaide, as part of its contract with the Department of Health and Ageing, has drafted this decision analytic protocol to guide the assessment of the safety, effectiveness and cost-effectiveness of the proposed intervention in order to inform MSAC's decision-making regarding public funding of the intervention.

Background

Current arrangements for public reimbursement

Under current arrangements, radiologists provide CTC as a professional service attracting a government rebate subject to the criteria outlined in the previous section. Medicare statistics for billing of items 56552 (Table 1) and 56554 (Table 2) indicate the number of reimbursed CTC services provided in public and private hospitals annually in Australia. Based on Medicare item reports available online², 4,150 services were accessed under item number 56552 during the 2010-2011 financial year, while item number 56554 was accessed 1,062 times during the same year, making an annual total of 5,212 reimbursed CTC services. This represents a national yearly incidence of 24 CTCs per 100,000 population. However, this

¹ ARGANZ is a special interest group of the Royal Australian and New Zealand College of Radiologists (RANZCR).

² https://www.medicareaustralia.gov.au/statistics/mbs_item.shtml

figure underestimates the incidence of CTC in Australia, as it does not capture patients who are treated in the public sector and are not reimbursed under item numbers 56552 and 56554.

The application from ARGANZ maintains that a substantial number of patients are currently referred for CTC by a general practitioner (GP) or specialist because they are considered to be unfit for colonoscopy or concomitant sedation due to comorbidities or a contraindication.

While PASC agreed with the intention of the proposed changes in the patient population, there is a concern that any item descriptor for MBS-listed CTC should not allow a perverse incentive for patients to be offered CTC when colonoscopy remains a viable option because this would represent suboptimal management. In addition, clinical expert advice indicated that access to colonoscopic services is generally good in the private sector but can be limited in the public sector, so the definition of 'limited availability' may raise equity issues about differential access across these sectors.

PASC have commented that it is likely that strategies in patient management (for example stopping anticoagulant therapy for an appropriate period prior to colonoscopy or using alternative sedatives or anaesthesia) would enable colonoscopy to proceed in a proportion of patients who may otherwise be considered unfit for colonoscopy. The distinction between diagnostic and therapeutic colonoscopy needs to be emphasised, as anticoagulant therapy would not be an absolute contraindication in the case of the former. Diagnostic colonoscopy, is a purely diagnostic procedure with low risk of haemorrhage, and can be performed in the first instance for patients under anticoagulant treatment. If polyps or cancer are found, it is then possible to treat these patients using a subsequent colonoscopy or other surgical procedure, however a low risk of haemorrhage still remains when a second procedure with conscious sedation is performed.

The applicant notes that the alternative to CTC, double contrast barium enema (DCBE) is less accurate, less comfortable and less acceptable for the patient, while delivering a higher dose of radiation compared to CTC. Unlike CTC, barium enema does not provide information about pathology outside of the bowel. With the proposed broadening of the patient populations eligible for CTC, the applicant suggests that DCBE will be progressively replaced by CTC and that the number of colonoscopies currently performed will be reduced. However PASC has advised that just as many, if not more, colonoscopies will be performed while the number of CTC procedures will also increase. The economic implications of the proposed changes to the MBS listings will be considered as part of the assessment guided by this protocol.

It should be noted that perforation of the colon is a contraindication for colonoscopy and for CTC. Despite this, perforation of the colon is listed in the current item descriptor for MBS

item 56554 as an indication for CTC. Current understanding of the CTC procedure necessitates that “perforation of the colon” be deleted as an indication for CTC in the descriptor for item 56554, regardless of the outcome of this application.

Table 1 Current MBS item descriptor for 56552

Category 5 – Diagnostic Imaging Services
<p>56552</p> <p>COMPUTED TOMOGRAPHY OF COLON for exclusion of colorectal neoplasia in symptomatic or high risk patients if:</p> <ul style="list-style-type: none"> a) the patient has had an incomplete colonoscopy in the 3 months before the scan; and b) the date of incomplete colonoscopy is set out on the request for scan; and c) the service is not a service to which items 56301, 56307, 56401, 56407, 56409, 56412, 56501, 56507, 56801, 56807 or 57001 applies (R) (K) <p>Bulk bill incentive (Anaes.) Fee: \$600.00 Benefit: 75% = \$450.00 85% = \$526.30 (See para DIL, DIQ of explanatory notes to this Category)</p>

Table 2 Current MBS item descriptor for 56554

Category 5 – Diagnostic Imaging Services
<p>56554</p> <p>COMPUTED TOMOGRAPHY OF COLON for exclusion of colorectal neoplasia in symptomatic or high risk patients if:</p> <ul style="list-style-type: none"> a) the request for scan states that one of the following contraindications to colonoscopy is present: <ul style="list-style-type: none"> i. suspected perforation of the colon; ii. complete or high-grade obstruction that will not allow passage of the scope; and b) the service must not be a service to which item 56301, 56307, 56401, 56407, 56409, 56412, 56501, 56507, 56801, 56807 or 57001 applies (R) (K) <p>Bulk bill incentive (Anaes.) Fee: \$600.00 Benefit: 75% = \$450.00 85% = \$526.30 (See para DIL, DIQ of explanatory notes to this Category)</p>

Regulatory status

Under the Therapeutic Goods Act, CT scanners are classified as Medical Devices and are required to be registered as such (TGA 2011). Legislation for Medical Devices is administered by the Office of Devices Authorisation (ODA) for pre-market regulation, and the Office of Product Review for post-market regulation, with the aim to maintain public

confidence in the safety, performance, benefits and risks associated with the use of medical devices on the Australian market. The proposed medical service does not involve any changes to the medical device (CT scanner) or associated services used for items 56552 or 56554. There are currently several CT systems registered with the TGA.

Computed tomography is a form of diagnostic radiology and its usage is also overseen by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2008). According to ARPANSA, regulations governing the practice of nuclear medicine, radiology and radiotherapy are currently the domain of State and Territory regulators. While current regulations are broadly consistent, there are some differences. State and Territory regulatory bodies include health and environmental departments and are listed in Table 3.

Additionally the parent body of the applicant, RANZCR, has developed guidelines for the training and practice of CTC (RANZCR 2012), which are further discussed in the 'Prerequisites' section (page 12). The proposed medical service involves the use of a CT scanner, laxative solutions for bowel preparation, and in some circumstances IV contrast and/or hyoscine butylbromide. Oral contrast may be used for faecal tagging. No in-vitro diagnostic testing is required in addition to the procedure.

The international authority 'International Collaboration for CT Colonography Standards' established technical reference standards which were published in 2010 (Burling 2010). The publication is referenced by RANZCR and describes the service, including minimum and best practice. This is further discussed in the 'Delivery of the intervention' section.

Table 3 State and Territory Radiation Protection Regulations (ARPANSA 2008)

Jurisdiction	Regulator	Basis of regulation
NSW	Radiation Control - Dept. of Environment and Conservation	Regulation is based on the <i>Radiation Control Act 1990</i> and <i>Radiation Control Regulation 2003</i> and the <i>Medical Practice Act 1992</i> . Radiation Control Regulation 2003 calls upon ARPANSA Code RPS 2 (2001)
Vic	Radiation Safety Section - Dept. of Human Services	Regulation is based on the <i>Radiation Regulations 2007</i> and the <i>Radiation Act 2005</i> .
Qld	Radiation Health - Dept. of Health	Regulation is based on Queensland's <i>Radiation Safety Act 1999</i> and <i>Radiation Safety Regulation 1999</i> and also incorporates ARPANSA Codes RPS 2 (2001) and RPS 8 (2005)
SA	Radiation Protection Division - Environment Protection Authority	Regulation is based on South Australia's <i>Radiation Protection and Control Act 1982</i> and the <i>Radiation Protection and Control (Ionising Radiation) Regulations 2000</i>
WA	Radiological Council	Regulation is based on the <i>Radiation Safety Act 1975</i> and the <i>Radiation Safety (General) Regulations 2003</i> . RPS 2 (2001) and RPS 4 (2002) are also applied in WA
Tas	Dept. of Health and Human Services	Regulation is based on the <i>Radiation Protection Act 2005</i> and <i>Radiation Protection Regulations 2006</i> . A range of NHMRC and ARPANSA Codes are also referred to
NT	Radiation Protection Section - Dept. of Health and Community Services	Regulation is based on the following NHMRC and ARPANSA Codes - RHS 23 (1988), RHS 13 (1985) and RPS 4 (2002)
ACT	ACT Radiation Safety Section - ACT Health	Regulation is based on the ACT's <i>Radiation Act 1983</i> and <i>Radiation Regulation 2002</i>

Intervention

Description

Colorectal (bowel) cancer (CRC) is an increasing concern in Australia. Epidemiological data show CRC to be the second most frequently occurring cancer in Australia and the second most common cause of cancer-related death after lung cancer (10.7% and 19.0% of cancer deaths, respectively, in 2005) (AIHW 2008). The AIHW have reported that CRC incidence has been gradually increasing in women with a rise in new cases of 30 per cent predicted between 2001 (5883 cases) and 2011 (7673 cases, 95% confidence interval 7034 to 7414). For men, a 33 per cent increase in new cases was predicted between 2001 (6961 cases) and 2011 (9249 cases, 95% confidence interval 7627 to 12,710) (AIHW 2005). However, this is a reflection of Australia's ageing population and more recent data indicate that *age-standardised incidence* rates of colorectal cancer are decreasing for both men and women. For the period 2006 to 2010, the projected age-standardised rate of colorectal cancer for males decreased from 74.1 to 72.7 cases per 100,000, and for females the decrease was from 51.2 and 50.3 cases per 100,000 (AIHW 2008).

CRC is a relatively slow developing disease, which can arise from *de novo* lesions, but most often develops from benign adenomas which can vary in size from tiny nodules to polyps 12 mm across. Benign adenomatous polyps develop in the lining of the bowel, and are considered to have malignant potential, so that removal of polyps at an early stage is recommended. In 2006 the Australian government introduced a screening program for 55 to 65 year olds using a faecal occult blood test (FOBT), with the aim of reducing the incidence of colorectal cancer. Persons with a positive FOBT are referred to a specialist to undergo further evaluation, usually by colonoscopy (Australian Cancer Network 2005).

Colonoscopy (or optical colonoscopy, OC) is performed for the exclusion or diagnosis of colorectal neoplasia and is considered the gold standard method for detection of polyps and precancerous lesions of the colon, with a 95% sensitivity for detecting colon cancer (Australian Cancer Network 2005). An advantage of OC is that it provides the opportunity for both diagnosis and simultaneous treatment by removal of polyps, as instruments for removal can be passed down the scope directly to the polyp site. OC with or without polypectomy will be the reference standard test for this assessment. Alternative methods for detection and diagnosis of polyps or CRC are DCBE and computed tomographic colonography (CTC, also called virtual colonoscopy).

CTC is a less invasive test than either OC or DCBE. CTC is conducted in radiology rooms, either within a hospital setting or independently. Not all radiology service locations provide CT scanners and there can be substantial demand for those available. CTC requires a multidetector CT scanner (minimum 8 rows; (RANZCR 2012)) and dedicated software for post-processing and interpretation of data. The patient is required to undergo bowel preparation for CTC which usually involves taking a laxative solution with a clear liquid diet in the 24 hour period before the scheduled scan to achieve as close to full laxation as possible. The laxation method is standard in many centres, however faecal tagging is an increasingly popular technique. Where faecal tagging is carried out laxation is not necessary, but the patient is required to add a barium or iodinated contrast medium to their meals for 48 hours prior to the scan (NICE 2005). According to Burling, although faecal tagging is preferred by many clinicians, the method requires 'additional interpretive experience of validated tagged examinations, and additional resources by adding to cost and complexity of patient preparation' (Burling 2010).

Further requirements for CTC include distension of the bowel by insufflation with air or CO₂, which is conducted through a thin rectal catheter. In some cases there may be intravenous administration of antispasmodic drugs or contrast media. The patient is not anaesthetised and does not generally require pain relief, and can therefore leave the service location as soon as the radiologist has confirmed that satisfactory data have been collected. The scanning process alone takes approximately 10 minutes.

Interpretation of CTC is an acquired skill requiring training. RANZCR has published guidelines for the training and practice requirement for CTC radiologists and these are discussed in the 'Prerequisites' section (RANZCR 2012). The size of the colonic polyp is an important biomarker for malignant potential and is therefore an important factor in the interpretation of results. A review on CTC polyp measurement by Summers (2010) reported on the variability of polyp measurements between OC and CTC and found that the size difference can affect clinical management. According to the 2005 NHMRC clinical guidelines for detection of colorectal cancer, OC is currently the most accurate method (Australian Cancer Network 2005).

Currently CTC in Australia is subsidised for patients who are at high risk of or symptomatic for CRC and have undergone an incomplete colonoscopy not more than three months previously. The reasons for not completing the colonoscopy may include development of breathing difficulties or other complications during the procedure such as perforation of the bowel. The population currently recommended for CTC includes those patients who are symptomatic or at high risk of CRC and have contraindications to colonoscopy due to a complete or high-grade bowel obstruction. This patient population is reflected in the current

MBS item descriptors for colonography.³ The applicant is seeking to extend the indicated populations now that CTC has become a more accepted technique.

Historically DCBE has been the alternative procedure to OC where there are patient contraindications or an incomplete OC has been performed. For the purposes of this assessment DCBE will act as the comparator. DCBE is not a satisfactory technique for visualising the rectum or rectosigmoid region and consequently sigmoidoscopy or OC are recommended for these investigations. If polyps or CRC that warrant removal or biopsy are identified using either the DCBE or CTC technique, management with colonoscopy or surgery is required (Australian Cancer Network 2005).

Delivery of the intervention

Whether a patient is attending a radiology department for CTC as an outpatient or an inpatient it is important they understand the procedure and risks involved. Written and/or verbal information can be given and further information may be accessed by telephone or email contacts.

Prior to CTC a patient is required to undergo bowel preparation, usually in the form of laxatives and a low residue diet. While full laxation is sufficient for many practitioners, increasing numbers agree that faecal tagging (in the form of barium or iodine based compounds) provides a superior result. The rectum is catheterised with a thin tube enabling insufflation of the bowel with either room air or CO₂. The distension of the bowel provides contrast between the gas-filled bowel lumen and the soft tissue of the bowel wall, and a "scout" view is usually conducted first to ensure distension is sufficient (Burling 2010).

The radiation dose should be kept as low as practicable, but it will be dependent on factors such as age and patient size. Ideally effective doses should be monitored locally and dose modulation should be used. The recommended collimation/section thickness is ≤ 3 and ≥ 1 mm, with patients imaged in the cranio-caudal direction. Scanning should be conducted in both the prone and supine positions, however immobility or obesity may require alternative positions. CTC images should be assessed before the conclusion of the examination so as to determine whether they are satisfactory for diagnosis or if further scanning is required (Burling 2010).

Intravenous contrast agents are not recommended for CTC in low-risk patients. Indications for use of intravenous contrast agents include prior history of colorectal neoplasm and high

³ According to the current MBS item descriptor (56554), patients with perforated colon are also recommended for CTC. However, as previously discussed, perforated colon is a contraindication for both colonoscopy and CTC.

risk of neoplasm or extra-colonic cause of symptoms (for example in older symptomatic patients). CTC enhanced with contrast agents may also be used as a 'one-stop shop' approach for staging or diagnosis of recurrence or metachronous tumours. As no sedation is required for a CTC, the patient is able to leave the radiology department immediately after the procedure.

The applicant is proposing changes to two CTC MBS items and the introduction of a new item. Under the proposal it would be expected that an increased number of patients would be eligible to receive CTC. The additional patients are those

1. who have had an incomplete or technically difficult colonoscopy at any time (additional under item 56552);
2. who are symptomatic but have a contraindication to colonoscopy (additional contraindications to those currently under item 56554); or
3. are symptomatic or at high risk and require exclusion or diagnosis of colorectal cancer but have limited access to colonoscopy such as to delay diagnosis (additional under new item).

There are no limitations to the number of services per patient under the applicant's proposal and its frequency will differ according to clinical context. Patients who undergo regular surveillance for colorectal neoplasm are likely to require CTC every one to three years, provided they fulfil MBS conditions. Colonography may be performed as a once-off procedure in some patients such as the symptomatic elderly but may have to be repeated within a short interval if the initial procedure does not provide a clear outcome.

It would be expected that with the increase of CTC procedures, the use of DCBE (MBS item 58921) would decrease. The utilisation of items 56552, 56554 and 58921 over the periods 2008/9 and 2010/11 are reported in Table 4.

Table 4 Utilisation of items 56552 and 56554 in the periods 2009/10 and 2010/2011 (Medicare 2012)

Item	2009/10	2010/11
56552	3,760	4,150
56554	949	1062
58921	9,804	8,104

As explained in a previous section, dose and usage of diagnostic radiology technology such as CTC is regulated by international and national bodies due to the risks involved with radiation. Facilities housing CT equipment and clinicians using it must be aware of and comply with these regulations.

Prerequisites

RANZCR has developed guidelines for the training and practice of CTC and has recently published their requirements for practice of the procedure (RANZCR 2012). The publication provides a statement of 1) Training requirements for practitioners and 2) Facility requirements. The RANZCR requirements are summarised in Table 5.

Table 5 Summary of RANZCR training and facility requirements for CTC practice (RANZCR 2012)

Training requirements for practitioners	
Qualifications	Experience in abdominal CT Holder of current RANZCR fellowship or equivalent recognised qualification Other qualifications as outlined in the RANZCR Standards of Practice
Competencies	Standard training CT interpretation skills Familiarity with the indications and contraindications to CTC Familiarity with bowel preparation types and regimens of 'minimal preparation' and faecal tagging Awareness and training in methods of colonic insufflations Use of various scanning protocols (low-dose, standard-dose +/- IV contrast, prone, supine etc) as appropriate to patient Accurate reading and interpretation of scan variants so as to be able to distinguish normal from abnormal results Knowledge of pathologies of the colon wall Knowledge of the following references: the guidelines to reporting CTC published by the European Society of Gastrointestinal and Abdominal Radiology (ESGAR)(Taylor et al. 2007), the consensus of North American experts (RANZCR 2012), the CTC Standards by the United Kingdom led international collaboration of Europe, Canada, Australia and New Zealand (Burling 2010), and Polyp Size Measurement at CT Colonography (Summers 2010) Awareness of the limitations of CTC
Training	Before a practitioner can practice independently he/she must have completed 60CTC cases under the following conditions: All cases are worked up by trainee on a workstation using raw data 50 cases must be validated by either endoscopy or surgery 10 cases must be 'live' cases under conditions where the trainee is personally present for the duration of the examination, the examinations are supervised by a recognised CTC radiologist, the trainee's name is recorded on the patients notes as the co-reporting CTC trainee Case experience is evidenced in the form of RIS record and/or Logbook
Training assessment	Trainees will be assessed by the RANZCR CTC Assessment Panel
Grandfather period	CTC experienced radiologists may be recognised as competent to train others during a grandfathering period effective until 31 March 2013. To be recognised the applicant must demonstrate experience of at least 60 CTC cases, of which 10 must be 'live'.
Ongoing competency	To maintain competency a recognised CTC specialist must interpret a minimum of 30 examinations per year for which: All cases are worked up using raw data The cases are recorded in the RANZCR CTC Logbook Record and declaration of annual RANZCR CPD returns must be completed Specialists will be suspended from the CTC registry until the a logbook of 30 cases has been submitted
Suspending CTC registration	CTC specialists may suspend their CTC registration during a period in which they are not performing CTC examinations, for a variety of reasons
Cancellation of CTC registration	A CTC specialist will be removed from the register if they do not maintain their ongoing competency requirements
Facility requirements	
Facilities	Facilities must make provision for: Easy patient access to toilets Management of complications including resuscitation and monitoring equipment, appropriate drugs and IV preparations, protocols for management of cardiovascular and abdominal complications, colonic perforation, and management of diabetic and renal failure patients

Equipment	Minimum 8 slice CT scanner Pressure injector for intravenous contrast Automated CO ₂ insufflator or manual air insufflator
Data management	Capability for fast review of axial images Workstation and dedicated CTC software enabling 2D axial, coronal and sagittal displays and 3D reformats, operator interactivity
Staff	Appropriately trained staff to support the CTC procedure (as outlined in Sections 4 and 5 of the RANZCR Standards of Practice 7) Knowledge of contraindications and complications of Hyoscine-N-Butylbromide ('Buscopan')

It is likely that a patient requiring CTC (a short diagnostic procedure after which a patient can immediately leave) is likely to have easier access to that procedure than to colonoscopy which requires conscious sedation or anaesthesia, theatre facilities and bed space for recovery. While CTC does require facilities providing a CT scanner and appropriate support (see Table 3), these facilities can be provided at radiologist practice rooms or hospital outpatient departments. Access may be restricted by the number of trained CTC specialists available, however if demand for the procedure increases, the number of trained specialists could be increased to meet the need (ARPANSA 2008).

Co-administered and associated interventions

Colonography is a diagnostic service which can be administered with full laxation alone or with the addition of faecal tagging. According to Burling, best practice uses faecal tagging however this method requires additional interpretive experience of tagged examinations and additional cost and complexity in patient preparation (Burling 2010). Full laxation alone requires administration of a purgative such as polyethylene glycol electrolyte solution or magnesium citrate solution, whereas faecal tagging requires the addition of a barium or iodinated contrast medium to the diet of the patient approximately 48 hours before the scan. In some cases antispasmodic or contrast agents may be administered intravenously to the patient beforehand (NICE 2005).

Once CTC results have been established, a patient may require treatment for colonic polyps or neoplasm. While a colonoscopy allows for the removal of smaller polyps during the procedure, this is not the case with a colonography. Patient management will require clinical decisions made on an individual case basis.

Listing proposed and options for MSAC consideration

Proposed MBS listing

The applicant ARGANZ is proposing changes to MBS items 56552 and 56554. The item changes are highlighted in Table 6 and Table 7 below. The changes will broaden access to items 56552 and 56554 to include a larger population of symptomatic and high risk patients

who have contraindications to colonoscopy. The applicant has supplied the following list of contraindications to colonoscopy⁴:

- active colitis;
- large abdominal aortic aneurysms;
- recent myocardial infarction or pulmonary embolism;
- coagulopathies, including therapeutic anticoagulation;
- patients unable to tolerate adequate bowel preparations for colonoscopy;
- frail patients of advanced age;
- abdominal large bowel hernias; and
- splenomegaly.

ARGANZ claims that the proposed changes reflect the current demand for CTC from referring clinicians. Patients who require ongoing monitoring for polyps or neoplasia but underwent an incomplete colonoscopy more than three months previously, or underwent a colonoscopy with difficulties due to poor patient tolerance or technical problems would benefit from the changes to items 56552 and 56554.

⁴ PASC noted the list of contraindications and agreed that prior to finalising the proposed changes to MBS item number 56554, further consultation with the Gastroenterology Society of Australia (GESA) and the Colorectal Surgical Society of Australia and New Zealand (CSSANZ) would be beneficial to the decision on the final definition for “contraindications” to be included with the explanatory notes associated with item number 56554.

Table 6 Proposed MBS item descriptor for 56552

Category 5 – Diagnostic Imaging Services
<p>56552</p> <p>COMPUTED TOMOGRAPHY OF COLON for exclusion or diagnosis of colorectal neoplasia in symptomatic or high risk patients if:</p> <ul style="list-style-type: none"> a) the patient has had an incomplete or technically difficult colonoscopy; and b) the service is not a service to which items 56301, 56307, 56401, 56407, 56409, 56412, 56501, 56507, 56801, 56807 or 57001 applies (R) (K) <p>Bulk bill incentive (Anaes.) Fee: \$600.00 Benefit: 75% = \$450.00 85% = \$526.30 (See para DIL, DIQ of explanatory notes to this Category)</p>

Table 7 Proposed MBS item descriptor for 56554

Category 5 – Diagnostic Imaging Services
<p>56554</p> <p>COMPUTED TOMOGRAPHY OF COLON for exclusion or diagnosis of colorectal neoplasia in symptomatic or high risk patients if:</p> <ul style="list-style-type: none"> a) a contraindication to colonoscopy exists b) the service must not be a service to which item 56301, 56307, 56401, 56407, 56409, 56412, 56501, 56507, 56801, 56807 or 57001 applies (R) (K) <p>Bulk bill incentive (Anaes.) Fee: \$600.00 Benefit: 75% = \$450.00 85% = \$526.30 (See para DIL, DIQ of explanatory notes to this Category)</p>

The applicant is further proposing a new item which will provide access to CTC for patients with limited access to colonoscopy, particularly those in rural and regional areas. It is expected that patients in remote or rural areas are more likely to have access to facilities which provide CTC than those which provide colonoscopy. This new item is described in Table 8.

Table 8 Proposed new MBS item descriptor

Category 5 – Diagnostic Imaging Services
<p>[item number]</p> <p>COMPUTED TOMOGRAPHY OF COLON for exclusion or diagnosis of colorectal neoplasia in symptomatic or high risk patients if:</p> <p>(a) there is limited access to colonoscopy such as to cause delay in diagnosis</p> <p>(b) the service must not be a service to which item 56301, 56307, 56401, 56407, 56409, 56412, 56501, 56507, 56801, 56807 or 57001 applies (R) (K)</p> <p>Bulk bill incentive (Anaes.)</p> <p>Fee: \$600.00 Benefit: 75% = \$450.00 85% = \$526.30</p> <p>(See para DIL, DIQ of explanatory notes to this Category)</p>

Population expected to benefit from the proposed changes

The proposed MBS changes are designed to benefit patients who are symptomatic or are at high risk of having colorectal neoplasia or polyps. A subgroup of this population is contraindicated for colonoscopy or have restricted access to colonoscopy. This subgroup is defined by the indications for the service described here. Indications to be included on a radiology request form for CTC are:

1. Symptomatic or high risk (for colorectal neoplasm) symptomatic or high risk asymptomatic patients who have had a previous incomplete or technically difficult optical colonoscopy (as documented by an accredited colonoscopist).
2. Exclusion or diagnosis of colorectal neoplasia in symptomatic or high risk asymptomatic patients when a contraindication to optical colonoscopy exists (as documented by the patient’s practitioner).
3. Investigation of colorectal neoplasia in symptomatic or high risk asymptomatic patients when there is limited access to colonoscopy such as to cause delay in diagnosis (as determined by the patient’s practitioner).

Clinical place for proposed intervention

Computed tomography colonography for exclusion of colorectal neoplasia in symptomatic or asymptomatic high risk patients is currently available as a publicly reimbursed alternative to colonoscopy where a previous colonoscopy has been incomplete or colonoscopy is contraindicated. To be eligible, the patient must satisfy two main criteria as determined by documentation with the scan request. As per the current MBS item descriptors (56552 and 56554), the request for scan must indicate that:

1. the date at which the patient has undergone a previous incomplete colonoscopy is *within* the previous three months;

2. the patient is contraindicated for colonoscopy due to suspected perforation of the colon, or complete or high-grade obstruction that will not permit passage of the scope.

The applicant proposes changes to item numbers 56552 and 56554 in order to broaden the clinical indications under which CTC is publicly reimbursed. The changes would result in eligibility for CTC among patients who have undergone a previous incomplete or technically difficult colonoscopy at any time, and those who have contraindications to colonoscopy as determined by their clinician (see list of contraindications and explanation at footnote 4, page 16). In addition, the applicant suggests eligibility of patients for whom access to colonoscopy is limited such as to cause delay in diagnosis, regardless of whether or not they have had a previous difficult (or even successful) OC. These proposed arrangements are predicted to lead to a decrease in the use of double contrast barium enema (DCBE) which is the alternative diagnostic intervention for patients who have contraindications to colonoscopy but do not meet the current eligibility criteria for CTC.

The management algorithms provided in Figure 1 to Figure 3 summarise the patient pathways under current MBS arrangements (as shown in green), and the pathway as proposed by the applicant (blue), divided by indication.

Figure 1 Clinical management algorithm for patients who have had an incomplete or technically difficult OC

Note that the pathway from incomplete colonoscopy to CTC (dashed line) is at present only possible with documentation that the patient underwent the colonoscopy within the previous three months. Patients with contraindications to colonoscopy, other than suspected colon perforation (a contraindication to both OC and DCBE) or high-grade obstruction, cannot currently be reimbursed for CTC (also shown by way of dashed line), but may receive DCBE (solid line).

Abbreviations: OC, optical colonoscopy; DCBE, double contrast barium enema; CTC, computed tomography colonography; TBD, to be defined.

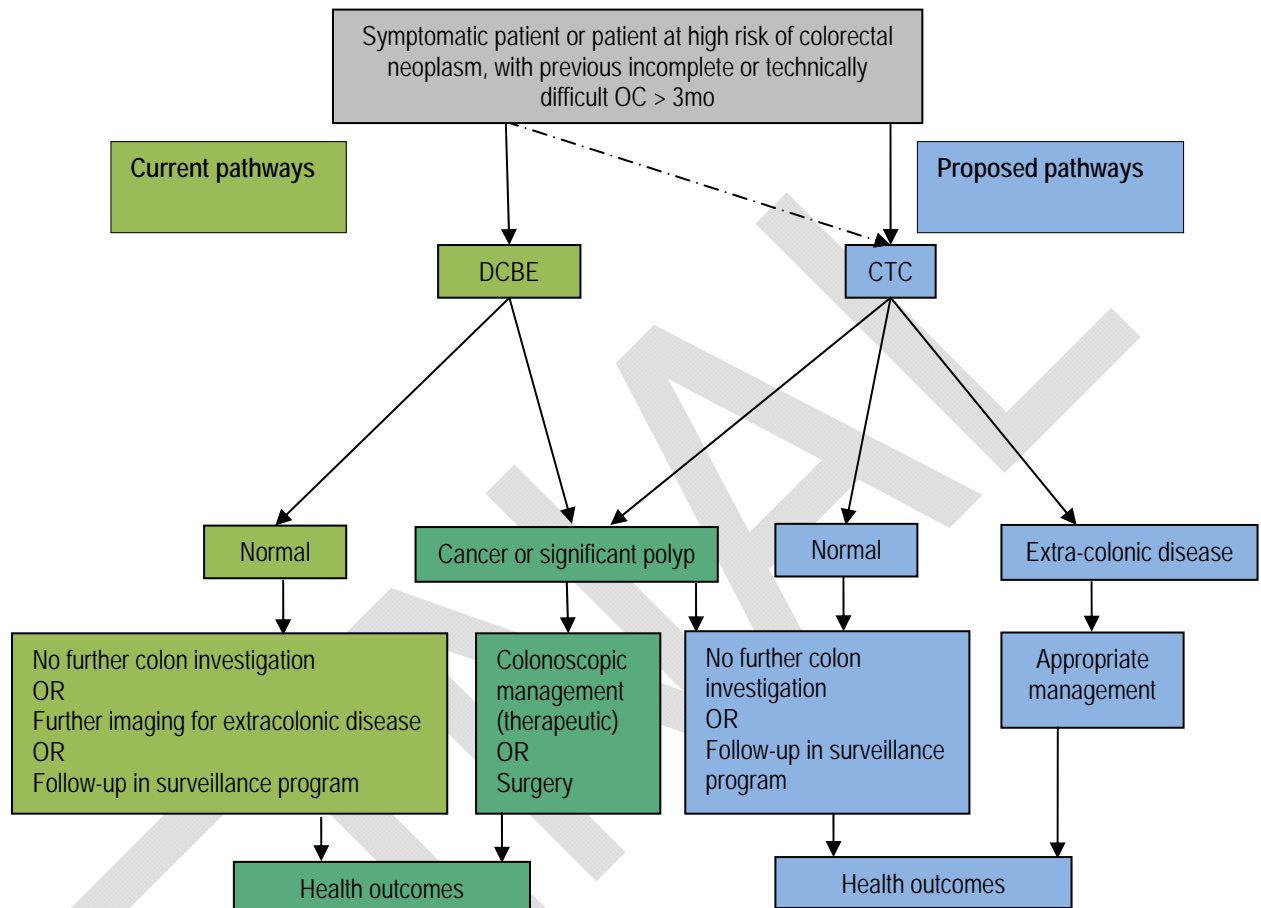


Figure 2 Clinical management algorithm for patients with contraindications to OC

Note that patients with contraindications to colonoscopy, other than suspected colon perforation (a contraindication to both OC and DCBE) or high-grade obstruction, cannot currently be reimbursed for CTC (also shown by way of dashed line), but may receive DCBE (solid line).

Abbreviations: OC, optical colonoscopy; DCBE, double contrast barium enema; CTC, computed tomography colonography.

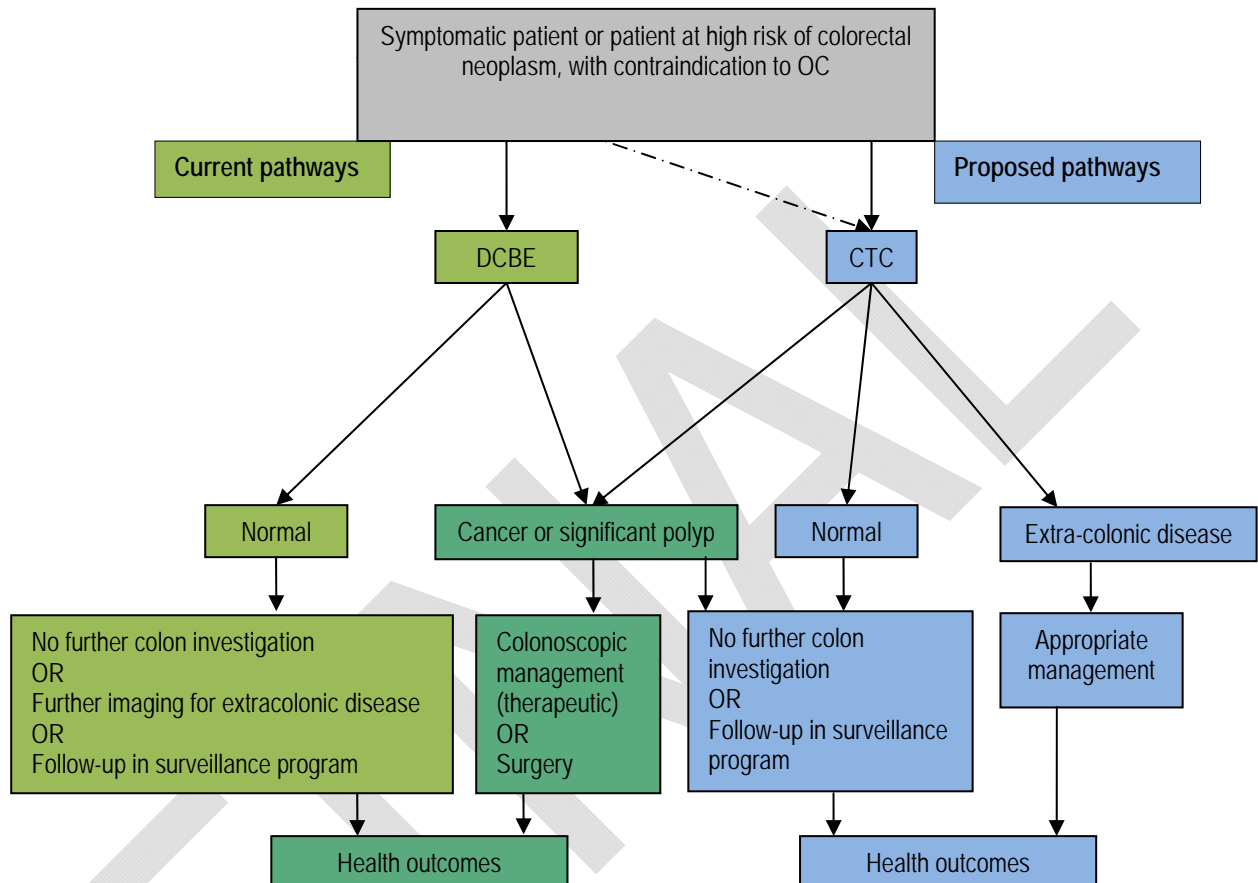
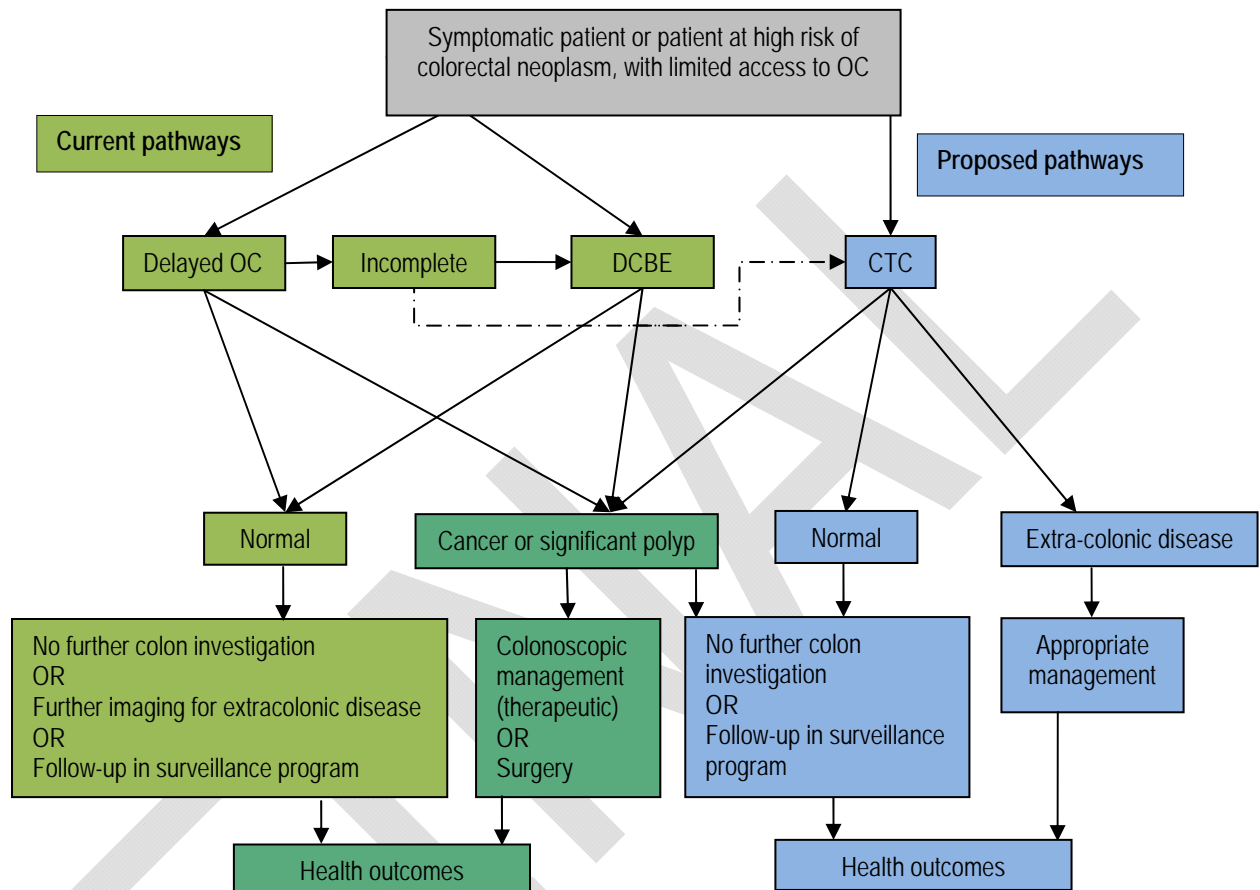


Figure 3 Clinical management algorithm for patients with limited access to OC

Note that the pathway from incomplete colonoscopy to CTC (dashed line) is at present only possible with documentation that the patient underwent the colonoscopy within the previous three months. The "limited access" item is proposed regardless of whether there has been a previous successful or unsuccessful OC.

Abbreviations: OC, optical colonoscopy; DCBE, double contrast barium enema; CTC, computed tomography colonography; TBD, to be defined.



Comparator

In line with the management algorithm the appropriate comparator for CTC (for patients who are unable to receive optimal management with colonoscopy due to an incomplete or technically difficult colonoscopy or a contraindication to colonoscopy) is double contrast barium enema (DCBE). Barium enema is the diagnostic method currently MBS listed for patients with suspected or high risk of colorectal cancer who have contraindications to colonoscopy but who do not meet eligibility for CTC under current funding arrangements. Compared to CTC, the applicant has stated that DCBE is less accurate, less comfortable and less acceptable for the patient. Barium enema also delivers a higher dose of radiation compared to CTC, and unlike CTC, DCBE cannot provide information about extra-colonic pathology. For these reasons, the applicant cites CTC as the preferred alternative to DCBE in patients who have contraindications to colonoscopy or have had a technically difficult previous colonoscopy.

For patients for whom there is limited access to colonoscopy (for example through geographical location) PASC have agreed that the comparator for CTC should be 'delayed colonoscopy' as it is unlikely that these patients would be offered DCBE. As the concerns in this population are related to access rather than the most clinically appropriate service delayed colonoscopy should be defined as 'colonoscopy with date determined by clinician according to urgency'.

The current MBS listing for DCBE is item number 58921. Details of the descriptor are shown at Table 9.

Table 9 MBS item descriptor for 58921

Category 5 – Diagnostic imaging services
MBS 58921 OPAQUE ENEMA, with or without air contrast study and with or without preliminary plain films Fee: \$135.25 Benefit: 75% = \$101.45 85% = \$115.00

Outcomes for safety and effectiveness evaluation

Diagnostic test effectiveness is dependent on whether that test leads to improvement in patient health outcomes. This can be assessed in one of two ways. The ideal approach is using studies that directly investigate the impact of the test and any subsequent treatment on patient-relevant outcomes. In the absence of such studies, a linked evidence approach will be required. The linking of evidence from studies that report on diagnostic test

performance, and studies that report on the impact to clinical decision making and/or impact of treatment on patient health outcomes, has been detailed in the MSAC *Guidelines for the assessment of diagnostic technologies* (MSAC 2005).

Should there be an absence of direct evidence comparing the safety, effectiveness and cost-effectiveness of CTC with DCBE, a linked evidence approach will be undertaken. Similarly, a linked evidence approach will also be required if no direct evidence is found comparing CTC with delayed colonoscopy in the scenario of limited availability of the latter. The criteria for selecting studies for a linked narrative relate to the population, intervention, comparator and/or reference standard, and outcomes given for *each* of the linking components in Table 10. As shown, the outcomes included for each of the linkage components may fall within the categories of diagnostic accuracy, change in patient management, or impact on patient health outcomes (i.e. linked effectiveness based on change in patient management).

Specifically, the outcomes to measure the comparative clinical performance of CTC versus barium enema and CTC versus delayed colonoscopy are:

Diagnostic accuracy

Sensitivity, specificity, negative predictive value (NPV), positive predictive value (PPV), area under the curve, positive likelihood ratio, negative likelihood ratio and level of agreement. The diagnostic odds ratio and receiver operator characteristic curves are the included summary measures.

Effectiveness

Primary effectiveness outcomes include overall survival, quality of life, and progression free survival. Additional relevant outcomes are patient acceptability and tolerance, the detection and consequences of extracolonic findings⁵, and the need for retesting. In the absence of direct evidence providing these outcomes, the downstream clinical impact (management and health outcomes) from testing will be determined based on linking evidence between the types of studies described above.

Safety

Potential physical and psychological harms from testing are the required safety outcomes. Radiation exposure, the need for retesting and the consequences of delayed colonoscopy should also be specifically included in the assessment of safety.

⁵ Potential benefits include detection of an extracolonic cause of symptoms and/or detection of a concurrent condition for which intervention is possible. Potential harms include risks to patients associated with further investigation of false positive or clinically insignificant extracolonic findings.

Summary of PICO to be used for assessment of evidence (systematic review)

Table 10 provides a summary of the PICO used to:

- (1) define the question for public funding,
- (2) select the evidence to assess the safety and diagnostic accuracy of CTC in patients who are contraindicated for colonoscopy, or who have undergone a previous complicated/technically difficult colonoscopy, and
- (3) provide the evidence-based inputs for any decision-analytical modelling to determine the cost-effectiveness of CTC in this population.

Table 10 Summary of PICO to define research questions that assessment will investigate

Patients	Intervention	Comparator	Reference standard	Outcomes to be assessed
Patients with colonic symptoms or asymptomatic patients with high risk of colorectal neoplasia who are unable to receive optimal management with colonoscopy due to previous incomplete or technically difficult colonoscopy	CTC	DCBE	Colonoscopy +/- polypectomy or surgery	<p><u>Safety</u> Potential physical and psychological harms from testing, radiation exposure, need for retesting and the consequences of delayed colonoscopy</p> <p><u>Diagnostic accuracy</u> Sensitivity, specificity, NPV, PPV, area under the curve, positive likelihood ratio, negative likelihood ratio and level of agreement Summary measures - diagnostic odds ratio, receiver operator characteristic curve</p> <p><u>Change in management</u></p> <p><u>Effectiveness</u> Primary: overall survival, quality of life, and progression free survival. Other: patient acceptability and tolerance, the detection and consequences of extracolonic findings, and the need for retesting.</p> <p><u>Cost-effectiveness</u> Gain in QALYs, life years saved</p>
Patients with colonic symptoms or asymptomatic patients with high risk of colorectal neoplasia who are unable to receive optimal management with colonoscopy due to contraindications to colonoscopy		DCBE		
Patients with colonic symptoms or asymptomatic patients with high risk of colorectal neoplasia who are unable to receive optimal management with colonoscopy due to limited access to colonoscopy so as to delay diagnosis		Delayed colonoscopy OR DCBE		
<p><u>Questions</u></p> <ol style="list-style-type: none"> 1. What is the safety, diagnostic accuracy, effectiveness and cost-effectiveness of CTC in patients who have undergone a previous complicated/technically difficult colonoscopy compared with DCBE? 2. What is the safety, diagnostic accuracy, effectiveness and cost-effectiveness of CTC in patients who are contraindicated for colonoscopy, compared with DCBE? 3. What is the safety, diagnostic accuracy, effectiveness and cost-effectiveness of CTC compared to delayed colonoscopy or DCBE in patients with poor access to colonoscopy? 				

Abbreviations: CTC, computed tomography colonography; DCBE, double contrast barium enema; NPV, negative predictive value; PPV, positive predictive value; QALY, quality adjusted life year.

Clinical claim

The applicant claims that CTC is more accurate than DCBE for the detection of clinically significant colorectal polyps. It is additionally noted that CTC is considered more acceptable to patients, with greater comfort, less time involved and lower overall radiation dosage, while providing equivalent safety to DCBE and information on extra-colonic pathology.

Superior diagnosis of colorectal cancer and large polyps translates to improvements in patient outcomes via early diagnosis and treatment, with improved survival. It is known that the detection and removal of large polyps, the precursors to cancer, prevents the development of malignant disease. Therefore, it is claimed that extending the indications for reimbursed CTC services to include patients who are unable to receive optimal management with colonoscopy due to contraindications or a previous incomplete or technically difficult colonoscopy should lead to improved patient safety and less complications than a clinical pathway in which colonoscopy is attempted and then found to fail, necessitating a DCBE instead. Additionally it is proposed that providing the option of CTC for patients for whom there is limited availability of colonoscopy so as to delay diagnosis, that patients are likely to be diagnosed earlier in the disease state, and are more likely to be successfully treated as a result. However, as previously noted, this claim will need to be substantiated by way of comparing CTC with delayed colonoscopy.

Based on the clinical claims of greater safety (reduced radiation), improved patient comfort and greater diagnostic accuracy of CTC compared to DCBE, the economic evaluation required is a cost-effectiveness or cost-utility analysis, as indicated in Table 11. A CEA or CUA may also be appropriate for the comparison between CTC and delayed colonoscopy⁶. In the event that the evidence included in the assessment of CTC versus DCBE in the relevant population fails to show superiority in outcomes then an economic evaluation would not be required because CTC would be more expensive than DCBE and colonoscopy combined⁷. Similarly, if CTC fails to show superiority to delayed colonoscopy, then no economic analysis would be necessary for the scenario in which patients have limited access to colonoscopy. MSAC is unlikely to recommend subsidy for extended indications for CTC where no demonstrated health benefit applies and the cost is higher than the comparator.

⁶ It is recognised that the applicant has made no claim regarding the comparative clinical merits of CTC and delayed colonoscopy, however, PASC have agreed that these should be compared as part of the assessment.

⁷ Cost of colonoscopy in addition to DCBE is a relevant cost comparison in patients who undergo DCBE subsequent to failed (incomplete) colonoscopy procedure, but not where DCBE is the initially chosen diagnostic method due to clear contraindications.

Table 11 Classification of an intervention for determination of economic evaluation to be presented

		Comparative effectiveness versus comparator				
		<u>Superior</u>		<u>Non-inferior</u>	<u>Inferior</u>	
Comparative safety versus comparator	<u>Superior</u>	CEA/CUA		CEA/CUA	<u>Net clinical benefit</u>	CEA/CUA
					<u>Neutral benefit</u>	CEA/CUA*
					<u>Net harms</u>	None^
	<u>Non-inferior</u>	CEA/CUA		CEA/CUA*	None^	
	<u>Inferior</u>	<u>Net clinical benefit</u>	CEA/CUA	None^	None^	
		<u>Neutral benefit</u>	CEA/CUA*			
<u>Net harms</u>		None^				

Abbreviations: CEA = cost-effectiveness analysis; CUA = cost-utility analysis

* May be reduced to cost-minimisation analysis. Cost-minimisation analysis should only be presented when the proposed service has been indisputably demonstrated to be no worse than its main comparator(s) in terms of both effectiveness and safety, so the difference between the service and the appropriate comparator can be reduced to a comparison of costs. In most cases, there will be some uncertainty around such a conclusion (i.e., the conclusion is often not indisputable). Therefore, when an assessment concludes that an intervention was no worse than a comparator, an assessment of the uncertainty around this conclusion should be provided by presentation of cost-effectiveness and/or cost-utility analyses.

^ No economic evaluation needs to be presented; MSAC is unlikely to recommend government subsidy of this intervention.

Outcomes and health care resources affected by introduction of proposed intervention

Outcomes for economic evaluation

Gain in quality-adjusted life-years (QALYs) or life years saved (LYS) would be appropriate health outcomes for the economic evaluation. These may need to be derived from linkage of evidence from studies of diagnostic test accuracy, studies that report on the changes to clinical decision making as a result of testing, and studies of the impact of treatment on the health outcomes of patients.

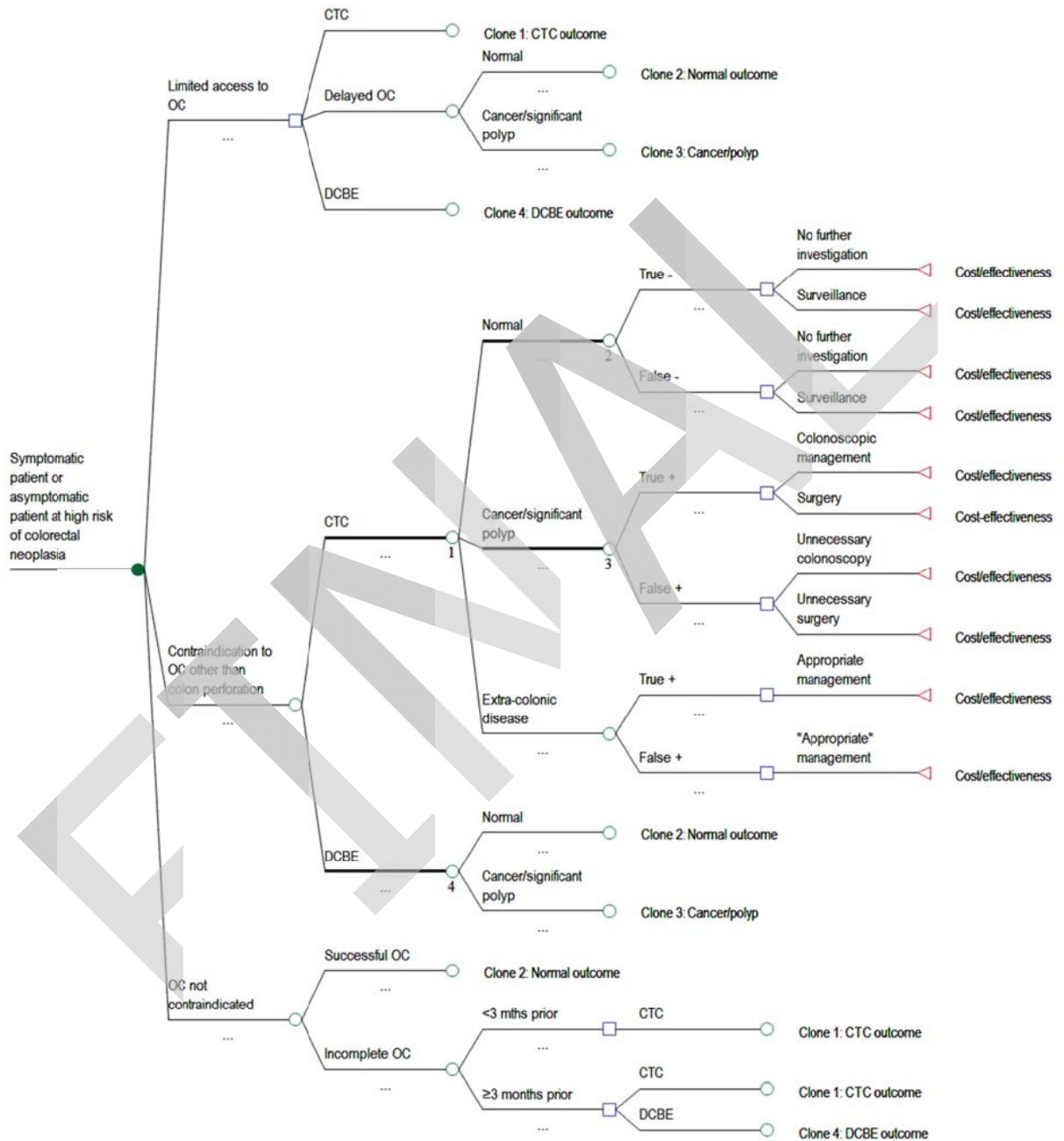
Health care resources

A list of resources that would need to be considered in the economic analysis comparing CTC with DCBE are provided in Table 12. The comparison between CTC and delayed colonoscopy is also considered. The resources listed apply to the population who are symptomatic or at high risk of colonic neoplasia and have a contraindication to colonoscopy, or who have restricted access to facilities providing colonoscopy so as to prevent early diagnosis.

Proposed structure of economic evaluation (decision-analytic)

The decision analyses shown below summarise the pathway of patients under current MBS funding arrangements (Figure 4), and the proposed new funding pathway (**Error! Reference source not found.**) including a branch showing the delayed colonoscopy pathway as agreed to by the PASC. These indicate each of the factors that will determine the diagnostic outcomes and costs for the economic evaluation. Under the current pathway the starting population are either contraindicated for colonoscopy or have undergone a previous colonoscopy that could not be completed. Of these individuals, only those that meet specific clinical indications with documentation on their scan requests are eligible for publicly funded CTC, the alternative publicly funded service being DCBE. Under the newly proposed pathway, broader contraindications may be considered, however these will need to be determined and agreed upon by PASC for inclusion in the final DAP. It is also proposed that previous difficulty with colonoscopy will result in eligibility for publicly funded CTC, and that CTC be provided as a reimbursed service among patients for whom it is determined (practitioner judgment of urgency) that a lack of access to colonoscopy will lead to delay in diagnosis. As indicated in the limited access arm of the decision tree in **Error! Reference source not found.**, the potential benefit of CTC will need to be demonstrated in comparison to delayed colonoscopy. If it is found that there are no negative consequences of delayed colonoscopy, PASC have recommended a sensitivity analysis to determine whether CTC is favoured over *available* colonoscopy for any patient risk groups, or whether colonoscopy remains the gold standard for all groups considered.

Figure 4 Decision-analytic representing the management options for symptomatic patients or those at high risk of colorectal neoplasia.
 Abbreviations: OC, optical colonoscopy; CTC, computed tomography colonography; DCBE, double contrast barium enema



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