Screening Colonoscopy for Average Risk Individuals in Singapore

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In Singapore colorectal cancer (CRC) is the most common cancer for males, second most common cancer for females and most common cancer overall. A national CRC screening program for average risks individuals was started in July 2011, with the primary test modality being the faecal immunochemical test. Individuals may choose to undergo screening colonoscopy directly. Colonoscopy has two roles in CRC screening. It is performed either as a primary screening test or used to evaluate abnormal results from another screening test. Colonoscopy is a safe and effective procedure but potential risks exist. Local complications such as perforation and bleeding, cardiopulmonary events and even mortality may occur. Additionally there could be failed cecal intubation and missed lesions. It is imperative that prior to colonoscopy, there is a proper discussion of risks, benefits and alternatives. To provide quality assurance for colonoscopy in the CRC screening program, a set of quality indicators and criteria for endoscopists and endoscopy centres was established. The endoscopists must be qualified specialists with a lifetime experience of at least 500 colonoscopies and 50 polypectomies, and need to meet annual monitoring parameters that include at least 50 colonoscopies, >95% cecal intubation rate, >95% recovery rate of excised polyps, and withdrawal time of at least 6 minutes. In addition, complication rates must be within acceptable limits such as perforation rate of less than 0.1% and postpolypectomy bleeding rate less than 1%. (Intest Res 2012;10:219-228)

Key Words: Colonic Neoplasms; Colonoscopy; Screening

THE CLINICAL BURDEN AND EPIDEMIOLOGY OF COLON CANCER IN SINGAPORE

Singapore is a small multi-ethnic city state located in Southeast Asia with a land area of 710.3 km² and population of about 5 millions. The main ethnic groups are the Chinese (74.2%), Malays (13.4%) and Indians (9.2%). The main cause of mortality in cancer which was responsible for 29.3% of mortality in 2009. The colorectal cancer (CRC) is currently the most common cancer for males (age standardized rate [ASR]: 40.1/100,000 per year), second most cancer for females (ASR: 28.6/100,000 per year) and most common cancer overall. These incidence rates are higher than other parts of Asia, and have exceeded the rates in parts of the developed western world (Table 1). The risk for CRC in Singapore increased dramatically from the time period 1968-1972 to the time period 2003-2007, with a 125.1% increase in risk in males, and a 112.4% increase in risk in females. The observed higher risk in males compared to females is consistent with published liter-

Table 1. Age Standardized Rate (ASR) of Colorectal Cancer in Singapore Compared to Other Geographic Regions

<table>
<thead>
<tr>
<th>ASR of colorectal cancer</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>40.1</td>
<td>28.6</td>
</tr>
<tr>
<td>Australia/New Zealand</td>
<td>45.7</td>
<td>33.0</td>
</tr>
<tr>
<td>Western Europe</td>
<td>41.2</td>
<td>26.3</td>
</tr>
<tr>
<td>Southern Europe</td>
<td>39.3</td>
<td>24.5</td>
</tr>
<tr>
<td>Northern Europe</td>
<td>36.0</td>
<td>24.6</td>
</tr>
<tr>
<td>Northern America</td>
<td>35.3</td>
<td>25.7</td>
</tr>
<tr>
<td>Eastern Asia</td>
<td>21.5</td>
<td>14.8</td>
</tr>
<tr>
<td>South-Eastern Asia</td>
<td>15.2</td>
<td>12.9</td>
</tr>
<tr>
<td>Western Asia</td>
<td>13.1</td>
<td>10.1</td>
</tr>
<tr>
<td>South-Central Asia</td>
<td>3.6</td>
<td>2.9</td>
</tr>
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ature. A recent meta-analysis (MA) concluded that the pooled relative risk (RR) estimate for advanced neoplasia for men compared with women was 1.83 (95% confidence interval [CI], 1.69-1.97). This positive association between gender and advanced neoplasia was significant across all age groups from 40 to older than 70 years. Among the ethnic groups in Singapore, the Malays and Indians have lower risks than the Chinese. Compared to Chinese, RR for Malay and Indian males were 0.6 and 0.3 respectively, and RR for Malay and Indian females were 0.6 and 0.4 respectively. ASR of CRC among the Chinese is the highest among Chinese populations globally and has exceeded those of Caucasians in the United States. In terms of anatomical distribution, 20.2% of CRC occurred proximal to the splenic flexure, 73.2% were in the distal colon and 6.6% were in overlapping sites. Apart from male gender and Chinese ethnicity, other epidemiological risk factors associated with CRC in Singapore are the body mass index (BMI), smoking status and alcohol consumption. These findings mirror reported observations from other countries. In the Singapore Chinese Health Study a significant, U-shaped, quadratic association was observed between BMI and CRC risk, with increased risk with BMIs ≥27.5 and <18.5 kg/m². Localized CRC had a more pronounced association with BMIs ≥27.5, whereas advanced cases had a more pronounced association with BMIs <18.5 kg/m². A MA of mainly Western studies demonstrated evidence of a dose-response relationship between BMI and CRC; for a 2 kg/m² increase in BMI, the risk of CRC increased by 7%. In the single Asian study in the MA, which was from Japan, a higher BMI was associated with CRC for men. The relations between CRC and cigarette smoking and alcohol consumption were also examined in the Singapore Chinese Health Study. Compared with non-drinkers, subjects who drank >7 alcoholic drinks per week had a statistically significant increased risk of CRC (hazard ratio [HR], 1.72). Cigarette smoking was associated with an increased risk of rectal cancer. Compared with non-smokers, HRs for rectal cancer were 1.43 for light smokers and 2.64 for heavy smokers. A pooled analysis of data from cohort studies from North America and Europe showed that compared with non-drinkers, the RR for CRC was 1.41 for those who consumed 45 g/day or greater. Another MA supported the finding that relative to non-smokers, current and former smokers had a significantly increased risk of CRC incidence and mortality, respectively.

RATIONALE FOR CRC SCREENING GUIDELINE AND PROGRAM

Despite the clinical burden of CRC, studies have suggested that awareness of CRC in Singapore was poor. In a local survey of 2,000 adults that was published in 2002, less than 3% named CRC as a fatal disease and most were unable to name symptoms of CRC and were unaware of the importance of screening as an important tool against cancer development. Conceivably with greater media publicity and higher educational levels over time, general awareness should have improved. However the 2010 National Health Survey showed that most individuals aged 50 to 69 years never underwent CRC screening. Only 27.8% had faecal occult blood test (FOBT) and 14.2% had colonoscopy performed. The aim of CRC screening is to prevent the development of advanced cancers through the detection and treatment of early cancer, and the detection and endoscopic resection of adenomas. Randomized controlled studies have shown that CRC screening results in decreased CRC-related mortality.

Several excellent reviews on the issue of CRC screening have been written in recent years and national guidelines published. The majority of published guidelines are from the West. Recently the Asia Pacific consensus recommendations for CRC screening were published. A natural concern would be how much we can extrapolate from these Western guidelines for application in the East. In particular, are there crucial epidemiological and clinical differences that would alter screening strategies? It would seem however that the recommendations from the West can be similarly applied in the East. In the Asia Pacific consensus report, it was noted that in high incidence Asian countries such as Japan, Korea, Singapore and Hong Kong, the incidence of CRC was comparable with or approaching that of Western countries, although it was recognized that in other countries such as India, Philippines and
Vietnam, there was still a gap in the incidence of CRC between these countries and the West. It was recognized that the incidence of advanced colorectal neoplasm in symptomatic and asymptomatic Asians was comparable with the West. In terms of polyp distribution, although there were more distally located polyps in the Asia Pacific studies compared to the West, the distribution of advanced neoplasia was not significantly different between the East and the West. In fact, studies from Asia showed that 53-68% of proximal advanced neoplasia were found in patients without a distal lesion, a figure comparable with that reported in the West. Similar to the West, it also recommended that CRC screening should begin at the age of 50, due to an increased risk for CRC from that age onwards.

Due to the burden of CRC in Singapore, a national CRC screening program was started in July 2011. Prior to that, CRC screening was essentially opportunistic although CRC screening guidelines have already been published in 2003 and then updated in 2010. Screening options in the guideline include FOBT, colonoscopy, flexible sigmoidoscopy, computed tomographic colonography and double contrast barium enema. Of the screening tests available, the screening test of choice for population-based screening is the FOBT, with preference for the faecal immunochemical test (FIT) because it is inexpensive, safe, non-invasive and effective. Colonoscopy is regarded as an alternative screening test of choice for average risk individuals since it combines detection with prevention by polypectomy. Colonoscopy is the recommended screening test for higher risk individuals.

**CONCEPT OF RISK STRATIFICATION**

The overall life-time risk of an individual developing CRC is about 5%. Average risk individuals are those aged 50 years and above who do not have any additional personal or familial risk factors for CRC, and any familial history, if present, is confined to non first degree relatives or relatives older than 60 years. Asymptomatic individuals with personal history of CRC, personal history of adenoma, positive family history of sporadic adenoma or CRC in first degree relatives younger than 60 years are considered to be at increased risk. Individuals with hereditary non polyposis CRC, polyposis syndromes and extensive colitis from inflammatory bowel diseases are considered at high risk. Screening strategies differ based on risk level, with earlier, more frequent surveillance and the use of colonoscopy in the higher risk groups.

For patients at average risk, the risk of CRC rises significantly after age 50 years hence screening strategies are recommended at this age cut-off. Among these asymptomatic individuals, there have been attempts at further risk stratification, in an attempt to formulate cost effective screening strategies and rationalize the use of limited resources, while balancing test performance characteristics, risks and costs. A multicenter Asia Pacific prospective cross sectional study evaluated a scoring system to stratify risk for advanced colorectal neoplasia in asymptomatic individuals. The components of the scoring system were age, gender, family history and smoking status. Based on the risk score, the risk levels were arbitrarily divided into average, moderate and high risk. Subjects in the moderate and high risk groups had 2.6-fold and 4.3-fold increased prevalence of advanced neoplasia compared to the average risk group. Another study used Markov modelling to analyse data from 787,000 individuals aged 50-75 years undergoing CRC screening to assess a cost-effective screening strategy, taking into consideration factors such as type of test, real-life conditions of suboptimal compliance and societal cost perspective. It was found that performing single sigmoidoscopy on individuals when they were 60 years old was the cheapest screening strategy; it would reduce CRC incidence by 19% and mortality by 16%, compared with no screening. A single colonoscopy was less cost effective than a single sigmoidoscopy, unless the proportion of right-sided lesions exceeded 65%. FIT had the lowest incremental cost-effectiveness ratio when all strategies were compared with no screening; FIT and colonoscopy every 10 years each had extended dominance over other strategies. Screening subjects 50 to 60 years old by FIT and subjects 60 to 72 years old with colonoscopy every 10 years was the most cost-effective strategy (USD 25,000/quality-adjusted life-years). Risk for CRC, adherence, and cost of colonoscopy were the main determinants of cost effectiveness, based on sensitivity analysis. It was concluded that selectively
screening individuals for CRC based on risk was the most cost-effective approach, as it limited the cost and number of colonoscopies needed and significantly reduced CRC mortality. Although these results may not change the current screening strategies for average risk individuals, they do provide additional information for individual patients when they consider screening options and may potentially enhance awareness of risk. Risk stratification may help to optimise the efficiency of resources for screening and offer an option of prioritising high-risk subjects for colonoscopy and average-risk subjects for FIT.

**COLONOSCOPY IN COLON CANCER SCREENING AND SURVEILLANCE**

In the average risk individual, the options for CRC screening are yearly FOBT or FIT, 5-yearly CT colonography, 5-yearly barium enema and 10-yearly colonoscopy. The first line test recommended in the Singapore National CRC screening program is the FIT, which, if positive, would have to be followed by colonoscopy. Individuals may choose to undergo screening colonoscopy directly. Regulations governing the use of Medisave, the national healthcare savings scheme, were amended recently to allow these funds to be used for screening colonoscopy. The aim of colonoscopy, when used as a primary screening tool, is to prevent CRC by detecting and removing pre-cancerous lesions. This effect has been proven with sigmoidoscopy screening in a randomized controlled trial (RCT) and it is assumed that colonoscopy will have an equally positive effect, although there is currently no direct RCT evidence. The national polyp study provided indirect evidence about the utility in the sense that colonoscopic polypectomy interrupted the adenoma-carcinoma sequence and prevented development of CRC. A recent population based case control study found that colonoscopy in the preceding 10 years was associated with 77% lower risk for CRC and that adjusted odds ratios (OR) for any CRC, right-sided CRC, and left-sided CRC were 0.23, 0.44 and 0.16 respectively. Colonoscopy may detect right sided adenomas that would be missed by sigmoidoscopy and would be expected to detect non-polypoid adenomas that would be missed by non-endoscopic screening tests. The aim of colonoscopy when after a positive screening test is to reduce mortality by detecting early cancer.

Despite the obvious advantages of CRC screening using colonoscopy in average risk individuals, only the American College of Gastroenterology guidelines recommended it as a preferred strategy; other guidelines recommended a variety of tests. Pertinent reservations include cost considerations, resource availability, procedural risks and issues pertaining to quality assurance which may negate the advantages of colonoscopy and even result in harm in these asymptomatic well individuals. On the other hand, in the context of individuals with higher risk for CRC, such as personal history of CRC, personal history of adenoma, positive family history of sporadic adenoma or CRC in first degree relatives younger than 60 years, or those with hereditary non-polyposis CRC, polyposis syndromes and extensive colitis from inflammatory bowel diseases, colonoscopy is considered the screening test of choice.

For screening the general population at risk, colonoscopy should be performed at an interval of no more than 10 years. This 10-year time interval is based on evidence that it takes an average of 10 years for the transformation of an adenoma to an invasive cancer, and is supported by results from case-controlled and cohort studies showing very low rates of advanced neoplasia or cancer at 5-year follow-up. If the index colonoscopy showed low risk polyps, colonoscopy surveillance may be considered in 5 years after the initial polypectomy. Patients having high risk polyps (features of severe dysplasia, focal malignancy, sessile, more than 10 mm, multiple >3) should undergo colonoscopy within 3 years after the initial polypectomy. If there is concern of incomplete resection, colonoscopy is to be repeated in 2-6 months to ascertain complete removal. Following resection of CRC, provided synchronous disease has been excluded, surveillance colonoscopy should be performed in 1 year to look for metachronous lesions.

**THE RISKS OF SCREENING COLONOSCOPY AND POTENTIAL FOR LITIGATION**

Colonoscopy is a safe and effective procedure, when
performed by trained endoscopists. Even then, potential risks exist, with the possibility of litigation. The risks include local complications such as perforation and bleeding, occurrence of cardiopulmonary events as a consequence of procedural stress or sedation and even mortality as a result of these complications. In addition, failed cecal intubation and missed lesions may occur. Thus it is imperative that prior to colonoscopy, there is a proper discussion of risks, benefits and alternatives.

**COMPLICATIONS OF COLONOSCOPY**

The key complications of perforation, bleeding, cardiovascular complications and mortality will be discussed (Table 2). Perforation is considered the most serious potential complication and may arise during both diagnostic and therapeutic colonoscopy. During diagnostic colonoscopy, direct mechanical damage may occur when the endoscope tip is forcibly pushed into a large diverticulum that is mistaken as the colonic lumen. Indirect mechanical damage may result from stretching of the bowel when loops are formed or the endoscope is advanced by the slide-by technique, especially if parts of the colonic segments are tethered down by fibrosis. Barotrauma from excessive air insufflation may also predispose to perforation when there are trapped bowel loops. Leakage of bowel contents into the peritoneum may be devastating with up to 5% mortality.36 The risk is lower in diagnostic colonoscopy compared to therapeutic colonoscopy. Reported rates following diagnostic colonoscopy ranged from 0.03% to 0.8%, while that following therapeutic colonoscopy ranged from 0.15% and 3%.37 Specifically the frequency of perforation after polypectomy has been reported to be 0.41% per patient.38 There is now a push for establishing minimum requirements for the provision of safe and efficient colonoscopy. A recent publication form the American Society of Gastrointestinal Endoscopy recommended that the overall rate of iatrogenic perforations after colonoscopy should be less than 1 in 500, and the perforation rate after screening colonoscopy should be less than 1 in 1,000.39 To minimize the risk of perforation, a good technique is crucial. It is also important to identify patients with potentially higher risks, such that appropriate risk-benefit discussion can be carried out and alternative screening tests explored. Advanced age, female sex, the presence of multiple co-morbidities, diverticulosis, and bowel obstruction have been shown to increase the risk of perforation even before the initiation of any therapeutic interventions. When polypectomy is contemplated, polyp size larger than 1 cm and location in the right colon were found to significantly increase the risk of perforation.40 Limited studies have suggested that the experience and skills of an endoscopist may have an impact of the risks of perforation.41,42 In countries with programmatic CRC screening, the criteria for endoscopist credentialing for CRC screening are more stringent than for routine colonoscopy in symptomatic patients.43

Bleeding is another important complication, especially when more and more patients are on anti-platelet therapy or even anticoagulation for cardiovascular diseases. It usually arises in the context of polypectomy but may occur during diagnostic colonoscopy. It may be immediate or be delayed up to 3 to 4 weeks after polypectomy. Most large studies have reported bleeding to occur at a rate of 0.1 to 0.6%.44 Risk factors for postpolypectomy bleeding include polyp size,45-49 number...
number of polyps removed, recent warfarin therapy, polyp histology and patient comorbidities such as cardiovascular disease. The increasing use of antiplatelet and antithrombotic therapy is of particular concern due to the impact on bleeding risks and the fact that it may not be possible to stop treatment prior to endoscopy due to concerns of cardiovascular risks. Diagnostic colonoscopy can be performed safely in the context of active antiplatelet and antithrombotic therapy. However this may limit the scope of any therapeutic interventions, especially when patients are on anticoagulants, should pathology be detected and further interventions may need to be deferred. Hence it would be prudent to consider using other screening tests or stopping treatment prior to colonoscopy, so that at least a straight forward polypectomy can be performed in the same setting. The use of aspirin is not associated with a significant increase in postpolypectomy bleeding hence its use need not be interrupted in patients undergoing screening colonoscopy or polypectomy. In patients taking clopidogrel, resection of polyps smaller than 1 cm followed by endoclips placement has been reported to be relatively safe. Hence it had been recommended that thienopyridines be withheld if polyps larger than 1 cm have to be resected, provided that the patient is not at high risk for thrombotic events and that if thienopyridines cannot be discontinued, then preventive measures such as endoloops, endoclips and submucosal injection of diluted adrenaline for sessile polyps be considered. Postpolypectomy bleeding risk is increased for patients taking warfarin or who resume warfarin or heparin within 1 week after polypectomy and if anticoagulation has to be resumed, close monitoring is important. If more extensive endoscopic therapies are required, such as endoscopic mucosal resection or endoscopic submucosal dissection, all antithrombotic and anticoagulation therapies would need to be stopped. To prevent bleeding after polypectomy, the prophylactic use of mechanical methods such as endoclips and detachable snares, and injection of adrenaline prior to polypectomy, can be considered.

Cardiovascular events may occur as a complication of colonoscopy. The risk is increased with older age and presence of medical comorbidities. Hence appropriate pre-colonoscopy assessment and risk stratification is crucial. Acute cardiopulmonary complications have been reported in 0.9% of endoscopic procedures and were responsible for 67% of unplanned events during or after endoscopic procedures with sedation. A prospective study of patients undergoing colonoscopy reported an event rate of 1.4 per 1,000 for angina, myocardial infarction, stroke or transient ischemic attack at 30 days after colonoscopy. A recent systematic review reported an incidence rate for cardiovascular complications at 30 days of 19 per 1,000 colonoscopies for individuals aged more than 65 years, and an incidence rate of 34.2 per 1,000 colonoscopies for individuals aged greater than 80 years.

Mortality has been reported only rarely. A Canadian population-based cohort study reported that colonoscopy-related mortality 30 days after the procedure was <0.01% (1 out of 14,000 procedures). A prospective cohort from the US reported a mortality rate of 0.014% at 30 days after the procedure.

INCOMPLETE COLONOSCOPY AND MISSED LESIONS

It may not be possible to always achieve cecal intubation during colonoscopy due to factors such as poor bowel preparation, severe colitis, stricture and excessive colonic looping. Caecal intubation rate is the most commonly used indicator of the quality of colonoscopy and 90% caecal intubation for symptomatic patients and 95% for patients undergoing screening colonoscopy are accepted standards. Quality assurance programs require at least photo-documentation of either the appendix orifice or ileo-cecal valve or both, for verification of complete colonoscopy, in order to avoid the scenario of a missed right sided colonic lesion when an incomplete colonoscopy is passed off as complete.

Although colonoscopy is regarded as the reference standard, the possibility of missed adenomas and cancers is a reality that needs to be addressed in any quality assurance program. A meta-analysis which included 6 studies with a total of 465 patients found that the pooled miss rate for polyps of any size was 22%. Adenoma miss rate increased significantly in smaller sized polyps; >10 mm: 2.1%; 5-10 mm: 13%; 15 mm: 26%. A multicenter study evaluated 286 tandem colonoscopies.
The miss rates for polyps, hyperplastic polyps, adenomas, polyps and adenomas greater than 5 mm were 28%, 31%, 21%, 12% and 9% respectively. The miss rate for advanced adenoma was 11%. The diameter (1-mm increments) and number of polyps (≥3) were independently associated with a lower polyp miss rate, whereas sessile or flat shape and left location were significantly associated with a higher miss rate. A recent study investigated patient, procedure and polyp-related factors affecting the miss rate of polyps on colonoscopy. Overall the missed rate was 26.4%. Patient-related factors were male sex (OR, 2.11) and older age (OR, 2.51). Procedure-related factors were colonoscopy by clinical fellows (OR, 2.20) and delayed insertion time (OR, 4.10). Polyp-related factors were more than four polyps (OR, 4.48). Another recent prospective study reported a greater likelihood for missed and recurrent adenomas in the proximal colon. CRC may occur after apparently normal colonoscopy. These may reflect cancers that show more aggressive behaviour and rapid growth, but may also represent missed cancers or cancers arising from incompletely excised benign lesions. A study evaluated patients who underwent baseline colonoscopy with removal of at least one adenoma and were deemed free of remaining lesions. CRC was diagnosed in 19 of the 2,915 patients over a mean follow-up of 3.7 years (incidence: 1.74 cancers/1,000 person-years). Older patients and those with a history of more adenomas were at higher risk of being diagnosed with invasive cancer or adenoma with high-grade dysplasia. Another study analysed data from the Canadian Institute for Health Information, the Ontario Health Insurance Program, and Ontario Cancer Registry for all patients with a new diagnosis of right-sided, transverse, splenic flexure/descending, rectal or sigmoid CRC who had a colonoscopy within the 3 years before their diagnosis. The rates of new or missed cancers in the right colon, transverse colon, splenic flexure/descending colon and sigmoid colon/rectum were 5.9%, 5.5%, 2.1%, and 2.3% respectively. Independent risk factors for these cancers were older age, diverticular disease, right-sided or transverse CRC, colonoscopy by an internist or family physician and office-based colonoscopy. Another recent study used a model to apply risk estimates to a hypothetical average-risk population that underwent screening colonoscopies. The proportion of individuals with tumors missed at the baseline colonoscopy and tumors that arose from missed adenomas during a 5-year follow-up period was calculated. It was found that 0.7 per 1,000 persons undergoing a screening colonoscopy had a cancer that was missed at the baseline colonoscopy and an additional 1.1 per 1,000 subsequently developed cancer from a missed adenoma. Therefore, the expected rate of individuals with CRC, based on missed adenomas, was 1.8 per 1,000 persons within 5 years. Using the most conservative assumptions (a low miss rate and low prevalence of cancer in adenomas) 0.5 per 1,000 persons would have a detectable CRC within 5 years after a screening colonoscopy. If the highest reported miss rates and cancer prevalence were used, CRCs from missed lesions would occur in 3.5 per 1,000 persons.

The adenoma detection rate is an important tool for quality assurance. Based on expected prevalence rates, it has been proposed that adenomas should be detected in more than 25% of asymptomatic males and in more than 15% of asymptomatic female individuals older than 50 years at first colonoscopy. Lower rates are likely to be explained by poor examination quality. A withdrawal time of at least 6 minutes is used as a reflection of the meticulousness of the examination technique. A study that examined the rates of detection of adenomas and the amount of time taken to withdraw the colonoscope among endoscopists in a large community-based practice reported that a withdrawal time of 6 minutes or greater, compared to less than 6 minutes, resulted in significantly higher rates of detection of any neoplasia (28.3% vs. 11.8%) and of advanced neoplasia (6.4% vs. 2.6%).

**SETTING UP A NATIONAL PROGRAM AND ESTABLISHING A QUALITY ASSURANCE SYSTEM**

In July 2011, the Singapore national CRC screening program was instituted. This was primarily based on FIT. Individuals who test positive are referred promptly for colonoscopy. At the same, individuals have the option to undergo screening colonoscopy. To provide quality assurance, a set of quality indicators and criteria
was established for endoscopists and endoscopy centres providing colonoscopy for CRC screening. The endoscopists must be qualified specialists (either gastroenterologist or surgeons) with a lifetime experience of at least 500 colonoscopies and 50 polypectomies, and need to meet annual monitoring parameters that included at least 50 colonoscopies, >95% completion rate with photographic evidence of the ileo-caecal valve/appendix orifice, >95% recovery rate of excised polyps, and withdrawal time of at least 6 minutes. In addition, all centers were required to maintain standards of bowel preparation and have complication rates that are within acceptable limits such as perforation rate less than 1 per 1,000 colonoscopies, postpolypectomy bleeding rates less than 1 per 100 and post polypectomy perforation rate less than 3 per 1,000. These quality indicators were to be tracked prospectively and audited.

CONCLUSION

Colonoscopy is a powerful tool for CRC diagnosis and prevention. However it has a small but definite risk of significant complications. There is also a possibility of missed lesions due to inadequacy of bowel preparation, patient factors and endoscopist factors. To be successful, a CRC screening program requires stringent quality control measures for colonoscopy to ensure optimal quality standards.

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