Endoscopy Result of
The Specialists Surgery and Endoscopy Centre

Commissioned by

The Specialists Surgery and Endoscopy Centre

Executed by

Centre for Social Policy Studies
Department of Applied Social Sciences
The Hong Kong Polytechnic University

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Table of Content

1. Introduction

The Specialists Surgery and Endoscopy Centre (hereinafter, the centre) commissioned the Centre for Social Policy Studies (CSPS) of Department of Applied Social Sciences, The Hong Kong Polytechnic University, to conduct the Endoscopy result analysis on their patients. This report documented the survey findings.

2. Survey methodology & Samples

2.1. Survey Objectives

The objectives of the survey are to gauge the performance of the centre and patients' health situation of lower digestive system:

1. The frequency of procedure from June 2006 to December 2015;
2. The qualities of bowel preparation;
3. The Cecal and Ileal intubation rate;
4. The morbidity and mortality rate
5. The perforation rate;
6. The post-polypectomy bleeding rate;
7. The polyp detection rate;
8. The adenoma detection rate and
9. The cancer detection rate;

2.2. Survey Method and Survey Period

For the data collected from 2006 to 2013, the Specialists Surgery and Endoscopy Centre were responsible for inputting data derived from patients' medical reports[1]. The centre provided the dataset to CSPS and processed for calculation. For the data collected from 2014 to 2015, CSPS was responsible for inputting data based on the guideline provided by the centre. CSPS analyzed the medical related data based on the rationales and formulas set by the centre.

2.3. Privacy issues

Before receiving the patients' records from The Specialists Surgery and Endoscopy Centre, they assigned the patient number for replacing the name and removing unnecessary personal information from the records. CSPS keeps the records encrypted and stored properly. The data would be removed within 6 months after finishing all of the analyzing process.

[1] Data of the medical reports collected from 2006 to 2013 were endoscopy reports and corresponding pathology reports done by the Specialists Surgery and Endoscopy Centre. In the report, polyp sizes are determined by endoscopists, who compared the size with instrument. Matching of adenoma polyps with its corresponding size was done by the nursing staff based on the photo, size and location on the reports. The judgement was based on the nursing staff's professional knowledge and experience.

3. Survey Result

3.1. The procedure frequency from June 2006 to 2015

It is the frequency of procedures within the data collection period. The endoscopies were mostly conducted in 2015 with 20.4%. In 2015, there were a total of 4288 endoscopies conducted.

Table 3.1a The frequency of procedure from 2006 to 2015

	Frequency	Valid Percent
2006 (Jun - Dec)	41	0.2
2007	437	2.1
2008	922	4.4
2009	1598	7.6
2010	1577	7.5
2011	2530	12.0
2012	2686	12.8
2013	3063	14.6
2014	3859	18.4
2015	4288	20.4
Total	21001	100.0

Remark: There were 21,004 cases in total, in which 3 cases were missing the year record

Table 3.1b The frequency of procedure by age group

	Frequency	Valid Percent
age 11 - 15	9	0.0
age 16 - 20	98	0.5
age 21 - 25	282	1.3
age 26 - 30	471	2.2
age 31 - 35	707	3.4
age 36 - 40	1056	5.0
age 41 - 45	1651	7.9
age 46 - 50	2794	13.3
age 51 - 55	4101	19.5
age 56 - 60	3597	17.1
age 61 - 65	2671	12.7
age 66 - 70	1527	7.3
age 71 - 75	1054	5.0
age 76 - 80	687	3.3
age 81 - 85	244	1.2
age 86 - 90	51	0.2
age 91 - 95	3	0.0
Total	21003	100.0

Remark: There were 21,004 cases in total, in which 1 case were missing the age record

Table 3.1c The frequency of procedure from 2006 to 2015 by gender group

	Male		Female	
	Frequency	% within the year	Frequency	% within the year
2006 (Jun - Dec)	17	41.5	24	58.5
2007	232	53.1	205	46.9
2008	490	53.1	432	46.9
2009	834	52.2	764	47.8
2010	794	50.3	783	49.7
2011	1258	49.7	1272	50.3
2012	1377	51.3	1309	48.7
2013	1527	49.9	1536	50.1
2014	1904	49.3	1955	50.7
2015	2129	49.7	2159	50.3
Total	10562	50.3	10439	49.7

Remark: There were 21,004 cases in total, in which 3 cases were missing the year record

3.2. The qualities of bowel preparation

It is to clean and empty the colon for colonoscopy. A satisfactory bowel preparation helped doctor to view the lining and interior structure of the colon clearly and so thoroughly examined it.

Range was:

(i) Poor - Cannot have completed assessment nor be cleared up with irrigation; abandoned procedure was needed.
(ii) Fair - Taking long time and copious irrigation to achieve full assessment.
(iii) Satisfactory after irrigation - Moderate irrigation to achieve full assessment.
(iv) Satisfactory - Little irrigation with full assessment.
(v) Normal – Minimal irrigation with full assessment
(vi) Good - Almost no irrigation with full assessment

Most of the endoscopies conducted in The Specialists Surgery and Endoscopy Centre were above satisfaction after irrigation with 99.6% of all cases.

Table 3.2. The quality of bowel preparation

	Frequency	Valid Percent
Good	1154	5.5
Normal	5	0.0
Satisfactory	5449	26.0
Satisfactory After Irrigation	14296	68.1
Fair	15	0.1
Poor	68	0.3
Total	20987	100.0

Remark: There are 21,004 cases in total, in which 17 cases were missing data

3.2.1. The qualities of bowel preparation by procedure year

Most of the endoscopies conducted in The Specialists Surgery and Endoscopy Centre were above satisfaction after irrigation with above 97.6% of all cases every year. The highest quality was in 2014 and 2015 with 99.9%.

Table 3.2.1 The quality of bowel preparation by procedure year

	Good		Normal		Satisfactory		Satisfactory After Irrigation		Fair		Poor		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2006 (Jun - Dec)	35	85.4	0	0.0	4	9.8	1	2.4	1	2.4	0	0.0	41	100.0
2007	267	61.8	2	0.5	138	31.9	18	4.2	1	0.2	6	1.4	432	100.0
2008	409	44.4	0	0.0	451	49.0	59	6.4	2	0.2	0	0.0	921	100.0
2009	287	18.0	0	0.0	934	58.4	361	22.6	10	0.6	6	0.4	1598	100.0
2010	52	3.3	1	0.1	804	51.0	715	45.4	0	0.0	4	0.3	1576	100.0
2011	98	3.9	0	0.0	1029	40.7	1388	54.9	0	0.0	13	0.5	2528	100.0
2012	3	0.1	0	0.0	1734	64.6	927	34.5	0	0.0	21	0.8	2685	100.0
2013	2	0.1	1	0.0	350	11.4	2695	88.1	0	0.0	12	0.4	3060	100.0
2014	0	0.0	1	0.0	4	0.1	3851	99.8	0	0.0	2	0.1	3858	100.0
2015	1	0.0	0	0.0	0	0.0	4280	99.9	1	0.0	3	0.1	4285	100.0

Remark: There were 21,004 cases in total, in which 17 cases were missing data and 3 cases missed the year record

3.3. The Intubation rate

It is the frequency to reach caecum (end of colon), which is an indication of complete assessment of colon or a successful colonoscopy, is one of the assessment criteria of endoscopist's competence. It was suggested in 1990 that it should be over 90%. Cancer obstruction is usually excluded in view of a quality assessment.

3.3.1. The Caecal Intubation rate

Overall, the success rate of caecal intubation was 99.5%, only 114 out of 20,977 cases were failed (see table 3.3.1a). The success rate increased to be 99.8% when it excluded cancer obstruction cases (see table 3.3.1c). For the cancer cases, the success rate was 89.9% (see table 3.3.1b).

Table 3.3.1a The caecal intubation rate (Overall)

	Frequency	Valid Percent
Fail	114	0.5
Success	20863	99.5
Total	20977	100.0

Remarks: There were 21,004 cases in total, in which 27 cases were missing the related record

Table 3.3.1b The caecal intubation rate for cancer cases only

	Frequency	Valid Percent
Fail	68	10.1
Success	606	89.9
Total	674	100.0

Remarks: There were 674 cases with cancer in total

Table 3.3.1c The caecal intubation rate excluding cancer obstruction cases

	Frequency	Valid Percent
Fail*	46	0.2
Success	20863	99.8
Total	20909	100.0

Remarks: There were 20,909 cases without cancer obstruction (no. of overall cases deducted fail frequency of cancer cases = 20,977 – 68).

*Fail frequency excluding cancer obstruction cases = fail frequency in overall (N=114) deducted fail frequency (N=68) in cancer cases

3.3.1.1. The Caecal Intubation rate by procedure year

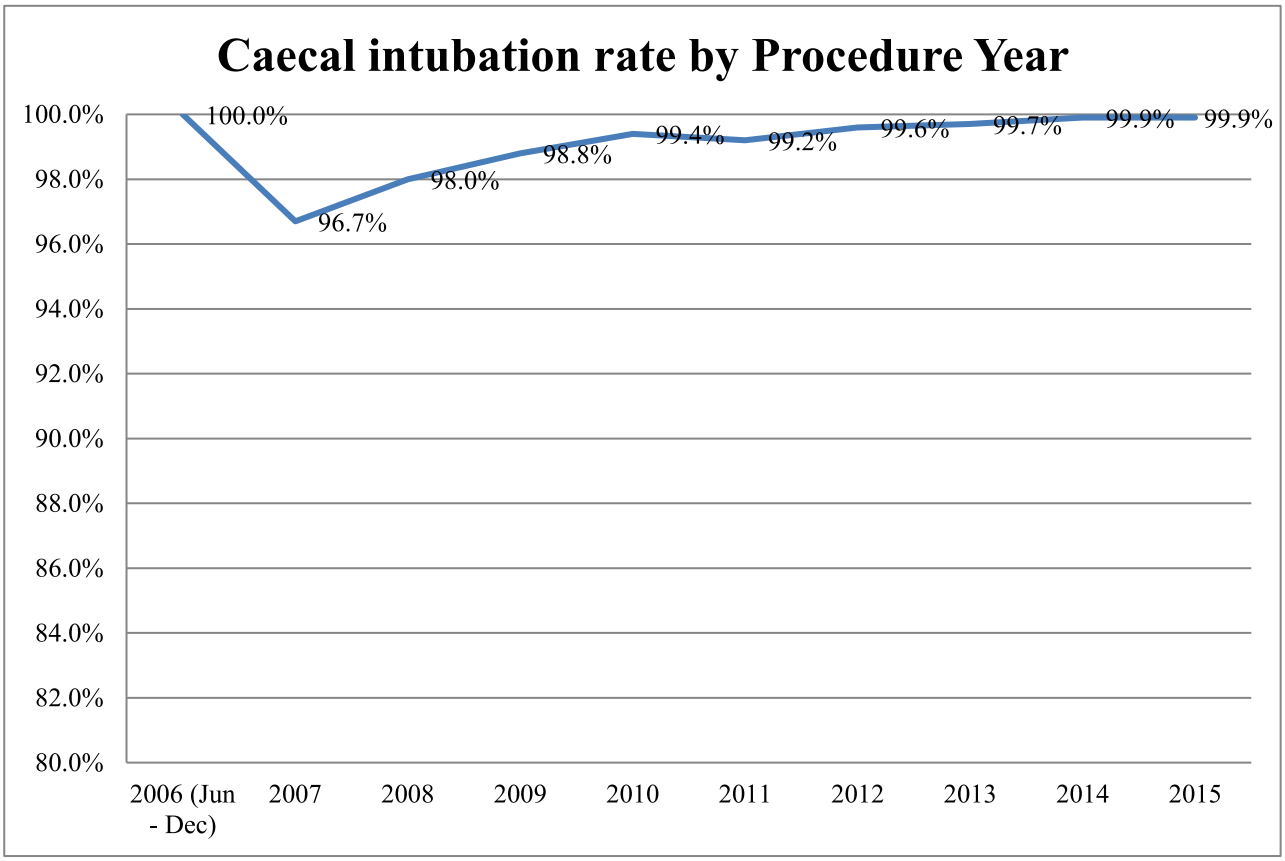
The success rates of the Caecal Intubation of each year were in the range of 98.3% to 100.0%.

Table 3.3.1.1 The Caecal intubation rate by procedure year

	Fail		Success		Total		*cancer obstruction
	N	%	N	%	N	%	
2006 (Jun - Dec)	0	0.0	41	100.0	41	100.0	1
2007	14	3.3	409	96.7	423	100.0	24
2008	18	2.0	904	98.0	922	100.0	46
2009	19	1.2	1578	98.8	1597	100.0	58
2010	10	0.6	1564	99.4	1574	100.0	66
2011	21	0.8	2508	99.2	2529	100.0	81
2012	11	0.4	2675	99.6	2686	100.0	86
2013	10	0.3	3045	99.7	3055	100.0	108
2014	5	0.1	3854	99.9	3859	100.0	105
2015	6	0.1	4282	99.9	4288	100.0	99

Remark: There were 21,004 cases in total, in which 27 cases were missing the related record and 3 cases were missing the year record.

Graph 3.3.1.1 The Caecal intubation rate by procedure year



3.3.2. The Ileal Intubation rate

The success rate of ileal intubation was 99.1%, only 200 out of 20,977 cases were failed to be advanced to Ileum (see table 3.3.2a). The success rate increased to be 99.4% when it excluded cancer obstruction cases (see table 3.3.2c). For the cancer cases, the success rate was 88.1% (see table 3.3.2b).

Table 3.3.2a The Ileal intubation rate (Overall)

	Frequency	Valid Percent
Fail	200	0.9
Success	20777	99.1
Total	20977	100.0

Remarks: There were 21,004 cases in total, in which 27 cases were missing the related record

Table 3.3.2b The Ileal intubation rate for cancer cases only

	Frequency	Valid Percent
Fail	80	11.9
Success	594	88.1
Total	674	100.0

Remarks: There were 674 cases with cancer in total

Table 3.3.2c The Ileal intubation rate excluding cancer obstruction cases

	Frequency	Valid Percent
Fail*	120	0.6
Success	20777	99.4
Total	20897	100.0

Remarks: There were 20,897 cases without cancer obstruction (no. of overall cases deducted fail frequency of cancer cases = 20,977 – 80).

*Fail frequency excluding cancer obstruction cases = fail frequency in overall (N=200) deducted fail frequency (N=801) in cancer cases

3.3.2.1. The Ileum Intubation Rate by procedure year

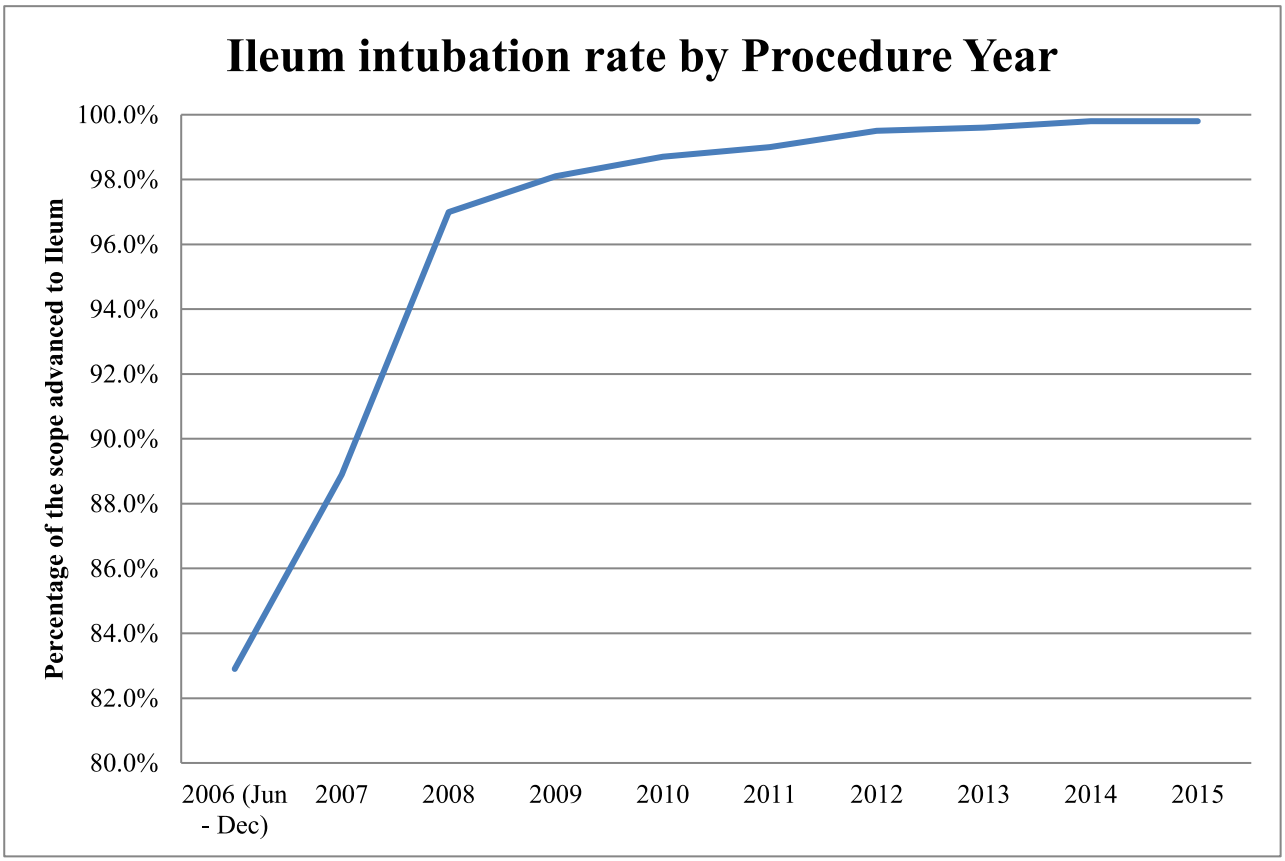
The success rates of the Ileum Intubation of each year were between 82.9% to 99.8%.

Table 3.3.2.2 The Ileum intubation rate by procedure year

	Fail		Success		Total		*cancer obstruction
	N	%	N	%	N	%	
2006 (Jun - Dec)	7	17.1	34	82.9	41	100.0	1
2007	47	11.1	376	88.9	423	100.0	24
2008	28	3.0	894	97.0	922	100.0	46
2009	31	1.9	1566	98.1	1597	100.0	58
2010	20	1.3	1554	98.7	1574	100.0	66
2011	26	1.0	2503	99.0	2529	100.0	81
2012	14	0.5	2672	99.5	2686	100.0	86
2013	12	0.4	3043	99.6	3055	100.0	108
2014	6	0.2	3853	99.8	3859	100.0	105
2015	9	0.2	4279	99.8	4288	100.0	99

Remark: There were 21,004 cases in total, in which 27 cases were missing the related record and 3 cases were missing the year record.

Graph 3.3.2.2 The Ileum intubation rate by procedure year



3.4. The morbidity and operative mortality rate

It describes the mortality happened during procedure or during stay in The Specialists Surgery and Endoscopy Centre related to our procedure and sedation or in the surgery period.

The operative and in-centre mortality rate of The Specialists Surgery and Endoscopy Centre keeps at zero.

3.4.1. The perforation rate

Perforation during colonoscopy is a major complication which causes peritonitis and puts patient's life at risk. It is widely accepted to be less than 1:1000. Perforation rate is one of the assessment criteria of endoscopist's competence.

The perforation rate of the endoscopies by the Centre was 0.0095%, i.e. less than 1:10,000. Two perforation were treated by surgical operations (one by resection of perforated cancer, another with laparoscopic repair of perforated diverticulum), both were recovered unevenfully.

Table 3.4.1 The perforation rate

	Frequency	Valid Percent
Perforation	2	0.0095
No perforation	21002	99.9905
Total	21004	100.0

3.4.1.1. The perforation rate by procedure year

Regarding the perforation rate by procedure year, the centre has kept at below 0.1% since 2006. Overall perforation rate is below 0.01%.

Table 3.4.1.1 The perforation rate by procedure year

	With perforation		Without perforation		Total	
	N	%	N	%	N	%
2006 (Jun - Dec)	0	0.0	41	100.0	41	100.0
2007	0	0.0	437	100.0	437	100.0
2008	0	0.0	922	100.0	922	100.0
2009	0	0.0	1598	100.0	1598	100.0
2010	0	0.0	1577	100.0	1577	100.0
2011	0	0.0	2530	100.0	2530	100.0
2012	0	0.0	2686	100.0	2686	100.0
2013	0	0.0	3063	100.0	3063	100.0
2014	2	0.1	3857	99.9	3859	100.0
2015	0	0.0	4288	100.0	4288	100.0

Remark: There were 21,004 cases in total, in which 3 cases were missing the year record

3.4.2. The post-polypectomy bleeding rate

It describes another common complication after polypectomy. The post-polypectomy bleeding referred to the delay bleeding happened usually at 7-9 days after polypectomy, as a result of submucosal vessel eroded through polypectomy wound. Almost all polypectomy have a satisfactory hemostasis before end of procedure. Nowadays it can be controlled satisfactorily with endoclips.

The Post-polypectomy bleeding rate was 0.4% after endoscopy process. All were controlled with endoscopy and endoclips.

Table 3.4.2 Post-polypectomy bleeding rate

	Frequency	Valid Percent
Bleeding	69	0.4
No Bleeding	15890	99.6
Total	15959	100.0

Remark: There were 15,959 cases with polyp in total

3.4.2.1. The post-polypectomy bleeding rate by procedure year

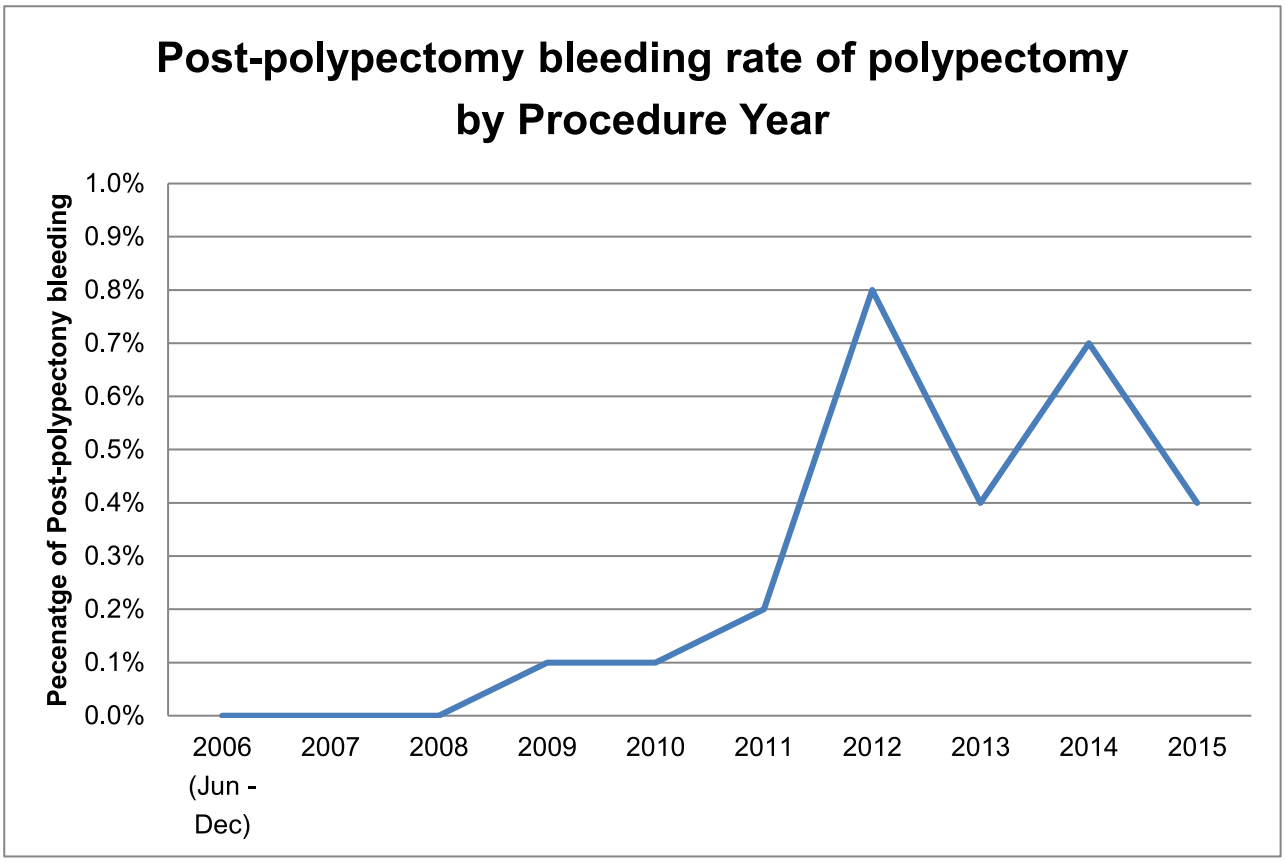
Regarding the post-polypectomy bleeding rate of polypectomy by procedure year, the centre has kept at 0.0%-0.8% starting from 2006.

Table 3.4.2.1 The post-polypectomy bleeding rate of polypectomy by procedure year

	Bleeding		No Bleeding		Total	
	N	%	N	%	N	%
2006 (Jun – Dec)	0	0.0	21	100.0	21	100.0
2007	0	0.0	257	100.0	257	100.0
2008	0	0.0	569	100.0	569	100.0
2009	1	0.1	946	99.9	947	100.0
2010	1	0.1	1033	99.9	1034	100.0
2011	4	0.2	1816	99.8	1820	100.0
2012	15	0.8	1906	99.2	1921	100.0
2013	9	0.4	2409	99.6	2418	100.0
2014	24	0.7	3439	99.3	3463	100.0
2015	15	0.4	3492	99.6	3507	100.0

Remark: There were 15,959 cases with polyps in total. 2 cases were missing the year record.

Graph 3.4.2.1 The post-polypectomy bleeding rate of polypectomy by procedure year



3.5. Polyp

It is the abnormal growth of epithelial tissue of colon with any protrusion from mucosal surface. There are mainly four types of polyps depends on the cell type constituent of it, namely neoplastic, hyperplastic/metaplastic, Peutz-Jehger polyps and juvenile polyps. The neoplastic polyp, which is an adenoma, has the potential to develop into cancer and is considered to be pre-cancerous entity that needed to be removed. Sessile serrated polyp, a variant between adenoma and hyperplastic polyp, also has cancerous potential that needed to be removed. However, at most of the times, the type of polyp is known only after removal and pathological examination.

3.5.1. The polyp detection rate

The polyp detection rate was 76.0%, more than three fourths of the patients could detect at least one polyp during endoscopy process. The age range of patients who have at least one polyp detected was 16-95.

Table 3.5.1. The polyp detection rate

	Frequency	Valid Percent
No polyp detected	5045	24.0
At least one polyp detected	15959	76.0
Total	21004	100.0

3.6. Adenoma

It is a benign tumour, representing the benign period of a cancer development process, adenoma-carcinoma sequence. It may develop into cancer in 5-10 years. As long as it was a benign tumour, complete excision with polypectomy is satisfactory.

3.6.1. The adenoma rate in overall cases

The adenoma detection rate was 54.8%, over a half of the patients (11,510 of 21,004 cases) could be detected at least one spot related to adenoma.

Table 3.6.1. The adenoma rate in overall cases

	Frequency	Valid Percent
No polyp	5045	24.0
Non-adenoma polyp / unknown polyp detected	4449	21.2
At least one adenoma polyp detected	11510	54.8
Total	21004	100.0

3.6.2. The adenoma rate in overall cases by procedure year

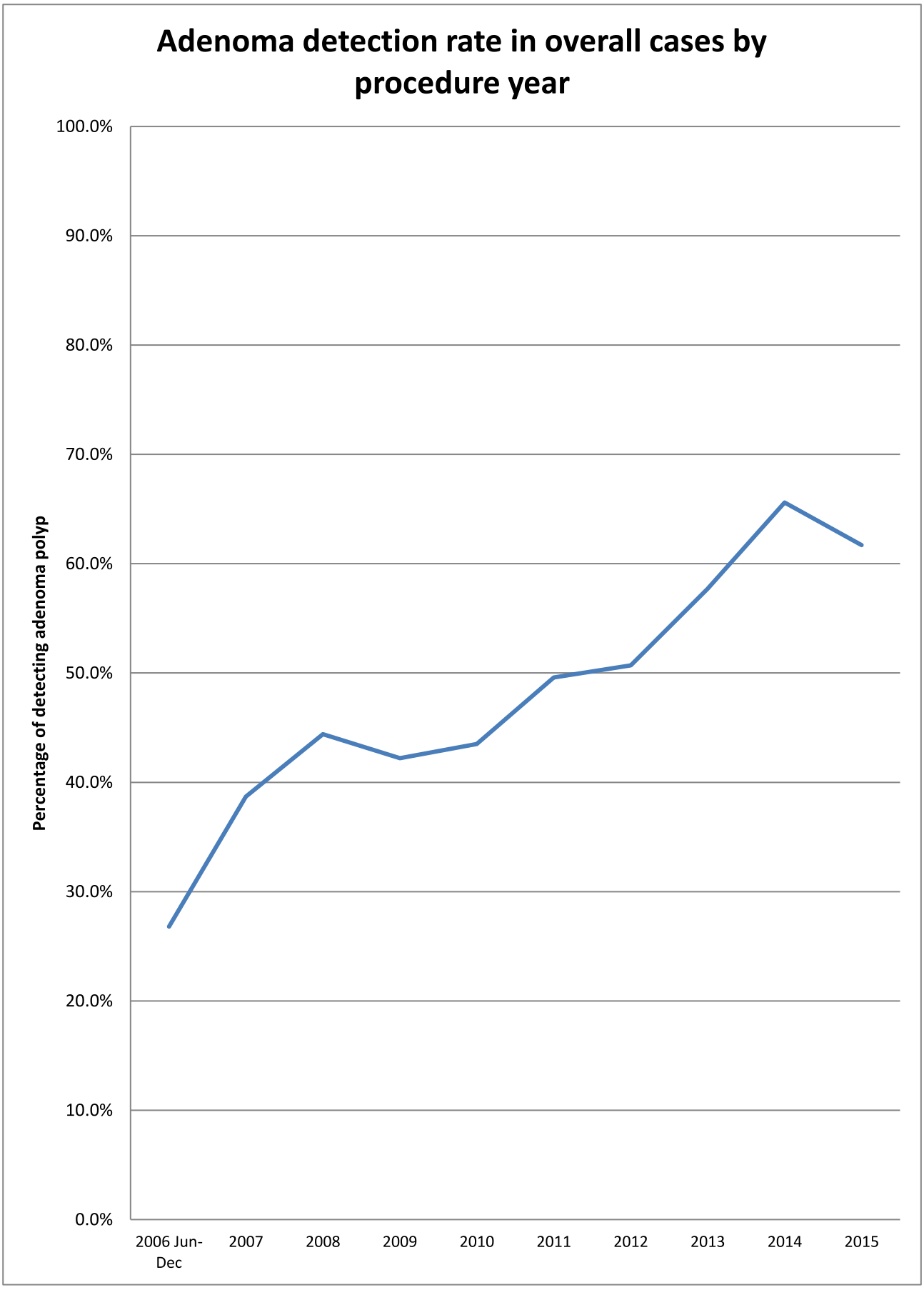
The highest adenoma detection rate since 2006 Jun was 65.6% in 2014.

Table 3.6.2. The adenoma rate in overall cases by procedure year

	No polyp		Non-adenoma polyp / unknown polyp detected		At least one adenoma polyp detected		Total	
	Frequency	Valid Percent	Frequency	Valid Percent	Frequency	Valid Percent	Frequency	Valid Percent
2006 (Jun - Dec)	20	48.8	10	24.4	11	26.8	41	100.0
2007	180	41.2	88	20.1	169	38.7	437	100.0
2008	353	38.3	160	17.4	409	44.4	922	100.0
2009	651	40.7	273	17.1	674	42.2	1598	100.0
2010	543	34.4	348	22.1	686	43.5	1577	100.0
2011	710	28.1	565	22.3	1255	49.6	2530	100.0
2012	765	28.5	560	20.8	1361	50.7	2686	100.0
2013	645	21.1	652	21.3	1766	57.7	3063	100.0
2014	396	10.3	932	24.2	2531	65.6	3859	100.0
2015	781	18.2	860	20.1	2647	61.7	4288	100.0

Remark: There were 21,004 cases in total, in which 3 cases were missing the year record.

Graph 3.6.2. The adenoma rate in overall cases by procedure year


Adenoma detection rate in overall cases by procedure year
Percentage of detecting adenoma polyp
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
2006 Jun-Dec
2007
2008
2009
2010
2011
2012
2013
2014
2015

3.6.3. The adenoma rate in overall cases by gender group

53.9% of adenoma cases belonged to male patients and 46.1% was female patients. In male population, 58.8% of them were found at least one adenoma polyp. In female population, 50.8% of them were found at least one adenoma polyp.

Table 3.6.3. The adenoma rate in overall cases by gender group

	Male			Female		
Polyp Status	Frequency	%	% within polyp status	Frequency	%	% within polyp status
No polyp	2201	20.8	43.6	2844	27.2	56.4
Non-adenoma polyp / unknown polyp detected	2154	20.4	48.4	2295	22.0	51.6
At least one adenoma polyp detected	6208	58.8	53.9	5302	50.8	46.1
Total	10563	100.0		10441	100.0	

3.6.4. The adenoma detection rate by number of adenoma polyps detected per patient

The mean and median of number of adenoma polyps detected in overall cases were 1.47 and 1.00 respectively. The mean and median of number of adenoma polyps detected in all cases with at least one adenoma polyp detected (N=11,510) were 2.69 and 2.00 (range=1 to 47). 23.5% of patients were found 1 adenoma polyp, 12.1% were found 2 adenoma polyps, 11% were found 3-4 adenoma polyps and 8.2% of them were found 5 adenoma polyps or above.

Table 3.6.4. The adenoma detection rate

	Frequency	Valid Percent
No polyp	5045	24.0
Non-adenoma polyp / unknown polyp detected	4449	21.2
At least one adenoma polyp detected*	11510	54.8
1 adenoma polyp detected	*4941*	*23.52*
2 adenoma polyp detected	*2536*	*12.07*
3 adenoma polyp detected	*1458*	*6.94*
4 adenoma polyp detected	*858*	*4.08*
5 adenoma polyp detected	*543*	*2.59*
6 adenoma polyp detected	*373*	*1.78*
7 adenoma polyp detected	*222*	*1.06*
8 adenoma polyp detected	*138*	*0.66*
9 adenoma polyp detected	*110*	*0.52*
10 adenoma polyp detected	*77*	*0.37*
11 adenoma polyp detected	*69*	*0.33*
12 adenoma polyp detected	*40*	*0.19*
13 adenoma polyp detected	*33*	*0.16*
14 adenoma polyp detected	*26*	*0.12*
15 adenoma polyp detected	*16*	*0.08*
16 adenoma polyp detected	*14*	*0.07*
17 adenoma polyp detected	*7*	*0.03*
18 adenoma polyp detected	*8*	*0.04*
19 adenoma polyp detected	*8*	*0.04*
20 adenoma polyp detected	*7*	*0.03*
21 adenoma polyp detected	*6*	*0.03*
22 adenoma polyp detected	*2*	*0.01*
23 adenoma polyp detected	*4*	*0.02*
24 adenoma polyp detected	*1*	*0.00*
25 adenoma polyp detected	*4*	*0.02*

26 adenoma polyp detected	*0*	*0.00*
27 adenoma polyp detected	*1*	*0.00*
28 adenoma polyp detected	*0*	*0.00*
29 adenoma polyp detected	*1*	*0.00*
30 adenoma polyp detected	*1*	*0.00*
31 adenoma polyp detected	*0*	*0.00*
32 adenoma polyp detected	*1*	*0.00*
33 adenoma polyp detected	*1*	*0.00*
34 adenoma polyp detected	*1*	*0.00*
35 adenoma polyp detected	*1*	*0.00*
36 adenoma polyp detected	*0*	*0.00*
37 adenoma polyp detected	*0*	*0.00*
38 adenoma polyp detected	*0*	*0.00*
39 adenoma polyp detected	*1*	*0.00*
40 adenoma polyp detected	*0*	*0.00*
41 adenoma polyp detected	*0*	*0.00*
42 adenoma polyp detected	*0*	*0.00*
43 adenoma polyp detected	*0*	*0.00*
44 adenoma polyp detected	*0*	*0.00*
45 adenoma polyp detected	*0*	*0.00*
46 adenoma polyp detected	*0*	*0.00*
47 adenoma polyp detected	*1*	*0.00*
Total	21004	100.0

Remark: *There were 30,933 adenoma polyps in total, in which 30,867 polyps were removed successfully (See table 3.6.6)

3.6.5. The adenoma detection rate per age group of patients

For the adenoma detection rate, the adenoma detection rate was increasing with ascending age group. The median of the patient with at least one adenoma polyp was age 56-60. The age range of patients who had at least one adenoma detected was 16-95.

Table 3.6.5.a. Adenoma detection rate by age group of patients

	Cases with No polyp		Cases with Non-adenoma polyp / unknown polyp detected		Cases with adenoma polyp detected		Number of Adenoma polyp	Size of adenoma polyp (mm)	Total	
	N	%	N	%	N	%	Mean (range)	Mean (range)	N	%
age 11 – 15	9	100.0	0	0.0	0	0.0	/	/	9	100.0
age 16 – 20	74	75.5	18	18.4	6	6.1	1.00 (1-1)	3.50 (2-8)	98	100.0
age 21 – 25	196	69.5	69	24.5	17	6.0	1.12 (1-2)	3.26 (2-7)	282	100.0
age 26 – 30	283	60.1	121	25.7	67	14.2	1.37 (1-9)	3.37 (2-12)	471	100.0
age 31 – 35	347	49.1	204	28.9	156	22.1	1.38 (1-7)	3.61 (2-40)	707	100.0
age 36 – 40	461	43.7	317	30.0	278	26.3	1.59 (1-29)	3.56 (2-35)	1056	100.0
age 41 – 45	582	35.3	443	26.8	626	37.9	1.84 (1-35)	3.55 (2-40)	1651	100.0
age 46 – 50	769	27.5	738	26.4	1287	46.1	1.98 (1-19)	3.71 (1-45)	2794	100.0
age 51 – 55	902	22.0	948	23.1	2251	54.9	2.27 (1-33)	3.64 (1-40)	4101	100.0
age 56 – 60	617	17.2	691	19.2	2289	63.6	2.62 (1-38)	3.72 (1-45)	3597	100.0
age 61 – 65	374	14.0	428	16.0	1869	70.0	2.94 (1-27)	3.74 (1-50)	2671	100.0
age 66 – 70	165	10.8	220	14.4	1142	74.8	3.24 (1-38)	3.95 (1-50)	1527	100.0
age 71 – 75	127	12.0	148	14.0	779	73.9	3.71 (1-30)	3.85 (2-40)	1054	100.0
age 76 – 80	99	14.4	70	10.2	518	75.4	4.32	4.10	687	100.0

							(1-32)	(1-40)		
age 81 – 85	31	12.7	27	11.1	186	76.2	4.49 (1-23)	4.36 (2-50)	244	100.0
age 86 – 90	8	15.7	7	13.7	36	70.6	4.33 (1-11)	4.47 (2-30)	51	100.0
age 91 – 95	0	0.0	0	0.0	3	100.0	3.00 (1-4)	4.11 (3-8)	3	100.0
Total	5044	24.0	4449	21.2	11510	54.8	2.69 (1-38)	3.79 (1-50)	21003	100.0

Remark: 1 case was missing the age record

Graph 3.6.5a The adenoma detection rate by age group of patient

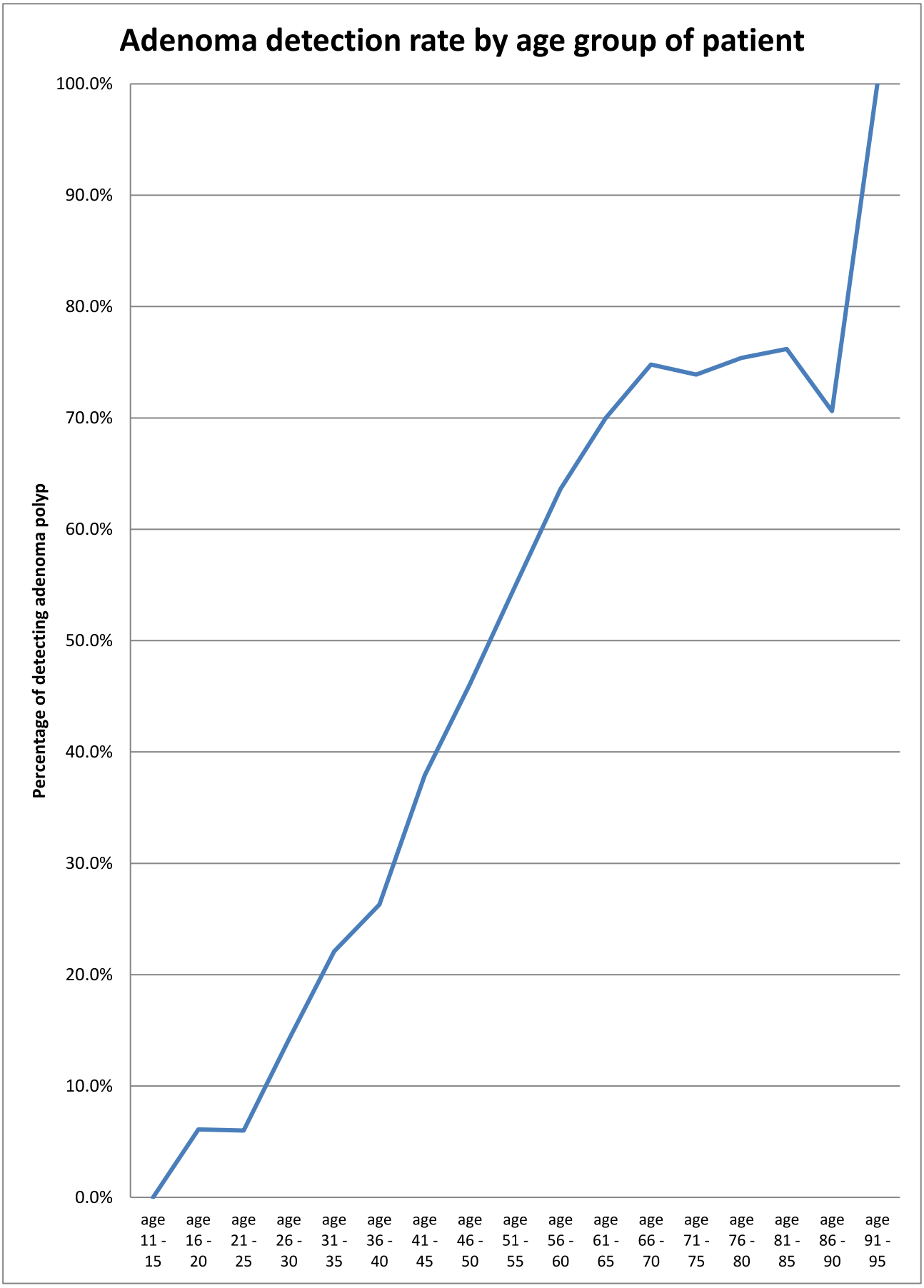


Table 3.6.5.b. The adenoma detection rate by age by procedure year

	2006 (Jun-Dec)	2007	2008	2009	2010	2011	2012	2013	2014	2015
	%	%	%	%	%	%	%	%	%	%
age 11 - 15	/	/	/	0.0	/	0.0	0.0	0.0	/	0.0
age 16 - 20	/	0.0	16.7	10.0	0.0	0.0	0.0	0.0	11.1	15.4
age 21 - 25	/	16.7	3.4	10.5	4.0	7.7	2.3	5.1	11.4	4.3
age 26 - 30	0.0	9.1	4.8	5.6	10.3	13.5	16.1	15.4	21.3	14.6
age 31 - 35	33.3	16.7	13.5	20.3	11.8	14.6	13.8	21.6	40.5	23.9
age 36 - 40	0.0	14.3	16.9	20.7	17.4	26.6	25.0	21.3	34.6	34.2
age 41 - 45	11.1	24.1	32.3	21.0	36.5	37.1	24.7	42.9	52.5	45.6
age 46 - 50	0.0	33.8	37.9	33.9	40.3	44.2	40.6	45.5	60.2	51.3
age 51 - 55	0.0	47.3	52.5	39.5	41.8	48.7	49.0	57.3	64.9	61.0
age 56 - 60	36.4	45.5	58.8	53.7	48.2	58.6	58.7	66.9	71.7	70.7
age 61 - 65	50.0	44.7	53.8	56.6	57.6	62.7	69.4	73.2	78.0	76.0
age 66 - 70	60.0	56.0	70.6	64.0	66.3	65.0	72.2	80.7	82.6	78.5
age 71 - 75	100.0	66.7	59.1	66.3	62.5	59.3	73.6	84.0	80.5	85.6
age 76 - 80	/	44.4	64.0	60.0	65.4	70.2	74.1	85.4	79.8	86.4
age 81 - 85	/	40.0	16.7	66.7	73.3	70.3	81.8	82.9	82.0	88.6
age 86 - 90	/	100.0	75.0	0.0	42.9	77.8	80.0	62.5	80.0	100.0
age 91 - 95	/	/	/	/	/	/	100.0	100.0	/	/

3.6.6. The adenoma rate in all removed polyps

Within the survey period, there were 55,020 polyps discovered inside 15,959 cases with polyp. Within 54,885 removed polyps, 43.6% polyp were not adenoma, on the other hand, 56.2% of the polyp were detected with adenoma.

Table 3.6.6. The adenoma rate in all polyps removed

	Frequency	Valid Percent
Non-adenoma polyp	23947	43.6
Adenoma detected polyp	30867	56.2
Unknown polyp	71	0.1
Total	54885	100.0

Remark: There were 55,020 polyps discovered inside 15,959 cases with polyp, in which 54,885 polyps were removed, 83 polyps were biopsied, 37 polyps were not removed and 15 polyps were missing the related record. Polyps are not removed as they are near cancer which will be removed in the related procedure of cancer. 4 of non-removed polyps are small and benign polyps deemed unnecessary to be removed as the patient is in terminal cancer.

3.6.7. The adenoma rate in all removed polyps by gender group

Within the status of adenoma detected polyp, 58.5% of them belonged to male patients and 41.5% was female patients.

Table 3.6.7. The adenoma rate in all polyps removed by gender group

	Male			Female		
Polyp Status	Frequency	%	% within polyp status	Frequency	%	% within polyp status
Non-adenoma polyp	13968	43.5	58.3	9979	43.8	41.7
Adenoma detected polyp	18068	56.3	58.5	12799	56.1	41.5
Unknown polyp	44	0.1	62.0	27	0.1	38.0
Total	32080	100.0		22805	100.0	

Remark: There were 55,020 polyps discovered inside 15,959 cases with polyp, in which 54,885 polyps were removed, 83 polyps were biopsied, 37 polyps were not removed and 15 polyps were missing the related record. Polyps are not removed as they are near cancer which will be removed in the related procedure of cancer. 4 of non-removed polyps are small and benign polyps deemed unnecessary to be removed as the patient is in terminal cancer.

3.6.8. The adenoma rate in all removed polyps by procedure year

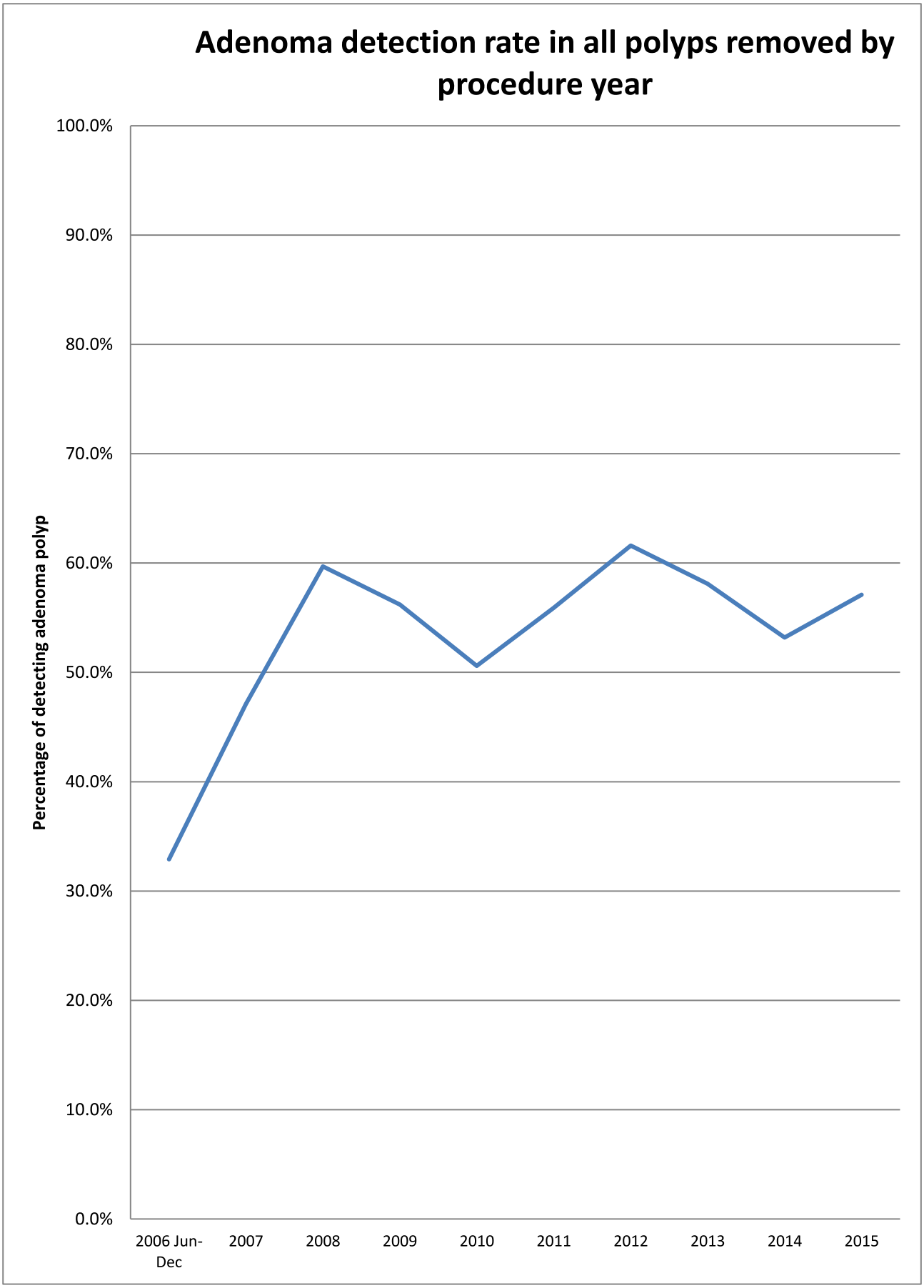
Among all polyps removed, adenoma rate ranged from 32.9% to 61.6% from 2006 to 2015.

Table 3.6.8. The adenoma rate in all polyps removed by procedure year

	No adenoma polyp		Adenoma detected polyp		Unknown polyp		Total	
	N	%	N	%	N	%	N	%
2006 (Jun – Dec)	48	65.8	24	32.9	1	1.4	73	100.0
2007	426	52.7	381	47.1	2	0.2	809	100.0
2008	663	40.2	984	59.7	2	0.1	1649	100.0
2009	1092	43.6	1410	56.2	5	0.2	2507	100.0
2010	1520	49.3	1561	50.6	2	0.1	3083	100.0
2011	2434	44.0	3092	55.9	2	0.0	5528	100.0
2012	2437	38.2	3930	61.6	8	0.1	6375	100.0
2013	3876	41.8	5390	58.1	8	0.1	9274	100.0
2014	6080	46.6	6947	53.2	31	0.2	13058	100.0
2015	5368	42.9	7147	57.1	10	0.1	12525	100.0

Remark: There were 54,885 removed polyps in total, in which 4 polyps were missing the related record.

Graph 3.6.8 The adenoma detection rate in all polyps removed by procedure year



3.6.9. The size of adenoma discovered

With total of there were 30,933 adenoma polyps discovered, 66.5% were within 3mm, 20.9% were 4-5 mm, 8.8% were within 6-9mm. Only 3.7% of them were 10mm or above.

Table 3.6.9. Adenoma Polyp size

	Frequency	Valid Percent
Within 3mm	20569	66.5
4-5mm	6476	20.9
6-9mm	2732	8.8
10-14mm	617	2.0
15-19mm	277	0.9
20mm or above	249	0.8
Total	30920	100.0

Remark: There were 30,933 adenomas detected, in which 13 adenoma polyps' sizes were missing. With reference to the polypectomy of the 30,933 adenomas detected, 30,867 were removed, 57 were biopsied, 5 were not removed and 4 were missing the related record.

3.6.10. The location of adenoma discovered

With total of there are 30,933 adenoma polyps discovered, 21.2% and 21.1% of the adenoma polyp are found at ascending colon and sigmoid colon respectively. Besides, 19.8% and 16.6% of them are found at transverse colon and descending colon respectively.

Table 3.6.10. Location of Adenoma Polyp discovered

	Frequency	Valid Percent
ileum	1	0.0
ileocaecal valve	4	0.0
appendix aperture	4	0.0
caecum	3003	9.7
ascending colon	6570	21.2
hepatic flexure	498	1.6
transverse colon	6125	19.8
splenic flexure	99	0.3
descending colon	5141	16.6
sigmoid colon	6536	21.1
rectosigmoid colon	1	0.0
rectum	2938	9.5
anal canal	12	0.0
Total	30932	100.0

Remark: There were 30,933 adenomas detected, in which 1 adenoma polyps 'site were missing. With reference to the polypectomy of the 30,933 adenomas detected, 30,867 were removed, 57 were biopsied, 5 were not removed and 4 were missing the related record.

3.7. Cancer

Adenocarcinoma, which is the most common type of cancerous growth in colon and rectum, is the type that we refer as colonic or rectal cancer. Most of them are developed from an adenoma while some are from sessile serrated polyp (through alternative pathway). It can rarely be developed de-novo (without polyp stage). It can invade and spread to the organ, and cause death eventually. It needs a radical resection which is the resection of cancer segment and related lymph node area. Some may require additional chemotherapy and/or radiotherapy. Even with complete resection, there are still about 30% chance of recurrence and subsequent death.

3.7.1. Cancer detection rate

For the cancer detection rate, 96.8% cases detected no cancer, 3.2% cases detected at least one cancer during the endoscopy process. When including re-scope cases, the cancer detection rate remained the same (see table 3.7.1b).

Table 3.7.1a The cancer detection rate excluding re-scope cases

	Frequency	Valid Percent
No Cancer spotted	20258	96.8
Cancer Spotted	674	3.2
Total	20932	100.0

Remark: There were 21,004 cases in total, in which 72 were re-scope cases after being diagnosed as cancer.

Table 3.7.1b The cancer detection rate including re-scope cases

	Frequency	Valid Percent
No Cancer spotted	20330	96.8
Cancer Spotted	674	3.2
Total	21004	100.0

3.7.1.1. The cancer detection rate by gender group

In cancer detection rate, 58.8% of cancer belonged to male patients while 41.2% is female.

Table 3.7.1.1 The cancer detection rate by gender group

	Male			Female		
Status	Frequency	%	% within status	Frequency	%	% within status
No Cancer spotted	10130	96.2	50.0	10128	97.3	50.0
Cancer Spotted	396	3.8	58.8	278	2.7	41.2
Total	10526	100.0	/	10406	100.0	/

Remark: There were 21,004 cases in total, in which 72 were re-scope cases after being diagnosed as cancer.

3.7.1.2. The cancer detection rate by procedure year

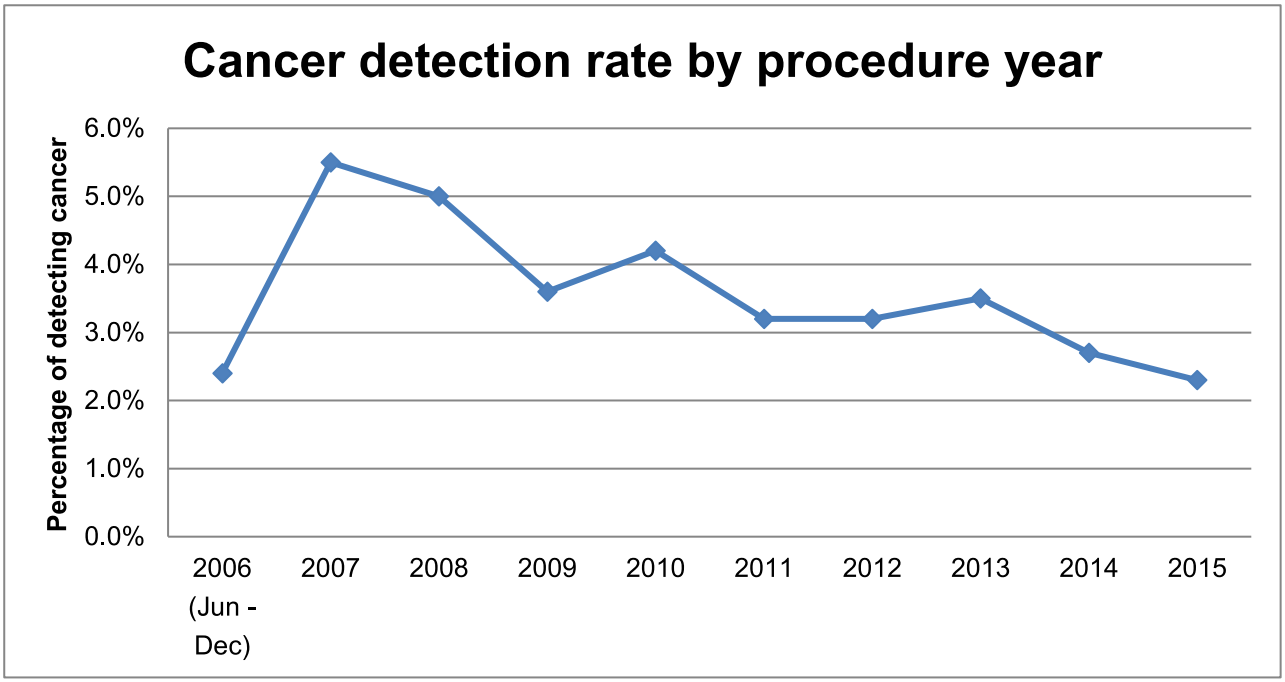
For the cancer detection rate, 5.5% cases detected at least one cancer during the endoscopy process in 2007 which was the highest in the record.

Table 3.7.1.2 Cancer detection rate by procedure year

	No Cancer spotted		Cancer Spotted			Total	
	N	%	N	%	*No. of Rescope Case**	N	%
2006 (Jun - Dec)	40	97.6	1	2.4	*0*	41	100.0
2007	413	94.5	24	5.5	*0*	437	100.0
2008	871	95.0	46	5.0	*5*	917	100.0
2009	1537	96.4	58	3.6	*3*	1595	100.0
2010	1504	95.8	66	4.2	*7*	1570	100.0
2011	2438	96.8	81	3.2	*11*	2519	100.0
2012	2590	96.8	86	3.2	*10*	2676	100.0
2013	2943	96.5	108	3.5	*12*	3051	100.0
2014	3740	97.3	105	2.7	*14*	3845	100.0
2015	4179	97.7	99	2.3	*10*	4278	100.0

Remark: *There are 21,004 cases in total, in which 72 of them were re-scope cases after being diagnosed as cancer and 3 cases missed the year record.

Graph 3.7.1.2 Cancer detection rate by procedure year



3.7.1.3. The cancer detection rate per age group of patients

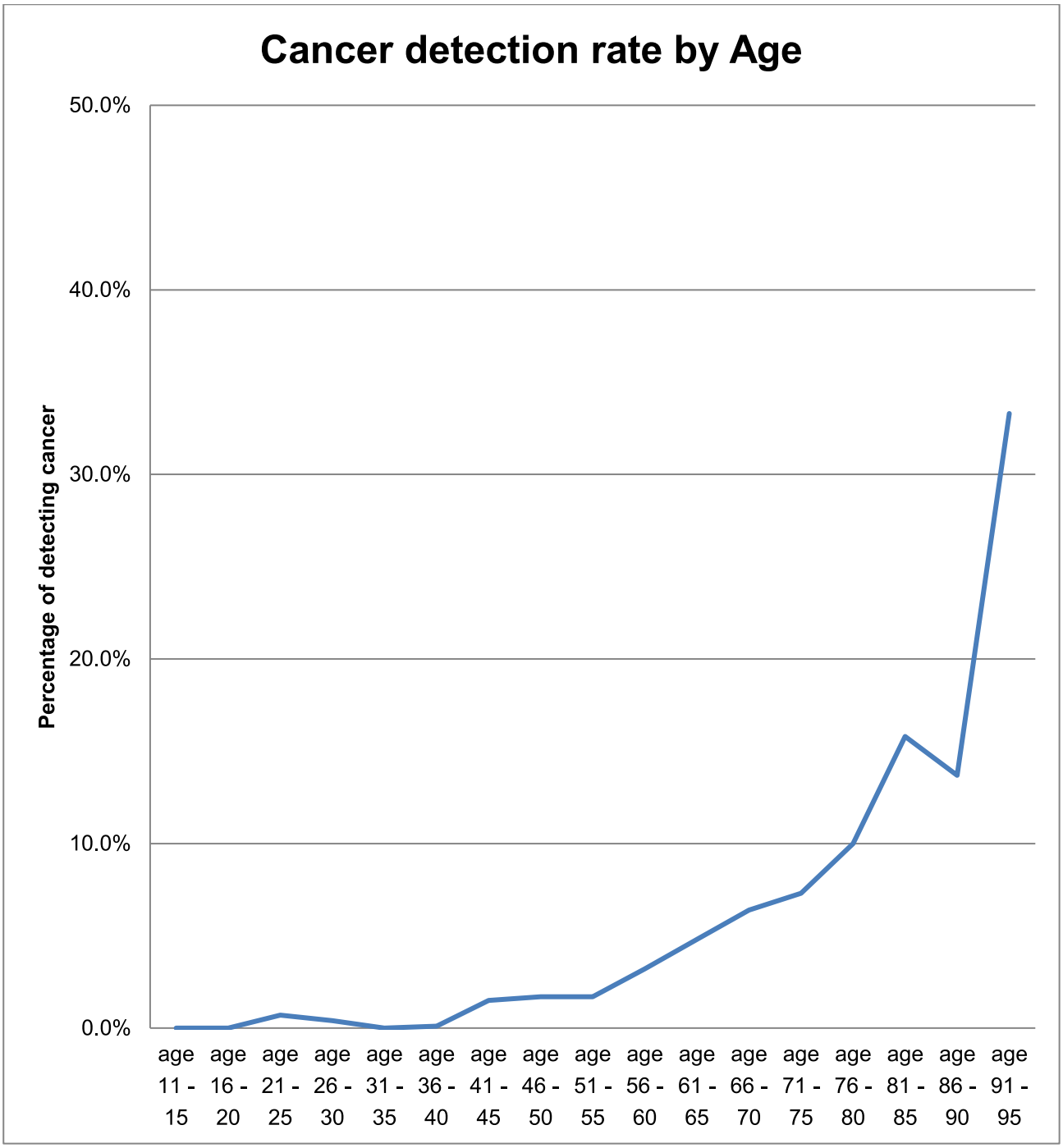
For the cancer detection rate, the median age of patients detected at least one cancer during the endoscopy process was age 61-65. The age range of cancer patients was 23-92.

Table 3.7.1.3 Cancer detection rate by age

	No Cancer spotted		Cancer spotted		Total	
	N	%	N	%	N	%
age 11 - 15	9	100.0	0	0.0	9	100.0
age 16 - 20	98	100.0	0	0.0	98	100.0
age 21 - 25	280	99.3	2	0.7	282	100.0
age 26 - 30	469	99.6	2	0.4	471	100.0
age 31 - 35	707	100.0	0	0.0	707	100.0
age 36 - 40	1055	99.9	1	0.1	1056	100.0
age 41 - 45	1624	98.5	25	1.5	1649	100.0
age 46 - 50	2739	98.3	48	1.7	2787	100.0
age 51 - 55	4025	98.3	68	1.7	4093	100.0
age 56 - 60	3477	96.8	114	3.2	3591	100.0
age 61 - 65	2528	95.2	127	4.8	2655	100.0
age 66 - 70	1419	93.6	97	6.4	1516	100.0
age 71 - 75	968	92.7	76	7.3	1044	100.0
age 76 - 80	610	90.0	68	10.0	678	100.0
age 81 - 85	203	84.2	38	15.8	241	100.0
age 86 - 90	44	86.3	7	13.7	51	100.0
age 91 - 95	2	66.7	1	33.3	3	100.0

Remark: There are 21,004 cases in total, in which 72 of them were re-scope cases after being diagnosed as cancer and 1 case missed the age record.

Graph 3.7.1.3 Cancer detection rate by age



3.7.2. Cancer location

From the 674 patients with cancer detected during the endoscopy process, 47.6% cases detected the cancer located at Rectum, and 30.0% cases detected the cancer at Sigmoid colon.

Table 3.7.2.a. Cancer location

	Frequency	Valid Percent
Caecum	14	2.0
Ascending Colon	48	7.0
Hepatic Flexure	17	2.5
Transverse Colon	34	4.9
Splenic Flexure	5	0.7
Descending Colon	24	3.5
Sigmoid Colon	207	30.0
Rectosigmoid Colon	5	0.7
Rectum	328	47.6
Anal Canal	7	1.0
Total	689	100.0

Remark: One patient may have more than one cancer.

Table 3.7.2.b. Cancer location by procedure year

	Caecum		Ascending Colon		Hepatic Flexure		Transverse Colon		Splenic Flexure		Descending Colon		Sigmoid Colon		Rectosigmoid Colon		Rectum		Anal Canal		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2006 (Jun - Dec)	1	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0
2007	1	4	2	8.0	2	8.0	0	0.0	0	0.0	0	0.0	10	40.0	0	0.0	10	40.0	0	0.0	25	100.0
2008	1	2.1	4	8.5	1	2.1	5	10.6	0	0.0	1	2.1	16	34.0	0	0.0	18	38.3	1	2.1	47	100.0
2009	1	1.6	7	11.3	2	3.2	5	8.1	1	1.6	1	1.6	18	29.0	2	3.2	25	40.3	0	0.0	62	100.0
2010	4	5.8	5	7.2	1	1.4	1	1.4	0	0.0	2	2.9	22	31.9	1	1.4	32	46.4	1	1.4	69	100.0
2011	0	0	6	7.4	2	2.5	3	3.7	1	1.2	3	3.7	27	33.3	2	2.5	36	44.4	1	1.2	81	100.0
2012	1	1.1	10	11.4	3	3.4	3	3.4	0	0.0	6	6.8	22	25.0	0	0.0	43	48.9	0	0.0	88	100.0
2013	1	0.9	4	3.6	5	4.5	8	7.3	2	1.8	5	4.5	30	27.3	0	0.0	55	50.0	0	0.0	110	100.0
2014	2	1.9	5	4.7	1	0.9	4	3.8	1	0.9	2	1.9	34	32.1	0	0.0	56	52.8	1	0.9	106	100.0
	2	2.0	5	5.0	0	0.0	5	5.0	0	0.0	4	4.0	28	28.0	0	0.0	53	53.0	3	3.0	100	100.0

Remark: One patient may have more than one cancer.

Graph 3.7.2b Cancer location by procedure year