OPINION

Number of significant polyps detected per six-minute withdrawal time at colonoscopy (SP6): a new measure of colonoscopy efficiency and quality

Rajaratnam Rameshshanker ^{1,2} Brian P Saunders^{1,2}

¹Wolfson Unit for Endoscopy, St Mark's Hospital, Harrow, UK
²Department of Surgery and Cancer, Imperial College London, London, UK

Correspondence to

Dr Rajaratnam Rameshshanker, St Mark's Hospital, Wolfson Unit for Endoscopy, Harrow, London HA1 3UJ, UK; r.rameshshanker@nhs.net

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INTRODUCTION

Quality assessment of the colon consists of detailed, systematic and meticulous inspection of the entire colonic mucosa. A thorough and careful mucosal inspection is essential to prevent colorectal cancer (CRC) and cancer-related mortality.¹ The detection and resection of precancerous polyps is the primary goal of screening colonoscopy. Recently, there has been a focus on quality and safety of colonoscopy. Worldwide, the demand for colonoscopy is increasing, and with a limited workforce, efficient working is of paramount importance.²

Quest for a colonoscopy efficiency marker

We performed an extensive search in the literature for the definition of colonoscopic efficiency (CE); however, no clear definition was found. We propose the following working definition as 'the ability to detect clinically significant pathologies within acceptable time limits without compromising the quality or safety of the examination'.

CE is augmented by the following factors: optimal bowel preparation, technical ease of the procedure, technique of the endoscopist, high-definition and high-quality video imaging, and uninterrupted panoramic view of mucosal surface.

Although mucosal views may be improved with dynamic position changes and routine retroflexion in the rectum, these manoeuvres may not be effective in narrower colonic segments and flexures.³

Recent technological developments in the field of colonoscopy such as

wide-angle view colonoscopes and disposable distal attachments (Endocuff Vision, transparent cap and Endorings) helped to improve the lateral and backward view of the mucosal folds.^{4–9}

These advancements demonstrated an improvement in the quality and performance of the procedure. However, none of the studies explored the impact on CE of the technologies. We aimed to assess the performance of a new marker of colonoscopic efficiency. We propose SP6 (number of significant polyps detected per 6 min withdrawal time during colonoscopy) as the novel efficiency marker.

METHODOLOGY

We performed a retrospective evaluation of prospectively collected data from our endoscopy database to assess the value of SP6 to compare different detection interventions (Endocuff-assisted colonoscopy (EAC) and standard colonoscopy (SC)). SP6 was calculated using the following simple formula:

$$SP6 = \frac{\text{Number of adenomas and sessile serrated polyps}}{\text{Total withdrawal time}} \times 6$$

For consecutive screening colonoscopies performed between October 2014 and September 2016 at our institution, patient demographic data and procedural data were retrieved from our endoscopy database. We included colonoscopies performed by seven experienced, UK bowel cancer screening programme accredited endoscopists with excellent performance indicators (caecal intubation rate >95%, adenoma detection rate

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Table 1 Polyp and procedural characteristics

	Endocuff-assisted colonoscopy	Standard colonoscopy	P value
No of patients	256	238	NS
Caecal intubation rate	99.6%	98.9%	NS
Caecal intubation time (mean±SD)	5.9±3.0	7.1±3.85	0.39
Withdrawal time (mean±SD)	12.9±4.5	11.8±5.33	0.72
No of polyps	343	159	0.001
No of adenomas	285	112	0.0005
No of SSA/Ps	28	20	1.0
ADR	84.4%	58.4%	0.004
SP6 (adenomas/SSA/P)	1.18	0.62	0.0004
MPP	1.34	0.66	0.001

ADR, adenoma detection rate; MPP, mean number of polyps detected per patient; NS, not significant; SP6, number of significant polyps detected per 6 min withdrawal time during colonoscopy; SSA, sessile serrated adenoma; SSP, sessile serrated polyp.

(ADR) >50%). Every endoscopist performed at least 5000 colonoscopies in clinical practice. All patients were either faecal occult blood test (FOBT) positive or undergoing surveillance colonoscopy within the programme.

RESULTS

A total of 494 patients (age range, 60–75 years) underwent surveillance colonoscopy during this period. Colonoscopy was performed for the following indications: screening following a positive FOBT (54%) and surveillance following previous polypectomy (46%). Table 1 summarises the procedural and polyp characteristics. There were no significant differences in the caecal intubation rate ($p=0.99$), caecal intubation time ($p=0.39$) or withdrawal time (WT) ($p=0.72$) between EAC and SC. However, total number of polyps and adenomas detected and resected were significantly higher in EAC than SC ($p=0.005$ and $p=0.0001$, respectively). Table 2 highlights the fact that there were no significant differences in WT between EAC and SC, when no polyps were detected during the procedure.

DISCUSSION

There are several quality indicators in use to assess the quality of colonoscopic examinations including caecal intubation rate, WT more than 6 min and ADR.^{10–13} ADR has been extensively studied and considered as

the most important performance marker of colonoscopy.^{12–14} It exhibits many advantages as a quality indicator. It is easy to calculate, understand and apply in clinical practice and in trials.¹⁵ Moreover, large studies have shown that ADR correlates well with interval CRC rate and mortality.^{16 17} However, there are fundamental problems with using ADR alone as a marker of colonoscopic quality and performance. First, the ADR does not take into account detection of sessile serrated adenomas/polyps (SSA/P), thought to be the precursor lesions of 15%–20% of all CRCs.¹⁸ Second, it has the potential for the colonoscopist to ‘switch off’ after one adenoma has been detected (*one and done phenomenon*) and does not reward the detection of multiple polyps in the same patient.¹⁹ Third, it does not measure how time-efficiently the endoscopist detects and removes polyps. This final point is of particular importance given the increasing volume of colonoscopy and the need to conduct colonoscopy lists in a timely and effective manner. Therefore, ADR cannot be used to assess the efficiency of an endoscopist, technique or colonoscopy aid.

We suggest a new and simple metric, SP6, as a quality and efficiency marker. SP6 takes into account detection and removal of all potential pre-cancerous lesions (adenomas and SSA/P) and measures how efficiently those polyps are detected and removed. SP6 is easy to calculate, user friendly and a highly reproducible marker.

$$SP6 = \frac{\text{Number of adenomas and SSA/P}}{\text{Total withdrawal time}} \times 6$$

In this study, we have demonstrated that SP6 could be used to compare the performance of novel interventions or techniques. For example, our data showed that EAC significantly improves colonoscopy performance and overall efficiency of the procedure when compared with SC.

We have to bear in mind that when we interpret the performance of any novel devices or interventions, the quality of the procedure should not be compromised in order to improve the efficiency. Both quality and efficiency of the procedure should be enhanced in parallel. European Society of Gastrointestinal Endoscopy (ESGE) and American Society of Gastrointestinal Endoscopy mandated minimum withdrawal time of 6 min for diagnostic examinations. It is clearly mentioned in the guidelines that this figure only applies to examinations in which no polyps are found as detection and resection of polyps increases duration of the procedure.^{20 21} Table 2 shows that when no polypectomies were performed, EAC (intervention) did not compromise the recommended withdrawal time of 6 min which highlights that the add-on device does not compromise the quality when improving the overall efficiency of the procedure.

Finally, the quality indicators such as WT and ADR could be gamed, where the target measure is achieved but without reflecting the high-quality examination.¹⁹

Table 2 Correlation of withdrawal time (WT) when no polyps were detected during colonoscopic examination

	Endocuff-assisted colonoscopy	Standard colonoscopy	P value
No of patients	27	61	<0.01
WT (mean±SD)	8.59±2.28	6.24±2.89	0.089

The chances of potential gaming for SP6 is minimal as it incorporates time as an important assessment factor.

Conversely, SP6 could be gamed during the procedure. This could occur when an endoscopist attempts to remove larger polyps (>2cm) and be tempted to complete the procedure within a given time slot. This would result in incomplete polypectomy and recurrence. In order to minimise this effect, we did not include procedures where large (>2cm) polypectomies were performed. One could argue that polyps of difficult nature (ie, peri-appendiceal location, recurrent/fibrotic polyps, polyps located within a diverticular segment) could take a longer time or highly advanced therapeutic modality to resect and they could adversely affect SP6. During these difficult situations, SP6 could be falsely low. However, this could be a positive argument for SP6 as it would clearly identify whether adjunct devices or interventions are superior in dealing with difficult polyps. In other words, SP6 marker could be used to compare the superiority of a device/intervention against each other.

In our cohort, we did not include any of the procedures which demands an additional session or advanced therapeutic modality such as endoscopic submucosal dissection, full-thickness resection or laparoscopy-assisted colonic resection as it may affect the SP6. Finally, SP6 is a modifiable marker, if the recommended WT is changed in the future. For example, ESGE promotes an optimal WT of 10min and the marker could evolve as SP10.

CONCLUSION

Our proposed efficiency marker SP6 may act as a meaningful new metric to demonstrate high-quality and efficient examinations. SP6 could be used to compare the efficiency of endoscopists' performance and novel endoscopic interventions or devices to aid the procedure. This new metric needs to be validated in randomised controlled trials prior to the implementation. It appears to be promising and perhaps more relevant to a modern colonoscopy practice.

Twitter Rajaratnam Rameshshanker @rameshshan777

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ORCID iD

Rajaratnam Rameshshanker <http://orcid.org/0000-0002-4556-9052>

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