RESEARCH

New Barrett's oesophagus surveillance guidelines: significant cost savings over the next 10 years on implementation

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ABSTRACT

Objective We aimed to estimate the cost saving (over the next 10 years) by our trust implementing the new British Society of Gastroenterology (BSG) surveillance guidelines for Barrett's oesophagus (BO).

Design Retrospective endoscopy database analysis.

Setting Two endoscopy units of St George's Hospital NHS Trust, London.

Patients Gastroscopy records between 2009 and 2012 were retrieved and patients with an endoscopic diagnosis of BO were identified. BO segment length was recorded and the presence (or absence) of intestinal metaplasia in the oesophageal biopsy samples was reviewed from pathology databases. Patients were then stratified into risk groups in accordance with the new BSG guidelines.

Interventions Nil.

Main outcome measures The projected surveillance costs using the new and the old guidelines were calculated over the next 10 years and the cost saving by the implementation of the new guidelines thus determined.

Results The 10 year projected cost saving for our trust by implementing the new BO surveillance guidelines was £720 330 (or £72 033 per annum). Projected across the NHS, implementation of the new guidance may save £100 million over the next 10 years.

Conclusions All trusts should review their Barrett's surveillance population and implement these new recommendations expeditiously.

INTRODUCTION

Barrett's oesophagus (BO) can be defined as replacement of any portion of the normal distal oesophageal squamous epithelial lining by columnar epithelium. BO is a risk factor for the development of oesophageal adenocarcinoma (OAC), which is increasing in incidence in developed countries.[1] BO is caused by chronic acid exposure as a result of gastro-oesophageal reflux.[2]

Diagnostic criteria for BO differ between Britain and the USA. BO should be clearly visible endoscopically as salmon-pink mucosa extending above the oesophageal gastric junction. The British Society of Gastroenterology (BSG) requires that the endoscopic suspicion of BO should be confirmed histologically by finding columnar lined epithelium.[3] It is not essential for intestinal metaplasia (IM) to be present for a diagnosis of BO to be made.

By contrast, the American Gastroenterological Association (AGA) defines BO as 'the condition in which any extent of metaplastic columnar epithelium *that predisposes to cancer development* replaces the stratified squamous epithelium'.[4] Because of evidence that the only type of columnar epithelium that confers a risk of malignant progression is the intestinal type,[5 6] the AGA require that the presence of IM must be confirmed in oesophageal biopsy samples before a diagnosis of BO is made.

OAC has a poor prognosis,[7] but detection at an early stage is beneficial in terms of 5-year survival rates postsurgical resection.[8] Therefore, any method of detecting OAC at an early (or precancerous) stage may be of great benefit to patients in higher risk groups. Indeed, retrospective analysis of patients with OAC has shown that those who had been surveyed had a better survival outcome than those who were not under surveillance and presented with symptoms.[9 10] Nonetheless, it is still not

known if endoscopic surveillance in BO patients is of benefit (and indeed what surveillance should actually comprise), as good quality prospective evidence is currently lacking.

The BSG guidelines had previously recommended a surveillance gastroscopy (with four quadrant biopsies for every 2 cm of BO) for patients with BO (without dysplasia) every 2 years.[11] This guidance did not risk stratify BO patients and may, therefore, have subjected some patients (who may actually be at low or minimal risk of developing OAC) to unnecessary endoscopic procedures.

The implications of performing unnecessary endoscopy are twofold. The first being that patients will be subjected to excess procedure-associated risk. The perforation rate from a gastroscopy is estimated to be 0.03% and the mortality rate is 0.004%.[12] Serious complications are rare, but if considered at national level, they do occur. For instance, for every 10 000 procedures there maybe three cases of perforation, and for every 25 000 procedures, there may be one death.

The second implication is financial; performing a gastroscopy costs approximately €615,[13] (£520). In addition to endoscopy costs are histopathology costs, which will depend on the number if biopsies taken and, hence, the length of the Barrett's segment.

The AGA has, in effect, already risk-stratified patients with columnar-lined oesophagus by excluding those without IM from being diagnosed with BO. The AGA recommend a surveillance gastroscopy every 3–5 years for BO patients (without dysplasia).[4] The 2014 BSG guidelines on the management of BO, risk-stratified BO patients according the length of the BO segment and the presence (or absence) of IM.[3] Recommended surveillance intervals are tailored to match the risk; for instance, those patients with BO segments of less than 3 cm and who do not have IM may be able to cease undergoing endoscopic surveillance after one confirmatory endoscopy, whereas patients with BO segments of greater than 3 cm are at greater risk and require surveillance every 2–3 years.

We aimed to estimate the cost savings that may be made by implementing the new BSG guidelines on BO surveillance.

METHODS

We performed a retrospective database analysis of the two endoscopy units of St George's Hospital NHS Trust, London, that together serve a large diverse southwest London population. Patients were identified through the recall database and endoscopy database. From the endoscopy database, gastroscopy records between 2009 and 2012 were retrieved, and patients with an endoscopic diagnosis of BO were identified. Length of the BO segment was recorded, and the presence or absence of IM in the oesophageal biopsy samples was reviewed from pathology databases.

The new BSG guidelines risk-stratify BO patients into three groups according to BO length and presence of IM. We named these groups 'minimal risk', 'low risk' and 'high risk', and classified our cohort of BO patients accordingly.

Following the publication of the new BSG guidelines, our local policy has been to follow the least intensive surveillance when options allow. Historically, we have continued surveillance until comorbid illness, frailty or patient wishes have led to a withdrawal from the surveillance programme.

The 'minimal risk' group were those patients who had a maximum Barrett's length of less than 3 cm confirmed histologically, but no IM. Furthermore, it was then identified how many of these patients had previously undergone gastroscopy and biopsy with similar findings and would, thus, potentially be able to cease endoscopic surveillance altogether. Patients who had had two minimal risk gastroscopies were subclassified 'minimal risk—for discharge'. Those who had only one minimal risk gastroscopy were subclassified 'minimal risk—potential discharge'. We assumed that this subcategory of minimal risk patients would likely require a repeat gastroscopy in the next 2 years, and afterwards may be discharged from any further surveillance.

Patients with a Barrett's length of less than 3 cm, but with IM were classified as 'low risk'. We modelled these patients on requiring a surveillance gastroscopy every 5 years. Patients with a Barrett's length of 3 cm or more were classified as being 'high risk'. We assumed that these patients required a gastroscopy every 3 years.

Under the previous guidelines, every patient in the cohort should undergo five surveillance gastroscopies over the next 10 years. We assumed that the patients we now classified as 'minimal risk—for discharge' would not need a further gastroscopy; those being 'minimal risk—potential discharge' would require one further surveillance gastroscopy in this period; those as being 'low risk' would only require two surveillance gastroscopies in this period; and those as being 'high risk' will only require three surveillance gastroscopies in this period. To implement the new guidelines, patients identified as being suitable for discharge would require active removal from surveillance (rather than being picked up at the time of their next scheduled endoscopy).

The cost saving of the implementation of the new surveillance guidelines was calculated by subtracting the projected cost of surveillance under the new guidelines over the next 10 years from the projected cost of surveillance for the old guidelines over the next 10 years. The mean annual cost saving was then calculated.

The local cost of processing and reporting four quadrant oesophageal biopsies was £65. The cost per patient of processing oesophageal biopsies is related

to the length of the BO segment. For instance, if the BO segment was less than 3 cm, this should require at least one set of four quadrant biopsies and, therefore, cost £65 per endoscopy. A 3–4 cm BO segment should require at least two sets of four quadrant biopsies at a cost £130 per endoscopy.

Ethical approval was not required, as this project was carried out as part of a programme to implement new guidelines.

RESULTS

Four hundred and sixty-three patients were identified who had an endoscopic diagnosis of BO. Sixty patients were excluded due to incomplete data.

Thirty per cent of the patients were female. The mean age was 65.8 years (females 67.9 years; males 64.9 years). Mean length of the BO segment was 3.5 cm (females 3.3 cm, males 3.6 cm). 25.6% of the patients had IM present in the oesophageal biopsy samples.

Patients were stratified into risk groups in accordance with the new BSG guidelines.

Ninety-one patients were identified who could be classified as 'minimal risk'. Forty-five were in the 'minimal risk—for discharge' subcategory, and would not need any further endoscopic surveillance. Forty-six patients were in the 'minimal risk—potential discharge' subcategory, and would thus likely only require one further gastroscopy before discharge. Under old guidelines, each of the minimal risk patients would have required at least five surveillance gastroscopies in the next 10 years. This translates to avoiding doing 409 procedures and a total endoscopy cost saving of £212 680 in this group (table 1). Furthermore, each procedure in this group would require at least one set of four quadrant oesophageal biopsies amounting to a cost saving of £26 585 (table 2). The total cost saving in this group over the next 10 years is, therefore, £239 265, or £23 926 per annum (table 3).

One hundred and nine patients were identified who could now be classified as being 'low risk'. These would still require endoscopic surveillance, but on a less frequent basis (table 1). However, they would still require at least one set of four quadrant biopsies per surveillance gastroscopy (table 2). The projected surveillance costs using the new and the old guidelines were calculated over the next 10 years, and the cost saving calculated (table 3).

Two hundred and three patients were identified as being 'high risk' and, hence, needing a gastroscopy every 3 years. The cost saving for this group was calculated as in the other groups, but took into account that patients with longer BO segments would require more sets of four quadrant biopsies per endoscopy (tables 2 and 3).

We identified only six patients whose risk category changed when they had a second surveillance gastroscopy. Four of these six were due to IM being present in biopsy samples (where it was not previously) and two were due to the presence of dysplasia (one high grade).

The 10 year projected cost saving for our trust by implementing the new BO surveillance guidelines was £720 330 (or £72 033 per annum).

DISCUSSION

This is the first study to assess the cost benefits of implementation of the new BSG Barrett's guidelines when applied to a real patient cohort. We have calculated significant savings over the next 10 years in our trust. There are over 150 hospital trusts in the UK that have endoscopy units, therefore, even a conservative estimate puts the cost savings to the NHS through adopting the new BO guidelines in excess of £100 million over the next 10 years.

The new BSG guidelines for the endoscopic surveillance of BO are now tailored to reflect the potential risk of developing OAC by taking into account the length of the BO segment and the presence or absence of IM in biopsy samples. Because new surveillance intervals are greater than the previous standard interval of 2 years, implementation of these guidelines will mean that fewer surveillance gastroscopies will need to be performed.

Fewer gastroscopies are likely to mean that BO patients will have a generally more favourable experience of surveillance and will be subjected to less gastroscopy associated risk. We have, however, calculated that by implementation of these guidelines, the cost

Table 1 Division of Barrett's patients into minimal, low and high-risk groups

	Patients	Number of gastroscopies using old guidelines	Cost of surveillance using old guidelines	Number of gastroscopies using new guidelines	Cost of surveillance using new guidelines	Cost saving	Mean cost saving per annum
Minimal risk—for discharge	45	225	£117 000	0	£0	£117 000	£11 700
Minimal risk—potential discharge	46	230	£119 600	46	£23 920	£95 680	£9568
Low risk	109	545	£283 400	218	£113 360	£170 040	£17 004
High risk	203	1015	£527 800	609	£316 680	£211 120	£21 112
All risk	403	2015	£1 047 800	873	£453 960	£593 840	£59 384

Calculation of endoscopy cost saving over the next 10 years (and per annum) from difference in projected new and old cost of surveillance.

Table 2 Division of Barrett's patients into minimal, low and high risk groups

	Patients	QB required before	Old cost of histology	QB required after	New cost of histology	Cost saving	Mean cost saving per annum
Minimal risk—for discharge	45	225	£14 625	0	£0	£14 625	£1462
Minimal risk—potential discharge	46	230	£14 950	46	£2990	£11 960	£1196
Low risk	109	545	£35 425	218	£14 170	£21 255	£2125
High risk	203	3025	£196 625	1815	£117 975	£78 650	£7865
All risk	403	4025	£261 625	2079	£135 135	£126 490	£12 649

Calculation of histology cost saving over the next 10 years (and per annum) from difference in projected new and old cost of surveillance.
QB, quadrant biopsies.

Table 3 Division of Barrett's patients into minimal, low and high-risk groups

	Patients	Old cost of surveillance	New cost of surveillance	Cost saving	Mean cost saving per annum
Minimal risk—for discharge	45	£131 625	£0	£131 625	£13 162
Minimal risk—potential discharge	46	£134 550	£26 910	£107 640	£10 764
Low risk	109	£318 825	£127 530	£191 295	£19 129
High risk	203	£724 425	£434 655	£289 770	£28 977
All risk	403	£1 309 425	£589 095	£720 330	£72 033

Calculation of total cost saving over the next 10 years (and per annum) from difference in projected new and old cost of surveillance.

saving for our hospital trust's endoscopy unit will be significant. In our trust with the population served this amounts to over £70 000 per annum. Nationally, the predicted savings to the NHS can be huge.

Our methods of calculating the estimated saving for our trust may be criticised for not taking into account some of the patients found on the endoscopy database who may not actually undergo BO surveillance, while a significant number of the patients identified may die over the next 10 years. Such factors may make our calculation an overestimate of the potential money saved. Although this is valid, we feel that our estimation of saving is actually somewhat conservative, for two reasons. The first is that our retrospective database analysis may not have identified all the patients with BO who are under surveillance; 60 patients were excluded from this analysis due to insufficient information on BO length and IM. Second (and possibly more importantly), we have not factored in the likely number of newly diagnosed cases of BO over the next 10 years. Such cases during this period are likely to be significant (based on an estimated prevalence of BO of between 1.3 and 1.6%[3]) and would be at least equal to the number of patients lost due to mortality.

We assumed that the subset of patients categorised as 'minimal risk—potential discharge' would likely only require one further gastroscopy before discharge. This assumption is justified by only six patients in the entire sample changing to a higher risk group after a subsequent surveillance gastroscopy. The finding that dysplasia was found in two biopsy samples previously categorised as 'minimal risk' underlies the importance of a second gastroscopy in this group before discharge from surveillance is considered.

A final potential source of error with our calculation is that information on comorbid health was not known. With advances in minimally invasive treatments for dysplasia and even early malignancy,[14] our local policy has been to continue surveillance until comorbid illness, frailty or patient wishes have led to a review of future surveillance. We have not factored this into our calculations but feel it would only have a minor impact.

We have demonstrated that tailoring of BO surveillance based on risk, will lead to a significant cost savings for UK hospital trusts. All trusts should review their Barrett's surveillance population and implement these new recommendations expeditiously.

Significance of this study

What is already known on the topic?
The potential cost saving by implementing the new Barrett's surveillance guidelines was not previously known.

What this study adds?
This is the first study to assess the cost benefits by the implementation of the new Barrett's guidelines when applied to a real patient cohort.

How might it impact on clinical practice in the foreseeable future?
This study will encourage trusts to review their Barrett's population and implement the new surveillance guidelines.

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Contributors RH and AP devised the project. RH and DC were responsible for data acquisition. All authors were responsible for data analysis, data interpretation, writing and reviewing the manuscript.

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REFERENCES

1 Dolan K, Sutton R, Walker SJ, *et al*. New classification of oesophageal and gastric carcinomas derived from changing patterns in epidemiology. *Br J Cancer* 1999;80:834–42.
2 Eisen GM, Sandler RS, Murray S, *et al*. The relationship between gastroesophageal reflux disease and its complications with Barrett's esophagus. *Am J Gastroenterol* 1997;92:27–31.
3 Fitzgerald RC, di Pietro M, Ragunath K, *et al*. British society of gastroenterology guidelines on the management of Barrett's oesophagus. *Gut* 2014;63:7–42.
4 Spechler SJ, Sharma P, Souza RF, *et al*. American Gastroenterological Association medical position statement on the management of Barrett's esophagus. *Gastroenterology* 2011;140:1084–91.
5 Sikkema M, de Jonge PJ, Steyerberg EW, *et al*. Risk of esophageal adenocarcinoma and mortality in patients with Barrett's esophagus: a systematic review and meta-analysis. *Clin Gastroenterol Hepatol* 2010;8:235–44.
6 Yousef F, Cardwell C, Cantwell MM, *et al*. The incidence of esophageal cancer and high-grade dysplasia in Barrett's esophagus: a systematic review and meta-analysis. *Am J Epidemiol* 2008;168:237–49.
7 Faivre J, Forman D, Esteve J, *et al*. Survival of patients with oesophageal and gastric cancers in Europe. EUROCARE Working Group. *Eur J Cancer* 1998;34:2167–75.
8 Menke-Pluymers MB, Schoute NW, Mulder AH, *et al*. Outcome of surgical treatment of adenocarcinoma in Barrett's oesophagus. *Gut* 1992;33:1454–8.
9 Ferguson MK, Durkin A. Long-term survival after esophagectomy for Barrett's adenocarcinoma in endoscopically surveyed and non-surveyed patients. *J Gastrointest Surg* 2002;6:29–35.
10 Fountoulakis A, Zafirellis KD, Dolan K, *et al*. Effect of surveillance of Barrett's oesophagus on the clinical outcome of oesophageal cancer. *Br J Surg* 2004;91:997–1003.
11 Guidelines for the diagnosis and management of Barrett's columnar lined oesophagus. A report of the working party of the British Society of Gastroenterology. Aug 2005. http://www.bsg.org.uk
12 Silvis SE, Nebel O, Rogers G, *et al*. Endoscopic complications. Results of the 1974 American Society for Gastrointestinal Endoscopy Survey. *JAMA* 1976;235:928–30.
13 Broe M, Barry M, Patchett S, *et al*. Evaluating the clinical efficacy and cost effectiveness of direct access endoscopy. *Surgeon* 2013;11:3.
14 Haidry RJ, Dunn JM, Butt MA, *et al*. Radiofrequency ablation and endoscopic mucosal resection for dysplastic Barrett's esophagus and early esophageal adenocarcinoma: Outcomes of the UK National Halo RFA Registry. *Gastroenterology* 2013;145:87–95.