Institution: Imperial College London

Unit of Assessment: 01 Clinical Medicine

Title of case study: Improving surveillance for bowel cancer in the NHS

Period when the underpinning research was undertaken: 2006 to present

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Amanda J Cross	Professor of Cancer Epidemiology and Head of the Cancer Screening & Prevention Research Group	2013 to present
Wendy S Atkin	Professor of Gastrointestinal Epidemiology and former Head of the Cancer Screening & Prevention Research Group	1997 to Oct 2018
Kate Wooldrage	Medical Statistician	2007 to present
Emma C Robbins	Research Assistant	2017 to present
Kevin Pack	Senior Data Clerk	2007 to present
Iain Stenson	Software Developer / Data Analyst	2014 to Jul 2020
Paula L Kirby	Project Manager	2015 to Dec 2019
Mariano Kalfors Perdices	Project Manager	2020 to present
Bhavita Patel	Clinical Trials Assistant	2014 to Oct 2020
Elizabeth Coles	Research Support Officer	2013 to present

Period when the claimed impact occurred: Ongoing from June 2017

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact (indicative maximum 100 words)

Research at Imperial College led to a change in UK post-polypectomy surveillance guidelines, minimising unnecessary invasive procedures and ensuring efficient use of NHS endoscopy resources.

Imperial College researchers demonstrated that a large proportion of post-polypectomy patients require less frequent colonoscopy surveillance than recommended in the 2002 guidelines. These findings made a vital contribution to the 2020 guidelines revision, endorsed by the British Society of Gastroenterology, Association of Coloproctology of Great Britain and Ireland, and Public Health England. Surveillance is now restricted to patients at increased risk of colorectal cancer, which will reduce colonoscopic surveillance workload by up to 80%.

2. Underpinning research (indicative maximum 500 words)

For patients who have had polyps or adenomas removed, regular colonoscopy is recommended to reduce risk of colorectal cancer (CRC). The 2002 UK surveillance guidelines stratified patients into low-, intermediate- and high-risk groups according to characteristics of adenomas removed. These guidelines recommended no surveillance or colonoscopy at five years for low-risk patients, three-yearly colonoscopy for intermediate-risk patients, and colonoscopy at one year followed by three-yearly colonoscopy for high-risk patients.

The 2002 guidelines were developed before recent improvements in colonoscopy quality and were largely based on detection rates of advanced adenomas rather than CRC at follow-up due to a lack of long-term data. This resulted in an over-estimation of CRC risk. Given the enormous burden placed on endoscopy services by post-polypectomy surveillance (20% of all colonoscopies in the

UK), there was an urgent need to reassess surveillance requirements using CRC risk as the endpoint. This would ensure colonoscopic surveillance was targeted to those at increased CRC risk compared to the general population and in whom surveillance is known to reduce risk.

In 2006, Imperial researchers initiated a retrospective cohort study of approximately 250,000 patients from 17 UK hospitals to provide data to inform revisions of the 2002 UK surveillance guidelines.

They first examined patients with baseline adenomas who were classed as intermediate-risk. This group accounted for most surveillance colonoscopies – approximately 40% (12,000 out of 30,000) patients. Over a median of eight years' follow-up, a single surveillance colonoscopy was shown to lower CRC risk by 43%. Moreover, a lower-risk subgroup (25%) of intermediate-risk patients was identified, whose CRC risk following adenoma removal was substantially lower than in the general population who did not undergo surveillance, indicating that surveillance may not be warranted. The research findings were published in *Lancet Oncology* (1) and *The NIHR Journals Library* in 2017 (2).

The researchers then examined low-risk (approximately 14,000) and high-risk (approximately 2,700) patients, and also collected new data to extend follow-up to ten years. Among low-risk patients, CRC risk following adenoma removal was no higher than in the general population without surveillance, indicating that surveillance is not required. Updated data on the intermediate-risk group corroborated the previous finding that a 'lower-risk' subgroup exists, comprising approximately 40% of intermediate-risk patients, who do not need surveillance. Finally, surveillance was shown to be necessary and effective for high-risk patients, who remained at increased CRC risk following adenoma removal.

Overall, these findings demonstrated that many patients with adenomas do not require the intensity of colonoscopy surveillance recommended in the 2002 guidelines. Among approximately 30,000 adenoma patients, colonoscopy surveillance was likely unwarranted in 66%, including 25-40% of intermediate-risk patients recommended three-yearly surveillance in the 2002 guidelines. These findings were published in *The NIHR Journals Library* (3) and *Gut* (4).

3. References to the research (indicative maximum of six references)

(1) Atkin, W., Wooldrage, K., Brenner, A., Martin, J., Shah, U., Perera, S., Lucas, F., Brown, J.P., Kralj-Hans, I., Greliak, P., Pack, K., Wood, J., Thomson, A., Veitch, A., Duffy, S.W., Cross, A.J. (2017). Adenoma surveillance and colorectal cancer incidence: a retrospective, multicentre, cohort study. *Lancet Oncol*ogy;18(6): 823-834. DOI.

(2) Atkin, W., Brennan, A., Martin, J., Wooldrage, K., Shah, U., Lucas, F., Greliak, P., Pack, K., Kralj-Hans, I., Thomson, A., Perera, S., Wood, J., Miles, A., Wardle, J., Kearns, B., Tappenden, P., Myles, J., Veitch, A., Duffy, S.W. (2017). The clinical effectiveness of different surveillance strategies to prevent colorectal cancer in people with intermediate-grade colorectal adenomas: a retrospective cohort analysis, and psychological and economic evaluations. *NIHR Health Technology Assessment*;21(25): 1-536. DOI.

(3) Cross, A.J., Robbins, E.C., Pack, K., Stenson, I., Kirby, P.L., Patel, B., Rutter, M.D., Veitch, A.M., Saunders, B.P., Little, M., Gray, A., Duffy, S.W., Wooldrage, K. The clinical and cost-effectiveness of colonoscopy surveillance following adenoma removal: A multicentre, retrospective, cohort study and economic evaluation. *NIHR Health Technology Assessment*. (In press).

(4) Cross, A.J., Robbins, E.C., Pack, K., Stenson, I., Kirby, P.L., Patel, B., Rutter, M.D., Veitch, A.M., Saunders, B.P., Duffy, S.W., Wooldrage, K. (2020). Long-term colorectal cancer incidence after adenoma removal and the effects of surveillance on incidence: A multicentre, retrospective, cohort study. *Gut*; 69(9): 1645-1658. DOI.

4. Details of the impact (indicative maximum 750 words)

There are one million new CRC diagnoses annually worldwide. It is the fourth most common cancer (c.45,000 new cases/year) and second most frequent cause of cancer mortality (c.17,000 deaths/year) in the UK. It is estimated that the overall cost of CRC to the NHS exceeds £1 billion annually.

Most CRCs develop from a type of polyp called an adenoma, and removal of adenomas reduces the risk of CRC. National guidelines recommend surveillance colonoscopy for patients thought to remain at increased CRC risk following polyp removal. Colonoscopy is an invasive procedure that is burdensome for patients, requires intensive bowel preparation and carries a small risk of serious complications. Post-polypectomy surveillance places enormous pressure on NHS resources, accounting for approximately 75,000-100,000 colonoscopies every year (20% of all colonoscopies) in the UK. For intermediate-risk patients alone, surveillance (as recommended in the 2002 UK guidelines) costs the NHS approximately £2,500,000 over each surveillance three-year cycle.

To reduce this burden on patients and the NHS, Professor Cross and colleagues at Imperial College reassessed these surveillance requirements to inform revisions to the 2002 UK post-polypectomy guidelines. Dissemination of the findings from this work (refs 1-2 above) highlighted potential beneficial impact on both patients and the NHS and resulted in Professor Cross playing a leading role in the revision of the UK surveillance guidelines and being co-senior author of the revised guidelines, published in *Gut* in 2020 [**A**].

Imperial research findings were used to determine which patients require surveillance and are cited >60 times in the guidelines to support the evidence statements. Surveillance is no longer recommended for nearly all the low-risk group and approximately half of the intermediate-risk group. For the high-risk group, one surveillance colonoscopy at three years is recommended, compared to a minimum of three examinations in the 2002 guidelines [**A**, page 219; Figure 1, page 205]; this largely aligns with the recommendations from the Imperial team of researchers (ref 4 above).

The Imperial findings were also incorporated into the latest EU guidelines, which similarly recommend surveillance after three years for the high-risk group [**B**, cited 17 times pages 689-690, 692-694].

The main impact of the new guidelines is a substantial reduction in the number of patients requiring surveillance colonscopy. It is estimated that total colonoscopic surveillance workload will fall by 80% [**A**, page 219], potentially saving approximately 60,000-80,000 colonoscopies per year. Under the new guidelines, surveillance is already being directed specifically towards patients who remain at increased risk of CRC following polyp removal. Conversely, patients not at increased CRC risk compared to the general population are returning to routine CRC screening based on stool-based tests.

In summary, the new guidelines are minimising patient exposure to unnecessary invasive procedures and alleviating the burden of colonoscopy surveillance on NHS endoscopy services.

The reduction in colonoscopy surveillance that has already taken place reflects the efficient dissemination and implementation of the new guidelines. Professor Cross, other guideline authors and national endoscopy stakeholders have used various electronic and web-based communication, conference presentations, and workshops to disseminate the guidelines. The Imperial researchers have promoted their data and the guidelines via Twitter (@CSPRG_Imperial), and their website (https://csprg.org.uk/), by press releases [**C, D, E**], blog articles [**F**], as well as at national and international meetings. Dissemination of the guidelines has been further aided by their endorsement from the British Society of Gastroenterology, the Association of Coloproctology of Great Britain and Ireland, and Public Health England.

Public Health England has sent communications to screening services to encourage implementation of the guidelines and the new guidelines are currently being built into the National Bowel Cancer Screening Programme software. NHS England have worked with cancer alliances, asking NHS trusts to nominate a consultant surveillance lead responsible for guideline implementation [**G**]. The 2002 guidelines were formally withdrawn from gov.uk webpages in July 2020 [**H**].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[**A**] Rutter MD, East J, Rees CJ, Cripps N, Docherty J, Dolwani S, Kaye PV, Monahan KJ, Novelli MR, Plumb A, Saunders BP, Thomas-Gibson S, Tolan DJM, Whyte S, Bonnington S, Scope A, Wong R, Hibbert B, Marsh J, Moores B, Cross AJ*, Sharp L*. British Society of Gastroenterology/Association of Coloproctology of Great Britain and Ireland/Public Health England post-polypectomy and post-colorectal cancer resection surveillance guidelines. *Gut*. 2020 Feb;69(2):201-223. (*co-senior author). DOI.
(REFERENCE 32, the key Imperial Study in Lancet Oncology, is cited on >60 occasions)

[**B**] Hassan C, Antonelli G, Dumonceau JM, Regula J, Bretthauer M, Chaussade S, Dekker E, Ferlitsch M, Gimeno-Garcia A, Jover R Kalager M, Pellisé M, Pox C, Ricciardiello L, Rutter M, Helsingen LM, Bleijenberg A, Senore C, van Hooft JE, Dinis-Ribeiro M, Quintero E. Post-polypectomy colonoscopy surveillance: European Society of Gastrointestinal Endoscopy (ESGE) Guideline - Update 2020. *Endoscopy*. 2020 Aug;52(8):687-700. DOI.
(REFERENCE 4, the key Imperial Study in Lancet Oncology, is cited on 17 occasions)

[**C**] NIHR Signal. New evidence confirms three-yearly surveillance interval for people at intermediate risk of bowel cancer. London: NIHR; 2017. DOI.
(Highlights the Imperial results in reference (1) above)

[**D**] https://www.bsg.org.uk/resource/bsg-acpgbi-phe-post-polypectomy-and-post-colorectal-cancer-resection-surveillance-guidelines.html. Archived here.
(British Society of Gastroenterology highlights the new UK post-polypectomy surveillance guidelines [A])

[**E**] https://www.bowelcanceruk.org.uk/news-and-blogs/campaigns-and-policy-blog/updated-surveillance-guidance-for-people-who-have-had-polyps-or-previous-cancer-removed/. Archived here.
(Bowel Cancer UK highlights the new UK post-polypectomy surveillance guidelines [A])

[**F**] https://blogs.bmj.com/gut/2020/08/05/gutblog-long-term-colorectal-cancer-incidence-after-adenoma-removal-and-the-effects-of-surveillance-on-incidence-a-multicentre-retrospective-cohort-study/. Archived here.
(The GUT Journal blog highlights the work of the Imperial research team and reference (6) above)

[**G**] https://www.england.nhs.uk/2019/12/provider-bulletin-5-december-2019/#cancer-guidelines
(NHS England link to new published guidelines [A]). Archived here.

[**H**] https://www.gov.uk/government/publications/bowel-cancer-screening-surveillance-screening-for-adenomas. Archived here.
(GOV.UK withdrawal of prior guidance for adenoma surveillance)