Colorectal cancer screening: 
an evaluation of colonoscopy services in Scotland 
with planning of the roll-out of the national colorectal cancer 
screening programme in Scotland

(Colorectal cancer screening)

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1 Abstract, keywords and competencies demonstrated

Abstract

Objective: To evaluate the colonoscopy services in Scotland and plan the implementation of the roll-out of the colorectal cancer screening pilot to a national programme.

Design: -

- Postal survey of colonoscopy services;
- Resource estimation based on pilot activity data;
- Discussion with key healthcare professionals, following a planning cycle route map.

Results: The main deficiencies identified in the evaluation were: -

- 53.9% of the colonoscopy equipment in use was more than five years old;
- There was expert colonoscopists staff shortages: 12% of recommended numbers for consultant gastroenterologists and 18% of those for consultant colorectal surgeons;
- Only 19% of facilities regularly audited the colonoscopy data, 52% collected a minimum dataset for colonoscopy and 73% recorded the completion of colonoscopy.

The roll-out of the screening programme would require significant additional resources (e.g. 14 additional colonoscopists, 4 colorectal surgeons). It would take approximately 5 years to build the capacity in the service to roll-out the programme.
Conclusions: The roll-out has to be preceded by investment addressing equipment, staff recruitment and training and the quality assurance processes.

(177 words)

Keywords
Colorectal cancer
Screening

Competencies demonstrated
This report demonstrated the following competencies:

To assess the effectiveness and efficiency (resource allocation) of health services or other activities aimed at improving health.

To identify and obtain relevant information and show how it can be used to plan health services or other activities aimed at improving health.

(Words: 6408, including 177 in the abstract)
## 2 Glossary and abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSG</td>
<td>British Society of Gastroenterologists</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>Cleaning and disinfection</td>
</tr>
<tr>
<td>CRC</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>CSBS</td>
<td>Clinical Standards Board for Scotland</td>
</tr>
<tr>
<td>DCBE</td>
<td>Double Contrast Barium Enema</td>
</tr>
<tr>
<td>FOBt</td>
<td>Faecal Occult Blood test</td>
</tr>
<tr>
<td>GI</td>
<td>Gastrointestinal</td>
</tr>
<tr>
<td>JAG</td>
<td>Joint Advisory Group</td>
</tr>
<tr>
<td>NSD</td>
<td>National Services Division</td>
</tr>
<tr>
<td>NSC</td>
<td>National Screening Committee</td>
</tr>
<tr>
<td>RCAGs</td>
<td>Regional cancer advisory groups</td>
</tr>
<tr>
<td>SEHD</td>
<td>Scottish Executive Health department</td>
</tr>
<tr>
<td>WTE</td>
<td>Whole Time Equivalent</td>
</tr>
</tbody>
</table>
3 Problem identification and definition of task

3.1 Background

Colorectal cancer (CRC) is the third most common malignancy experienced in Scotland. In 1999 there were 3356 incident cases and 1662 deaths due to CRC, with 1.2:1 male to female ratio. The risk of being diagnosed with the disease before age 75 is 3.4% for men and 2.4% for women. Overall three year survival for patients diagnosed in 1991-1995 was 42.7%. The incidence has been increasing particularly in men and is projected to continue to increase during the present decade.

Existing evidence from randomised controlled trials indicates that screening with guaic based faecal occult blood test (FOBt) followed by diagnostic colonoscopy can reduce mortality from CRC by 15-18% when done every two years and by 33% when done annually. After appraising existing evidence, the National Screening Committee (NSC) recommended the set up of a UK pilot project, to determine whether the outcomes achieved in the research setting could be repeated in population based programmes.

The pilot started in 2000 in two sites, one in the West Midlands in England and one in East of Scotland. 450,000 men and women aged 50-69 were to be invited to participate over 2 years.
The target population is men and women aged 50 to 69, with screening every two years. The screening test is guaic based FOBt, posted to participants. The gold standard diagnostic investigation is colonoscopy. If colonoscopy cannot be completed, double contrast barium enema (DCBE) is performed. During colonoscopy, suspicious lesions are removed and sent to pathology for histopathology examination and diagnosis. The treatment methods of the identified cases of CRC include surgery, chemotherapy and radiotherapy depending on the stage and location of the tumour.8

3.2 Problem identification

The Scottish arm of the pilot commenced in March 2000 in Grampian, Tayside and Fife Health Boards. (Figure 1) By March 2001, 143,443 individuals (51% of the Scottish target population) had been invited to participate. An interim evaluation of the pilot programme after 1 year9 (part of the formal pilot evaluation) showed that the screening test uptake (56%) and the rate of positive tests (2.1%) were comparable with the figures from the randomised controlled trials. This indicated that the roll-out to a national programme was a real possibility.

The Scottish Executive Health Department (SEHD) had pledged to roll-out a national CRC screening programme should the evaluation of the pilot be positive,10 and cancer monies were earmarked to pump prime the programme.
Therefore, SEHD commissioned the National Services Division (NSD) in Scotland to prepare a report to assess the national, high level health service implications of the possible roll out of the CRC screening pilot to a national CRC screening programme in Scotland. The report had to include a critical path for the tasks necessary to be implemented nationally before or during the roll-out of the programme.
3.3 Definition of task

I had been seconded to the National Services Division to work with a small group consisting of the Scottish national screening co-ordinator, CRC screening pilot project manager and finance director and produce the report for the SEHD. To that end, I had to identify and obtain relevant information for the national, high level, planning of the implementation of the Scottish CRC screening programme.

While the report to SEHD included all aspects of the CRC screening programme (primary care, secondary care, co-ordination, and quality assurance) for the purpose of this report which demonstrates public health competencies, I focus on secondary care aspects and specifically on colonoscopy services.

The task included involving key healthcare professionals in Scotland who would be stakeholders in the roll-out of the programme, through the set-up of a core working group (CWG).

To carry out the planning task, I decided to follow the planning cycle route map described by Pigot and consider: -
a) Where are we now?

The ongoing monitoring of the pilot indicated that the gastrointestinal endoscopy services delivering diagnostic colonoscopy for CRC screening in the East of Scotland were under pressure, with increasing waiting times and the need to periodically stop screening to allow for ‘catching-up’. This was the result of both the screening pilot and an additional increase in demand from symptomatic cases thought to be due to increased awareness of bowel cancer symptoms.

In addition, concerns were expressed at national level\textsuperscript{13} about serious deficiencies in the provision of diagnostic facilities for CRC.

Therefore it was important that the task included an evaluation of existing colonoscopy services in Scotland against objectives the service would have to achieve within the screening programme (and were currently compulsory for the units participating in the screening pilot). The service objectives were: -

- to comply with the professional bodies’ standards for accommodation, cleaning and disinfection, equipment, staffing levels and quality assurance and

- to deliver the procedure within 2 weeks of referral for colonoscopy.\textsuperscript{14}

It was likely that the inability of the colonoscopy services to meet standards would be a limiting factor in any roll-out to a national CRC screening programme.
b) Where do we want to go?

This involved:

- the estimation of CRC screening programme workload which would be generated by the roll-out nationally;

- the identification of the options and broad costs for the CRC screening programme service delivery, through discussion within the CWG and the setting of a finance sub-committee.

c) How do we get there?

This involved the drawing of a high level implementation plan for the roll-out, focusing on the critical path for implementation. This was national, high level, broad brush planning. Detailed local business planning would be required at a later stage.

d) How far did we get in implementation?

This involved agreeing through discussion with the stakeholders a framework for monitoring the implementation of the roll-out.
4 Aim and Objectives

4.1 Aim

1. To evaluate the colonoscopy services in Scotland against existent standards.

2. To draw up a high level, national plan for the roll-out of the CRC screening programme in Scotland.

4.2 Objectives

1. Identify standards for service delivery for colonoscopy relevant to diagnosing CRC through discussion with key professionals and a review of the published literature from regulatory bodies.

2. Evaluate colonoscopy services for CRC in Scotland against its objectives and service standards, using a postal questionnaire.

3. Estimate the projected workload for a national CRC screening programme.

4. Identify options and their costs for the CRC screening programme service delivery.

5. Draw a critical pathway for the roll-out of CRC screening programme.

6. Agree a framework for monitoring the implementation of the roll-out of the CRC screening programme.
5 Methods

5.1 Evaluation of the colonoscopy services in Scotland using a survey

Evaluation may be carried out to determine whether a service is a worthwhile investment for health, or whether there are improvements to be made in the delivery of the intervention. Evaluation may be divided into an examination of structure, process and outcome.\(^{15}\)

Following consultation with lead clinicians for diagnostic services involved in the pilot I performed a literature search and retrieved the relevant up-to-date service standards for accommodation, cleaning and disinfection, equipment, staffing levels and quality assurance\(^{16-20}\). The standards and recommendations were structured in line with Donabedian’\(^{15}\)’ taxonomy of structure, process and outcome.

I designed a questionnaire that would assess the compliance of the colonoscopy services with the identified standards. The questionnaire was discussed and agreed within the CWG and with representatives of UK professional organisations which set the standards (British Society of Gastroenterology and the Association of Coloproctology of Great Britain and Ireland).

After being piloted internally on health care professionals, the questionnaire was send to the 15 Medical Directors of all the Acute NHS Trusts in Scotland. They were advised in the covering letter to consult with clinical leaders or business managers for
each of the local gastrointestinal endoscopy facilities. The questions had to be answered separately for each clearly identifiable facility. I followed up non-responders by telephone.

The efficiency of the diagnostic services for CRC is about its organisation and internal day to day running. The service would be efficient if it does what it does well, and would be effective if it produces the desired effect.\(^{21}\)

I assessed efficiency by checking how far both structures (including accommodation, equipment, and staff) and processes (which are the systems necessary for the operation of the service) were in place and complied with the set standards.

It was not the aim of the project to assess fully the effectiveness of colonoscopy services in Scotland. Within the CWG was agreed that a most desired outcome for the purpose of the CRC screening roll-out was the ability of the colonoscopy service to cope with the existing demand. Failure to cope would significantly affect the roll-out of the programme.

I therefore assessed the colonoscopy service effectiveness by collecting information on a proxy measurement, the length of the waiting time, and the reason behind it. I and the CWG were aware that waiting time is a very rough indicator of effectiveness,
subject to a multitude of factors, but we chose it for the ease of access within the tight
time scale of the project.
5.2 Planning the roll-out of the national Scottish CRC screening programme

This involved the following steps:

1. Involving key stakeholders.

2. Estimation of the workload which would be generated by a national screening programme using the following data:

   - population predictions from the Registrar General for Scotland;
   - interim data from the ongoing pilot on
     - uptake rate of the screening test;
     - positive rate of returned tests;
     - uptake of diagnostic test (colonoscopy) following a positive screening test;
     - proportion of colonoscopies generating pathology specimens;
     - failure rate for colonoscopy, leading to DCBE;
     - proportion of patients who had surgery for CRC following colonoscopy and
     - proportion of surgical cases referred to oncology,

and following the algorithm described in Table 1.
Table 1: Algorithm for calculating CRC screening programme workload

<table>
<thead>
<tr>
<th>Annual workload</th>
<th>Calculation formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening office</td>
<td>Half of the target population (aged 50 – 69)</td>
</tr>
<tr>
<td>Laboratory</td>
<td>Population invited x screening test uptake rate</td>
</tr>
<tr>
<td>Colonoscopies</td>
<td>Population invited x uptake rate x positive rate for returned FOBt x uptake rate for diagnostic test</td>
</tr>
<tr>
<td>Pathology</td>
<td>Number colonoscopies x proportion of colonoscopies generating pathology specimens</td>
</tr>
<tr>
<td>Radiology (Double Contrast Barium Enema)</td>
<td>Number colonoscopies x failure rate for colonoscopy</td>
</tr>
<tr>
<td>Colorectal surgery</td>
<td>Number colonoscopies x proportion of patients who had surgery for CRC after colonoscopy</td>
</tr>
<tr>
<td>Oncology</td>
<td>Number surgical cases x proportion surgical cases referred to oncology</td>
</tr>
</tbody>
</table>

x: multiplied by

I then used assumptions based on working time in a year and recommendations on workload\textsuperscript{17,18,22,23} to estimate the resource requirements in terms of sessions or whole time equivalent (WTE) requirements for colonoscopy, radiology (DCBE), pathology, colorectal surgery and oncology.
3. Identifying the service delivery options for the Scottish CRC screening programme, through discussion with stakeholders in the CWG, and the estimation of the overall capital and revenue cost by using NHS service pilot costs at year 2000/2001 level.

4. Identifying the critical path in implementation of the roll-out of the Scottish CRC screening programme by considering the findings of the evaluation and the workload estimates.

5. Proposing a framework for monitoring the implementation of the roll-out recommendation, through discussion with the stakeholders in CWG.
6 Results

6.1 Evaluation of colonoscopy services in Scotland; results of the survey

All 15 trusts returned the questionnaires (response rate 100%).

6.1.1 Evaluating efficiency against standards

6.1.1.1 Accommodation

In Scotland there were 38 dedicated gastrointestinal endoscopy units where colonoscopies were performed.

Table 2 indicates the number and proportions of facilities in Scotland which complied with the standards for the design of gastrointestinal endoscopy units set by the working party of the British Society of Gastroenterologists.
Table 2: Compliance with the standards for design of the GI facilities in Scotland

<table>
<thead>
<tr>
<th>Standard</th>
<th>Number of facilities that comply</th>
<th>Proportion complying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endoscopy unit should have staffed reception area</td>
<td>28</td>
<td>73.7%</td>
</tr>
<tr>
<td>There should be separate endoscopy rooms</td>
<td>29</td>
<td>76.3%</td>
</tr>
<tr>
<td>There should be separate room for cleaning &amp; disinfecting of instruments</td>
<td>33</td>
<td>86.8%</td>
</tr>
<tr>
<td>There should be separate recovery room</td>
<td>31</td>
<td>81.6%</td>
</tr>
<tr>
<td>There should be cardio-respiratory monitoring equipment in the endoscopy rooms</td>
<td>29</td>
<td>76.3%</td>
</tr>
<tr>
<td>There should be cardio-respiratory monitoring equipment in the recovery area</td>
<td>30</td>
<td>79%</td>
</tr>
<tr>
<td>There should be resuscitation equipment in the endoscopy area</td>
<td>32</td>
<td>84%</td>
</tr>
</tbody>
</table>

6.1.1.2 Cleaning and disinfection of equipment and instruments

Table 3 indicates the number and proportions of facilities for gastrointestinal endoscopy that complied with the standards from the BSG regarding the cleaning and disinfection (C&D) of instruments for endoscopy.
Table 3: Compliance with the standards for cleaning and disinfection in Scotland

<table>
<thead>
<tr>
<th>Standard</th>
<th>Number of facilities that comply</th>
<th>Proportion complying</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;D should be performed by staff trained in performing cleaning and disinfection</td>
<td>35</td>
<td>92%</td>
</tr>
<tr>
<td>C&amp;D should follow agreed written local protocols</td>
<td>33</td>
<td>86.8%</td>
</tr>
<tr>
<td>C&amp;D process should allow clear patient tracing for each instrument</td>
<td>34</td>
<td>89.5%</td>
</tr>
<tr>
<td>Automated washer/disinfector machines should be used</td>
<td>34</td>
<td>89.5%</td>
</tr>
<tr>
<td>The endoscopy accessories for multiple use should be sterilised in a central sterilisation unit</td>
<td>26</td>
<td>68.4%</td>
</tr>
</tbody>
</table>

6.1.1.3 Equipment

Table 4 shows compliance with the standards for colonoscopy equipment in Scotland.
Table 4: Compliance with the standards for colonoscopy equipment in Scotland

<table>
<thead>
<tr>
<th>Standard</th>
<th>Proportion complying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colonoscopes should preferably be video-colonoscopes</td>
<td>100/117 (85.4%) of colonoscopes</td>
</tr>
<tr>
<td>Colonoscopes should be less than 5 years old</td>
<td>54/117 (46.1%) of colonoscopes</td>
</tr>
<tr>
<td>Endoscopy facilities should have service contracts for colonoscopes</td>
<td>30/38 (78.9%) of facilities</td>
</tr>
<tr>
<td>Endoscopy facilities should have business plan for replacement of endoscopy equipment</td>
<td>17/38 (44.7%) of facilities</td>
</tr>
<tr>
<td>Endoscopy facilities should have equipment available for taking photographs of endoscopic findings</td>
<td>25/38 (65.8%) of facilities</td>
</tr>
</tbody>
</table>

6.1.1.4 Staffing levels

Two hundred and ten professionals performed colonoscopies in Scotland. Of those, 43% were consultant colorectal or general surgeons, 25% consultant gastroenterologists 15% specialist registrars and the rest other hospital grades. There were no nurses performing colonoscopy in Scotland. Table 5 shows the compliance with the levels of staffing standards for consultant gastroenterologists and colorectal surgeons (there were no standards for other groups).
### Table 5: Compliance with the standards for staffing levels for consultant gastroenterologists and colorectal surgeons in Scotland

<table>
<thead>
<tr>
<th>Standard</th>
<th>Recommended numbers for Scotland</th>
<th>Shortfall from guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 consultant gastroenterologist per 80,000 population</td>
<td>62</td>
<td>10 (12%)</td>
</tr>
<tr>
<td>1 consultant colorectal surgeon per 100,000 population</td>
<td>50</td>
<td>9 (18%)</td>
</tr>
</tbody>
</table>

#### 6.1.1.5 Quality assurance processes for colonoscopy

Table 6 shows the compliance with the standards for quality assurance.
Table 6: Compliance with the standards for quality assurance in Scotland

<table>
<thead>
<tr>
<th>Standard</th>
<th>Number of facilities complying</th>
<th>Proportion complying</th>
</tr>
</thead>
<tbody>
<tr>
<td>A minimum dataset for each colonoscopy should be collected</td>
<td>20</td>
<td>52%</td>
</tr>
<tr>
<td>Completion of colonoscopy should be recorded using one of the accepted methods</td>
<td>28</td>
<td>73%</td>
</tr>
<tr>
<td>Regular audit of colonoscopy data should be performed</td>
<td>6</td>
<td>16%</td>
</tr>
</tbody>
</table>

6.1.2 Assessing effectiveness

One of the main standards and objectives of the colonoscopy service within a CRC screening programme, if pilot standards were applied, would be to deliver the investigation within 2 weeks.\textsuperscript{14}

The survey showed that in Scotland the median waiting time for urgent colonoscopy was 3 weeks (with a range of 1 to 8 weeks) and for routine colonoscopy 13 weeks (with a range of 3 to 36 weeks) indicating the inability of the service to cope with existing demand.

\textsuperscript{1}Identification of ileocaecal valve, tri-radiate fold or appendix fold; terminal ileum biopsy; photographic record; video recording
However, the survey identified accommodation capacity for another 73 sessions. Table 7 shows the reasons why it was not used. In addition, the median number of colonoscopies performed in a session in Scotland was 5 (range 2 to 8) while the accepted standard is 6 colonoscopies per session.17:18

Table 7 Reasons for unused capacity for GI endoscopy sessions in Scotland

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of respondents giving the reason</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff shortages</td>
<td>16</td>
<td>42%</td>
</tr>
<tr>
<td>No resources available</td>
<td>14</td>
<td>36.8%</td>
</tr>
<tr>
<td>Staff utilised in other areas e.g. ERCP/X-ray</td>
<td>2</td>
<td>5.3%</td>
</tr>
<tr>
<td>Sessions used by another speciality e.g. urology / ERCP, bronchoscopy</td>
<td>4</td>
<td>10.5%</td>
</tr>
<tr>
<td>Staff training/annual leave</td>
<td>2</td>
<td>5.3%</td>
</tr>
<tr>
<td>No bed space</td>
<td>1</td>
<td>2.6%</td>
</tr>
</tbody>
</table>

6.1.3 Evaluating the colonoscopy service in Scotland against the objectives

The compliance with the existing standards varied. More than 73% of the facilities complied with the standards for accommodation and over 86% with 4 of the 5 standards for C&D. The main shortcomings were: old equipment with no business
plans for replacement, consultant manpower shortages and poor quality assurance processes.

Overall, the service failed to achieve the objective of delivering the investigation within 2 weeks of appointment, mainly due to staff and other resource shortages.
6.2 Planning the roll-out of the national Scottish CRC screening programme

6.2.1 Involving key stakeholders

To accurately inform this high level planning of the national CRC screening programme roll-out and ensure ownership of the process, it was essential to involve in the core working group (CWG) key healthcare professionals from both the pilot and from parts of Scotland that were not included in the pilot. The whole process was considered, from identifying the target population through to treatment.

The CWG was chaired by the National screening co-ordinator and its membership comprised:

- CRC screening project manager
- CRC screening pilot evaluation team director
- Pilot screening office manager
- Pilot clinical biochemist
- Chairs of the three Scottish colorectal regional cancer advisory groups (RCAGs) \(^{(f)}\)

\(^{(f)}\) In Scotland there are three regional cancer advisory groups that have responsibility for the regional investment plans for cancer services, including capital investment and workforce planning and oversee service redesign. \(^{10}\) They each have cancer specific groups (e.g. CRC group).
- Pilot lead clinicians for gastroenterology and colorectal surgery

- NSD finance representative

- Public health medicine consultant

- Information management and technology expert

- SEHD representative

Representation was unsuccessfully sought from general practitioners, the Scottish directors of public health group, the Scottish NHS chief executives group and users. The user and general practitioner perspectives were indirectly fed in, by the CRC screening pilot evaluation director, based on ongoing research findings from the evaluation.

The CWG met regularly to discuss issues to be included in the report to SEHD, options for CRC screening service delivery, the implications from the evaluation and the critical aspects in the implementation of the CRC screening programme roll-out.

6.2.2 Estimation of the workload generated by the CRC screening programme

The CRC screening programme by FOB-t has the following components: -

- Identification of the population target group from the community health index (CHI)\textsuperscript{24} and issuing of the FOB test kit by the screening office;
- Processing and interpretation of the returned FOB-t by the biochemistry laboratory with issuing of the screening result;

- The application of diagnostic test(s) (colonoscopy and in some cases double contrast barium enema) to those with a positive screen test who make an informed choice to have a diagnostic test;

- Treatment of the identified cases of colorectal cancer (colorectal surgery/radiotherapy/chemotherapy);

- Overall programme co-ordination, quality assurance, audit and evaluation.

Based on General Register Office for Scotland population estimates there would be approximately 1,115,000 people aged 50 to 69 eligible for screening every two years. Each year approximately 557,000 people will be invited to take part in the CRC screening programme using FOBt.

Based on the interim data from the ongoing CRC screening pilot, the following assumptions were used for planning:

- uptake rate of the screening test: 60%;

- positive rate of returned tests: 2.2%;

- uptake of diagnostic test (colonoscopy) following a positive screening test: 90%;

- proportion of colonoscopies generating pathology specimens: 55.8%;
• failure rate for colonoscopy, leading to DCBE: 7.3%;

• proportion of patients that had surgery following colonoscopy for CRC: 7.4%;

• proportion of surgical cases referred to oncology: 40%.

Using the above data and following the algorithm described in Table 1, page 19, the workload, expressed as number of people using or treated by the service, for the different components of the CRC screening programme was calculated, and is presented in Table 8.

Each person will be subject to the service’s clinical path or protocol and can have more than one encounter with the service. For instance, a person who had an incomplete colonoscopy goes for DCBE; should an abnormality be seen, he or she would have another colonoscopy to remove a tissue sample for pathology examination; the person would also be seen in the outpatient department to be given the diagnostic result.
Table 8: Estimated workload, expressed as number of people, for service components of the CRC screening programme in Scotland, per year

<table>
<thead>
<tr>
<th>CRC screening service component</th>
<th>Yearly workload*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening office</td>
<td>557,000</td>
</tr>
<tr>
<td>Laboratory</td>
<td>334,200</td>
</tr>
<tr>
<td>Colonoscopy</td>
<td>6617</td>
</tr>
<tr>
<td>Pathology</td>
<td>3692</td>
</tr>
<tr>
<td>Radiology (Double Contrast Barium Enema)</td>
<td>483</td>
</tr>
<tr>
<td>Colorectal surgery</td>
<td>489</td>
</tr>
<tr>
<td>Oncology</td>
<td>195</td>
</tr>
</tbody>
</table>

* Workload figures refer to individual persons who can be sent more than one invitation to participate or have repeated laboratory or diagnostic tests

Detailed estimates for each part of the clinical path or protocol was not in the remit of this high level planning report. The estimation of the additional workload for colonoscopy services generated by the follow-up of patients with polyps would be done by the evaluation team.

Based on the information presented above, Table 9 presents the additional resources (expressed as specialist staff) required in secondary care for the delivery of the diagnostic and therapeutic components of the CRC screening programme in Scotland. The way the specialist staff resources were expressed was limited by the assumptions available for their calculation.
Table 9: Additional specialist staff resource requirements for the delivery of diagnostic and therapeutic components of CRC screening in Scotland and the assumptions upon which they are based

<table>
<thead>
<tr>
<th>Resource required</th>
<th>Assumptions used</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 colonoscopy sessions per week OR</td>
<td>- 6 colonoscopies per session</td>
</tr>
<tr>
<td>14 colonoscopists</td>
<td>- 40 weeks in year</td>
</tr>
<tr>
<td></td>
<td>- 2 colonoscopy sessions/week/colonoscopist&lt;sup&gt;18&lt;/sup&gt;</td>
</tr>
<tr>
<td>2 DCBE sessions per week</td>
<td>- 5 DCBE per session</td>
</tr>
<tr>
<td></td>
<td>- 40 weeks in year</td>
</tr>
<tr>
<td>1 consultant pathologist</td>
<td>- 4,000 specimens/consultant pathologist/year&lt;sup&gt;23&lt;/sup&gt;</td>
</tr>
<tr>
<td>4 colorectal surgeons</td>
<td>- colorectal cancer operations/week&lt;sup&gt;17&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>- 40 weeks in year</td>
</tr>
<tr>
<td>0.6 consultant oncologists</td>
<td>- 315 new cases/consultant oncologist/year&lt;sup&gt;22&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Experience from the pilot showed that the screening programme had an impact on all staff groups and activities associated with procedures performed by specialist staff (e.g. nursing, scientists, ancillary) and this should be taken into account in the detailed local planning.
6.2.3 Identification of options for service delivery and estimation of cost

The CWG considered whether the service components of a national CRC screening programme should be organised and delivered at local Health Board, regional or national level.

Although possible, following discussion within CWG, it was agreed that the screening centres and laboratories for testing should be organised and delivered at regional or national level. Issues considered were: volume of work, possible economies of scale, information technology and management available and the standardisation of procedures. That would require the set up of one Scottish or three regional screening centres and laboratories.

CRW agreed that in order to avoid the creation of a two tier service for CRC, the diagnostic and treatment components would be delivered by the existing services which would have to comply with the quality assurance requirements of the screening programme. The final decision on the options to be implemented should be done after the decision to roll out the programme.

Capital and revenue costs estimates for the national screening programme were based on the cost of the component, incurred in the pilot. These were multiplied by a factor of 3.97 reflecting the increase in the target population from 280,500 in the pilot to 1,115,000 in the national screening programme. The exception was the revenue costs
estimation for diagnostic services that were calculated by multiplying the cost per case within the pilot with the predicted level of activity.

Capital costs identified in the pilot for the screening centre, laboratory, diagnostic services (colonoscopy, radiology and pathology) and programme co-ordination (including media and promotion of the programme) included accommodation set-up, equipment, staff training and accreditation.

Revenue costs identified in the pilot for the screening office, laboratory and programme co-ordination included staffing, accommodation/running and consumables (e.g. leaflets, test kits).

The estimated costs for the national screening programme, using NHS costs at year 2000/2001 level, were £4,102,000 capital cost and £6,158,000 revenue cost. This assumes similar set-up, structures and processes to the ongoing pilot. Detailed costs should be estimated at local level as part of the business planning process prior to the implementation of the programme.
6.2.4 Identification of the critical pathway for the roll-out of CRC screening programme

The results of the survey of the colonoscopy services demonstrated expert colonoscopists staff shortages, equipment deficiencies and poor quality assurance processes in place, and the overall inability of the service to comply with the 2 week waiting time requirement. The CWG agreed that the rectification of the above deficiencies is critical for the roll-out to a national CRC screening programme.

The workload assessment as information for planning (6.2.2) demonstrated that the introduction of the national CRC screening programme would require a significant amount of additional resources for the delivery of colonoscopy and colorectal surgery. The CWG agreed that the increase in the number of expert colonoscopists was the factor requiring the longest period of time to be implemented and therefore is, on its own, on the critical path to rolling out the programme.

To that end, the group identified the need to set up one or more colonoscopy training centre(s) in Scotland which would provide high quality simulation teaching and access to clinical training supervised by experts, before the implementation of the programme. The centres would also be used for the accreditation of colonoscopists, similar to the process seen in the pilot.
The increase in the number of expert colonoscopists could be possible through the training and development of non-medical staff such as nurse endoscopists and the development of optimal skill-mix in the endoscopy departments.26

The CWG estimated that the process of setting up the training centres together with the training and accreditation of colonoscopists could take up to 5 years.

A national implementation group for the programme should be set up once the decision to roll-out the programme is announced. During the lead time, the other resource implications, which have shorter lead times, should be addressed by the CRC RCAGs working within a national framework set by the national implementation group.

6.2.5 Framework for monitoring the roll-out of the CRC screening programme

Following discussion, CWG agreed that the national implementation group should repeat the evaluation of the colonoscopy services to ensure deficiencies were rectified prior to full implementation. The workforce development should be overseen and monitored by SEHD.
7 Discussion

7.1 Evaluation of colonoscopy services

Colonoscopy capacity was identified as a major issue in the pilot. The evaluation of the existing colonoscopy services as a pre-requisite to planning was of public health importance, to ensure that the rolled-out national programme is enabled to “do more good that harm”. CWG strongly supported that view.

An alternative method considered for the evaluation was face to face interviews with lead clinicians across Scotland. This was rejected due to time constraints.

The postal questionnaire allowed the collection of contemporaneous data on many aspects of the service, unavailable from routine sources. The data was presented to policy makers and supported the recommendations of the report. The questionnaire also warned the service of the possibility of the screening programme roll-out and allowed the views of those delivering the service to be expressed in the free text comments part of the questionnaire (these were included in the report to SEHD).

The high response rate to the postal survey (100%) could be a reflection of the delegation of responsibility for replies to senior managers (medical directors) of the acute NHS trusts. Another explanation would be the concern of the service about coping with the extra workload generated by screening, as expressed in free text comments sent with the questionnaire replies.
The high response rate ensures that the results accurately reflect the situation in Scotland. They are not necessarily generalisable to UK. However, the results are similar to the findings of a UK wide survey of colonoscopy equipment performed on behalf of BSG that found that old equipment is widely used and the service pressures mirror those expressed nationally.\textsuperscript{13}

The results of the evaluation of colonoscopy services, delivered within gastrointestinal endoscopy units, was of major importance to the process of planning the implementation of the roll-out of CRC screening programme to the whole of Scotland. It changed the focus of the report from planning the implementation of the whole programme to the planning of the pre-implementation stage of the colorectal cancer screening.

The involvement of the whole service in the evaluation together with the major contribution played in the CWG by the chairs of the CRC regional groups from outside the pilot and the recommendations of the report, gained Scottish clinician’s confidence in the process and allayed the suspicions that the programme would be imposed on them.

\textbf{7.2 Planning the roll-out of the Scottish CRC screening programme}

The main assumption in the planning was that the national CRC screening programme would be an expansion to the whole of Scotland of the current pilot, and no major changes would be made to the programme protocol and components.
The data used in the information for planning originates from data available from the Scottish pilot. The strength of this is that it reflects the "Scottish" dimension in terms of likelihood to take up the screening and diagnostic tests, higher incidence of CRC\textsuperscript{28} and NHS Scotland costs.

The major weakness of the data is the fact it is interim data, available for the first year of the pilot. However, the algorithm presented for the calculation of resource requirements is valid and the report to SEHD\textsuperscript{29} clearly recommended that a recalculation, using complete data available at the end of the pilot, would be mandatory.

It would have been possible to use national prediction data used by NSC but clinicians involved in the pilot felt that in practice the situation was differed from the a priori assumptions.

The estimated capital and revenue costs were high level and were based on the first year processes and activities in the pilot. Should a national screening plan be implemented, detailed local planning and costing would be necessary as part of business planning.

Having used data from the Scottish arm of the pilot, the findings are not necessarily generalisable to UK. The estimates of workload and costs in the report were higher that those predicted by NSC prior to the starting the pilot programmes.\textsuperscript{30} This could be a reflection of difficulties associated with starting of a new programme and
therefore a recalculation based on activity in year 2 of the pilot programme is desirable.

A weakness of the project was the lack of user involvement in both the evaluation and planning, due mainly to time constraints. Their involvement will be included in the event of the roll-out of the programme.
8 Summary

In order to assist the SEHD in the roll-out of the ongoing pilot of CRC screening to a national programme, I carried out an evaluation of the colonoscopy service in Scotland.

The evaluation demonstrated the following main deficiencies in complying with service standards:

- More than half of the colonoscopy equipment in use is more than five years old and only 45% of facilities have business plans for the replacement of equipment;
- There are expert colonoscopists staff shortages (12% of recommended numbers for consultant gastroenterologists and 18% of those for consultant colorectal surgeons);
- Only 19% of facilities regularly audited the colonoscopy data, 52% collected a minimum dataset for colonoscopy and 73% recorded the completion of colonoscopy.

The colonoscopy service was neither efficient because of resource deficiencies it faced (equipment, staff), nor effective in coping with existing demand or delivering the service objectives required within a screening programme.

As a result of the evaluation, a number of recommendations were made to rectify the deficiencies identified and these would need to be implemented before the introduction of the screening programme.
To plan the CRC screening roll-out, focusing on the critical path, I: -

- Involved key stakeholders from the whole of Scotland;
- Obtained interim data from the ongoing pilot and estimated the critical resource requirements for the diagnostic and treatment components of programme;
- Identified the options for the delivery of the programme and estimated the overall capital and revenue costs;
- Considered the findings of the evaluation and identified the tasks on the critical path for the roll-out of the programme, that would take 5 years (pre-implementation phase). The planning for the implementation of the components of screening outside the critical path is not included in this project;
- Recommended a framework for monitoring the implementation of the recommendations of the report.
9 Recommendations

The result of the evaluation of colonoscopy services indicated the existence of important resource deficiencies and the inability of the service to cope with the existing demand from symptomatic patients; in addition, the introduction of the CRC screening programme would require significant secondary care additional resources. On that basis, the following recommendations were made:

1. The announcement of the CRC screening programme roll-out should be postponed until the findings of the full pilot evaluation are published and its implementation delayed until NSC criteria\(^\text{31}\) regarding availability of resources is satisfied.

2. Resources should be allocated to rectify the existent resource deficiencies identified in the evaluation, in particular to modernise equipment, and to enable the service to comply with the existing standards.

3. The shortage of expert colonoscopists should be addressed through the existent workforce planning processes, which should also address the future skill mix for the delivery of endoscopy services. One or more Scottish training centre(s) for colonoscopy should be set up to facilitate skill acquisition or improvement depending on colonoscopists’ needs, and to be used for the accreditation of colonoscopists participating in the screening programme.
4. The colonoscopy quality assurance processes should be improved; these should become a compulsory component in the process of re-accreditation of the colonoscopists.

5. The colonoscopy service should be re-evaluated to assess its readiness to deliver screening and the resource requirements for the whole programme should be recalculated using complete pilot data. An implementation group for the CRC screening should be appointed once the final evaluation of the pilot is available, to oversee the implementation of these recommendations and plan the implementation of all the components of the full population screening programme.
10 Outcomes

1. The SEHD accepted the recommendations of the report. The results of the evaluation\textsuperscript{32} were made available to the CRC RCAGs to assist them in planning the local service development, together with additional cancer money form SEHD.

2. The results of the work and the questionnaire were made available to the Department of Health to be used in England.

3. A working group, that I was part of, reviewed the options for staff expansion and training for colonoscopy in Scotland, and recommendations, together with cost implications, were submitted to SEHD.\textsuperscript{33}

4. Following the publication of the final evaluation of the pilot in June 2003,\textsuperscript{34} the Scottish Minister for Health expressed the commitment to introduce CRC screening, mentioning that planning for its introduction would take five years to ensure the infrastructure in both primary and secondary care are in place to support the programme.\textsuperscript{35}
11 Implications of the findings for the practice of public health

Part of the role of public health professional is to ensure that services aimed at improving health are enabled to achieve their health improvement objectives and in the case of screening programmes doing more good than harm is a fundamental principle. By undertaking a sound evaluation of the diagnostic component of the possible screening programme I gained the respect and confidence of senior clinical colleagues both in the pilot and Scotland-wide and demonstrated the role of the public health specialist as an honest broker, with a population and ethical perspective, capable to influence policy and resource allocation.

11.1 Demonstration of competency: evaluation

I demonstrated this competency by:

- Identifying the service objectives and standards;
- Carrying out a survey to assess effectiveness and efficiency against the standards;
- Making recommendations to address the deficiencies identified during evaluation.

11.2 Demonstration of competency: information for planning

I demonstrated this competency by:

- Involving and working closely with key stakeholders in the process of planning;
- Identifying data necessary for planning;
- Estimating resource requirements, options for service delivery and cost implications;
- Drawing a plan for the implementation;
- Recommending a framework for monitoring.

11.3 Personal contribution

- I fully participated in CWG;
- I ensured key stakeholders from outside the pilot areas were involved;
- I collated the service standards and designed, consulted and piloted the evaluation questionnaire;
- I identified necessary data and assumptions, and calculated critical secondary care resource requirements for the programme;
- I assessed the implications for planning of the results of the evaluation;
- I chaired the finance sub-committee that identified the programme costs;
- I drew the critical path for the implementation of the CRC screening programme;
- I wrote a very large part of the national report sent to the Health Minister and then to NHS Scotland Chief Executives;
- I reported the findings of the evaluation to CRC RCAGs.
12 Lessons learned

I learned a number of valuable lessons by being involved in this work:

- Acquiring and applying project management skills was very important for the drawing of the critical path for the implementation of the programme and for the delivery of the report within the relatively tight timescale required by SEHD;

- In working with a multidisciplinary group, the communication skills and in particular the ability to present clearly, was important to allow the participation of all members;

- Policy can be influenced when arguments are backed by sound evidence and consensus between different professionals;

- There is a strong tension between service constraints on one hand and the political drive, on the other.
References


32. Diagnostic services for colorectal cancer in Scotland; results of mapping exercise. 2002. Edinburgh, NHS Scotland Screening Programmes; National Services Division.


