



## SUSQI PROJECT REPORT:

### Use of histopathology multiwell cassettes to reduce waste in endoscopy procedures

Start date of Project: 01/06/2024

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#### Team Members:

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- Edit Szabone Kalmar, cellular pathology operational manager



#### Background:

During an endoscopy, biopsies are taken and sent to histopathology to diagnose or rule out diseases such as cancer, infections, and inflammatory conditions. This process involves removing small tissue samples from the gastrointestinal tract for microscopic examination. Currently, each biopsy sample is placed in an individual pot which contains formalin (a preservative solution), to prevent cross-contamination and ensure accurate diagnosis. For some patients, several samples will be taken and multiple pots sent to histopathology. Once in the lab, the histopathology team embed each biopsy in a separate paraffin block which is then used in subsequent processing steps prior to analysis.

However, multiwell cassettes are available which allow for secure placement of multiple biopsy samples in a single container, which has several potential benefits. This reduces the number of single use plastic items required per patient which means less virgin plastic is used, and a lower volume of waste is sent for incineration, reducing environmental harm and financial cost. For the endoscopy team, there is a reduced risk of formalin spillage and vapour exposure as several pots do not need to be opened. Multiwell cassettes may also reduce the risk of sample loss and improve efficiency of handling and processing in the laboratory. In histopathology the number of paraffin blocks and glass slides will be reduced, so all downstream consumables are reduced, streamlining workflow and reducing preparation and reporting time. These combined benefits may improve turnaround times that benefit patients while creating more cost-effective pathology services.

This project is being undertaken at the Basingstoke and North Hampshire Hospital Endoscopy Unit, a district general hospital undertaking general gastroenterology work that is part of Hampshire Hospitals NHS Foundation Trust. Approximately 50 patients per day undergo endoscopic procedures in the unit, with biopsy samples taken in > 50%. The project involves the medical, nursing and support staff in the endoscopy and histopathology units.

#### Specific Aims:

To replace the practice of single-use, single-sample pots with multiwell cassettes for patients requiring more than one Histopathology sample to be taken during an endoscopy procedure.



## Methods:

### *Studying the system*

We reviewed current practice and found there was opportunity to improve sample processing efficiency and to align biopsy processes across sites. A previous trial at Winchester Hospital Endoscopy service introduced the use of multiwell sample cassettes to reduce waste and improve processing time. A standard operating procedure (SOP) was produced to provide information on their use, including sample labelling protocols. Their use was accepted by the clinicians and the benefits identified including reduced consumable use alongside faster preparation and reporting. This trial supported the case for implementing the use of multiwell cassettes in Basingstoke and ensuring consistency in processes for their use across sites.

### *Multidisciplinary team engagement*

We engaged with the cellular pathology operational manager, who became a part of the project team, and the clinical lead for cellular pathology as the change will affect the pathology team and the equipment they are required to use. The wider endoscopy team including endoscopists and nurses were also engaged.

As an MDT, we discussed and agreed upon changes to biopsy protocol through meetings. This collaboration allowed us to identify benefits and address challenges to the change from both endoscopy and pathology perspectives. This also ensured appropriate recommendations for different patient groups, for example, it was agreed the change would apply to patients who have suspected benign conditions. Cancer patients were excluded due to the increased risk around ensuring the biopsy sample site is clear and samples are not contaminated. We also needed to agree on a labelling protocol due to risks of samples being mis-labelled. It was imperative to ensure that the labelling of the wells is consistent so that both clinicians and lab staff are clear on which sample is in which well.

### *Planned changes*

We are in the process of updating the existing protocol. Once finalised, the protocol will be presented for sign off at a clinical governance for gastroenterology meeting. Following approval we will disseminate the new protocol among staff and provide the multiuse cassettes. We already ordered and have the cassettes available in stock ready to use. There are no wider procurement changes required to implementing and maintaining the change.

## Measurement:

### *Patient outcomes:*

We will compare length of time between the date of request to date of report issued as the project has potential to improve the time that patients wait for their results. Our baseline data across 3 months is detailed in Appendix 1. On average, it was taking 3.46-4.35 weeks for patients to receive their results, with percentage of results received in specific timeframes as below:

- 1-2 weeks: 33.48%
- 3-4 weeks: 15.87%
- 5-6 weeks: 24.98%
- 7-8 weeks: 25.23%
- 9-10 weeks: 0.57%



We do not anticipate any negative outcomes, however incident reports would be raised by the Histopathology team if there were any issues with samples.

*Environmental and economic sustainability:*

A process based life cycle assessment was used to estimate the carbon footprint of the formalin pot, blue cassette, glass slide, tissue block and new six compartment multiwell cassette. The analysis included GHG emissions associated with raw material extraction, packaging raw materials, transport and disposal. Item and packaging materials were weighed by the team and converted into GHG emissions using emission factors taken from the UK Government Greenhouse gas conversion factors 2024 database, and [Trecourt et al, 2023](#). Packaging for the new six compartment multiwell cassette was excluded due not having purchased the item yet. Transport GHG emissions were based on distances from the largest port in the manufacturing country to the hospital. Conversion factors for waste were taken from the FutureNHS Emission Factors Workbook v1.

GHG emissions associated with the equipment used per slide (Cassette printer, slide stainer, microscope, dehydration machine) and reagents used per slide (Ethanol, Methylcyclohexane) have been taken from [Trecourt et al, 2023](#). It was assumed that the machines used in this study are the same as those used at the hospital.

Costs of the 6 compartment multiwell cassettes were provided from trust procurement and costs for energy by the Trust energy manager. Other financial costs were taken from the NHS Supply Chain catalogue.

Table 1 details the GHG emissions per item.

Item	GHG emissions per item (kgCO2e)	Cost per item	Change in resource use per patient*
Formalin pot	0.110	£0.30	Remove 3
Blue cassette	0.007	£0.18	Remove 4
6 compartment multiwell cassette	0.020	£0.47	Add 1
Glass slide (incl. cover slip)	0.023	£0.09	Remove 3
Tissue block	0.026	£0.05	Remove 3
Equipment electricity per slide (0.4 kWh per slide, 27p per kWh)	0.130	£0.11	Remove 3
Reagents per slide	0.021	£0.20	Remove 3

\*While there will be variation per patient, based on an average of 4.2 samples per patient in a 3 month sample, we have assumed in the old process that 4 formalin pots were used per patient.

The total carbon saving per patient is 0.938 kgCO2e. The total financial saving per patient is £2.50.



### *Social sustainability:*

A staff survey will be sent to Endoscopy and Histopathology teams following implementation of the change to explore the impacts of the change on their day to day work and perceptions of improving sustainability of healthcare.

We did not directly engage patients in this project, however have detailed some anecdotal evidence and literature in our results section which indicates this project can bring benefits to patients.

### **Results:**

#### *Patient outcomes:*

We are still awaiting implementation of our change however will continue to monitor the length of time between the date of request and report issued with an expectation we can improve the time patients await their results.

#### *Environmental and economic sustainability:*

Based on the 3 months data in one endoscopy room there is an average of 1,614 samples taken over 3 months for 380 patients (4.2 samples per patient). Assuming similar sample and patient numbers per our 3 endoscopy rooms, the change is applicable to 4,842 samples for 1,140 patients every 3 months.

Across a year, the change will therefore apply to 19,368 samples and 4,560 patients. This is an annual saving of **4,277.28 kgCO<sub>2</sub>e**, equivalent to driving 12,632 miles in an average car. This is an average financial saving of **£11,400** per year.

### *Social sustainability:*

#### Staff

We will implement a staff survey after the change, however anticipate considerable time savings for the pathology team. It is approximately twice as fast for lab staff to process and the pathologist to report the samples from a multiwell cassette with six compartments than it would be to process six separate individual sample pots. This results in staff efficiencies and increased productivity within the pathology service. Having a faster turnaround for biopsy results also benefits the clinical teams in terms of being able to progress a patient's pathway and next steps for their treatment plan more quickly.

#### Patients

Research shows that prolonged waiting times for biopsy results correlate with higher patient anxiety levels (1, 2). While most research has focused on cancer-related biopsies, similar emotional responses are seen in non-cancer cases. Through this small change, we have the potential to reduce waiting time for results directly for biopsies of benign conditions and reduce patient anxiety.

### **Discussion:**

This project has been initiated to reduce waste, increase efficiency and provide benefits to staff and patients. Currently each biopsy sample from endoscopies is placed in an individual pot and for most patients, several samples will be taken and multiple pots sent to histopathology. The lab team embed each biopsy in a separate paraffin block which is then used in subsequent processing steps prior to analysis. By switching to using a six section multiwell cassette where multiple samples are



provided this reduces the number of single use plastic items required per patient, reduces the number of paraffin blocks, glass slides and downstream consumables. It is also twice as fast for lab staff to process multiple samples using this process. This results in staff time savings and faster turnaround of samples also providing benefits to both staff and patients in terms of faster processing, reporting and progressing their care pathway. Patient anxiety following the wait for the results of their biopsy may also be reduced where their wait for the results is shortened by this new process.

The Winchester trial demonstrated that this change was workable and thus there were no challenges from a pathology perspective. The main challenges were ensuring that the multiwell cassettes were procured and made available to staff.

This change did present a risk around misidentification of samples with the multiwell cassettes and we needed to ensure there was clarity on the process and procedures for using the multiwell cassettes in a consistent way. This challenge was mitigated by developing a standard operating procedure (SOP) which clearly specified the protocol for using and labelling the multiwell cassettes. Engagement and communication with all clinical staff groups about this change was also required. Posters were also designed for clinical areas to indicate the agreed order for using and labelling the samples in the multiwell cassettes so this information is clearly provided to teams in the endoscopy rooms.

Once the change is fully implemented at Basingstoke, the next steps will be to implement this change at Winchester which has an additional four endoscopy rooms. Then the next stage will be to roll out this change to Andover, which has two endoscopy rooms running 20 sessions per week. Following this this change could also be implemented within the outsourcing team. This is where biopsies from a private clinical service come to our service, we have potential to implement similar changes for this workstream as well. Additionally, the current project only covers lower gastrointestinal (GI) samples and could potentially be extended to upper GI biopsies, which would further increase the patient benefits, financial savings and staff time savings. We will present this project to the teams and take the steps to continue to implement this project across these additional areas.

### Conclusions:

This project has indicated that there is the potential for financial savings of £11,400 per year, just for the implementation of this change at Basingstoke. Further financial savings could be made by implementing this change at Winchester, Andover and the outsourced service. Patients will see benefits from these improvements in terms of reduced sample turnaround time and so receiving their results back more quickly. Staff benefits include improved efficiency and staff time saving from quicker sample and slide processing and reporting and also benefits relating to faster care pathway management.

The environmental impact/ carbon saving for implementing this change at Basingstoke alone is an estimated annual saving of 4,277.28 kgCO<sub>2</sub>e, equivalent to driving 12,632 miles in an average car. This will be further increased when the project is rolled out at Winchester, Andover and the outsourced service.

The key elements that contributed to successes/learning in this project was engaging the multidisciplinary team including both consultant, nursing and laboratory staff. Key learning included the importance of having clear SOPs and communicating widely with all relevant staff. This is all essential for ensuring lasting change and to spread learning to others for further benefits.



## References and Resources

- 1) [The Waiting Game: How Long Are Breast Cancer Patients Waiting for Definitive Diagnosis? | Annals of Surgical Oncology \(springer.com\)](#)
- 2) [Characterizing the psychological distress response before and after a cancer diagnosis | Journal of Behavioral Medicine \(springer.com\)](#)

## Appendices

### Appendix 1: Histology report audit (June -August 2024)

JUNE 2024	
Total number of specimens	359
Total number of patients	98
Results reported within 1-2 weeks	37
Results reported within 3-4 weeks	28
Results reported within 5-6 weeks	31
Results reported within 7-8 weeks	2
Results reported within 9-10 weeks	0

JULY 2024	
Total number of specimens	842
Total number of patients	143
Results reported within 1-2 weeks	41
Results reported within 3-4 weeks	23
Results reported within 5-6 weeks	44
Results reported within 7-8 weeks	34
Results reported within 9-10 weeks	1

AUGUST 2024	
Total number of specimens	413
Total number of patients	139
Results reported within 1-2 weeks	40
Results reported within 3-4 weeks	5
Results reported within 5-6 weeks	13
Results reported within 7-8 weeks	53
Results reported within 9-10 weeks	1
No results yet as of 8/10/24	27

Total number of specimens sent in a 3-month period = 1,614

Total number of patients in a 3-month period = 380

Total number of results reported in 1-2 weeks = **118**

Total number of results reported in 3-4 weeks = 56

Total number of results reported in 5-6 weeks = 88

Total number of results reported in 7-8 weeks = 89

Total number of results reported in 9-10 weeks = 2

Total number of specimens without results = 27 (NOTE: specimens were collected in August)

**Conclusion: Most results are reported in 1-2 weeks in a 3-month period (June – August 2024)**

**Data taken from Endoscopy Room 1 registry book.**



## Critical success factors

Please select one or two of the below factors that you believe were most essential to ensure the success of your project changes.

People	Process	Resources	Context
<input type="checkbox"/> Patient involvement and/or appropriate information for patients - to raise awareness and understanding of intervention  <input checked="" type="checkbox"/> Staff engagement  <input checked="" type="checkbox"/> MDT / Cross-department communication  <input type="checkbox"/> Skills and capability of staff  <input type="checkbox"/> Team/service agreement that there is a problem and changes are suitable to trial (Knowledge and understanding of the issue)  <input type="checkbox"/> Support from senior organisational or system leaders	<input checked="" type="checkbox"/> clear guidance / evidence / policy to support the intervention.  <input type="checkbox"/> Incentivisation of the strategy – e.g., QOF in general practice  <input type="checkbox"/> systematic and coordinated approach  <input type="checkbox"/> clear, measurable targets  <input type="checkbox"/> long-term strategy for sustaining and embedding change developed in planning phase  <input type="checkbox"/> integrating the intervention into the natural workflow, team functions, technology systems, and incentive structures of the team/service/organisation	<input type="checkbox"/> Dedicated time  <input type="checkbox"/> QI training / information resources and organisation process / support  <input type="checkbox"/> Infrastructure capable of providing teams with information, data and equipment needed  <input type="checkbox"/> Research / evidence of change successfully implemented elsewhere  <input type="checkbox"/> Financial investment	<input type="checkbox"/> aims aligned with wider service, organisational or system goals.  <input type="checkbox"/> Links to patient benefits / clinical outcomes  <input type="checkbox"/> Links to staff benefits  <input type="checkbox"/> 'Permission' given through the organisational context, capacity and positive change culture.