The NCRI Cellular and Molecular Pathology (CM-Path) Initiative Year Three Review, May 2019

Background

The CM-Path initiative in academic cellular and molecular pathology was launched in June 2016 and is funded by ten of the NCRI Partner organisations.

The CM-Path year three review was conducted as part of the initial CM-Path five-year funding agreement to secure the funding for the final two years of the programme. The aim of the review was to identify the achievements to date, review the original objectives, and, where necessary, refocus and create new objectives in the changing landscape of pathology.

The CM-Path review has been undertaken by the CM-Path Executive Group in collaboration with the CM-Path workstream members, funding partners and other key stakeholders.

Introduction and review of progress to date

Rapid advances in our understanding of the mechanisms underlying the development of cancer and the introduction of new approaches to treatment have highlighted the vital role of cellular pathologists in initiating and facilitating tissue-based research and precision medicine. This has coincided with a decline in recruitment to the speciality which has been particularly marked for academic posts. The NCRI CM-Path Initiative was established in 2016 in order to re-invigorate contemporary pathology by:

- Increasing the engagement of NHS pathologists in research.
- Supporting organisations such as the Royal College of Pathologists (RCPath) to incorporate competence in molecular diagnostics alongside traditional skills such as morphology in college membership examinations.
- Promoting academic pathology as a career to pathology trainees, and also to medical undergraduates and newly qualified doctors, in partnership with organisations such as the Pathological Society of GB & Ireland (PathSoc).
- Encouraging the involvement of pathologists in the design and delivery of clinical trials, with appropriate recognition in grant applications and publications.
- Supporting the role of pathologists and biobanks in improving access to high quality samples for use in translational research.
- Facilitating the assessment and incorporation of new and emerging approaches and technologies in cellular pathology, including genetic analysis, multi-omic analysis, digital pathology and artificial intelligence.
- Engaging with consumers to improve understanding of the role of pathology in the delivery of better outcomes for patients with cancer and to help allay any concerns regarding new approaches.

CM-Path currently has over 60 members, including 18 trainees, affiliated into four workstreams (for a full list of CM-Path members see Appendix A). Each workstream is led by established experts and opinion formers. Overall co-ordination of the project is provided by the Workstream Leads and Chair, appointed at interview after advertisement, and the Deputy Chair, supported by a Programme Manager based in the NCRI office. External advice is provided by the NCRI Strategy Advisory Group.

It was recognised that the delivery of this ambitious project would only be possible by working in partnership with a wide range of stakeholders including NHS England, RCPath, PathSoc, regulators, research funders, Genomics England, Innovate UK and consumers (for a full list see Appendix B).

Over the last three years, the pathology landscape has changed dramatically with genomics and digital pathology now being used in clinical practice at the same time as increasing workload and workforce pressures. Along with molecular pathology, and enhanced data and informatics infrastructure, these technologies will require additional training and time for implementation; and together with artificial intelligence approaches they provide exciting opportunities for research, more targeted workloads and improved diagnostics.

This report summarises the findings of the CM-Path year three review which was undertaken as part of the original five-year funding agreement. Over the last three years CM-Path has

worked in several areas to influence pathology transformation. A series of well attended meetings with positive feedback have been held to help shape the agenda in priority areas, facilitate networking, disseminate new knowledge and practice and raise the profile of cellular and molecular pathology (for a full list of meetings CM-Path have held see Appendix C). Links and collaborations have been established with bodies such as RCPath, PathSoc, Health Research Authority (HRA) and Medicines Development Catapult (MDC). Work undertaken to date has led to the publication of 14 papers and articles in peer-reviewed and specialty publications which have a wide readership within the UK pathology community; five more papers are currently in preparation (full details of publications are given in Appendix D).

Outcomes to date include:

- Adoption by RCPath of a curriculum for two weeks of molecular pathology training, enhancing provision within the current five-year pathology training programme and helping to ensure that pathologists have the right skill set to embrace new approaches to diagnosis and precision medicine.
- Delivery with RCPath of two training days on clinical trials: the latest provided a 'Pathologist's guide to research and clinical trials' in February 2018, where 50 attendees including consultant and trainee pathologists shared knowledge and experience.
- Completion of a survey on UK pathologists' attitudes and practices relating to the release of human tissues from diagnostic archives for research in order to identify barriers to facilitating this process.
- Formation of a Clinical Trials Pathology Advisory Group (CT-PAG) to provide constructive feedback to funders and to researchers on tissue-based biomarker studies in order to improve the quality of research undertaken
- Development, piloting and launch in May 2018 of a biobank self-evaluation tool, aiming to support high quality sample curation and facilitate researcher access to tissue samples which are fit for purpose.
- Delivery of 'The liquid biopsy: ctDNA, circulating tumour cells and blood-borne biomarkers' symposium in March 2018 attended by 110 delegates to ensure that pathologists are aware of the potential of this new approach in monitoring tumour burden.
- Completion of a survey of 21% of the UKs pathology consultant workforce to assess current attitudes towards research and molecular pathology to highlight the challenges facing academic pathology.
- Contribution by CM-Path colleagues to recent RCPath guidelines: "Best practice recommendations for implementing digital pathology."
- Creation of a molecular diagnostics forum to allow pathologists, regulators and industry representatives to come together to find innovative solutions that will allow faster uptake of molecular diagnostic tests.
- Initiation of a collaboration with the HRA to develop a template for generic and enduring consent to use tissues for research following a meeting of relevant stakeholders in February 2018, in order to reduce the regulatory burden.

CM-Path Strategic Vision

In light of the progress made in the past three years, CM-Path have devised a six-point strategic vision that builds on success to date, focusses our trajectory and addresses areas we feel can transform pathology research in the UK.

Our aim is, with our partners, to generate a pathology community in position to contribute to and as needed lead tissue-based research and implementation, using the most appropriate genomic tests and digital technologies, integrated within wider cancer research and healthcare infrastructure; and who can contribute to expert cellular and molecular pathology within a multi-disciplinary team approach for optimal patient care.

In Figure 1 below are the six themes of the strategic vision, followed by mission statements for each theme proposed.

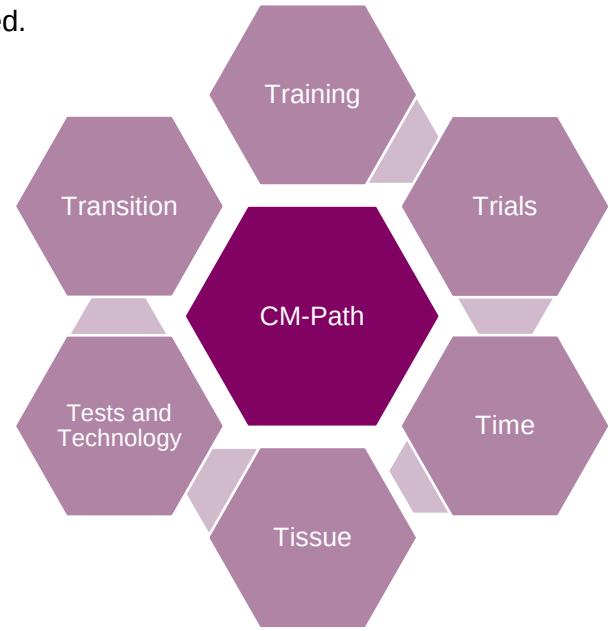

Figure 1: Strategic Vision for CM-Path year four and five

1. CM-Path is committed to supporting the **TRAINING** of all pathologists at all stages in their careers in order to produce a workforce with the skills necessary to maximise the benefits of new research findings for the treatment of cancer patients.
2. CM-Path will ensure that pathology expertise is available to drive and deliver high quality pathology contribution to clinical **TRIALS**. We will work to enable pathologists to be involved appropriately from trial development onwards.
3. CM-Path will share practice and develop solutions to support pathologists to have **TIME** in their job plans to develop and deliver clinical and translational studies as well as other academic activity.
4. CM-Path is committed to promoting tissue-based research, facilitating access to good quality **TISSUE** samples which are suitable to analysis using new and emerging technology and building and enabling quality supporting infrastructure.
5. CM-Path will support pathologist to gain expertise in, evaluate and deliver appropriate novel pathology **TESTS, TECHNOLOGICAL SOLUTIONS** and integrated diagnostics.
6. CM-Path will deliver a **TRANSITION** plan by March 2020 for consideration by the NCRI Strategy Advisory Group and NCRI Funding partners to ensure that the NCRI does not lose the valuable ideas in, knowledge of, position with and understanding of the pathology discipline that it has gained through CM-Path. We believe that NCRI should continue to champion pathology and pathologists and their role in clinical research.

Proposed activity for CM-Path Year four and five:

TRAINING

Objective	Deliverables by end of CM-Path Year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
*Support the RCPath in the development of a new post-graduate pathology curriculum which includes key molecular, research and digital pathology components	• CM-Path members to attend working group meetings • CM-Path members to write sections of the curriculum assigned to them • Submit new curriculum to Curriculum Advisory Group at GMC for approval • Gather statistics from CM-Path implemented two-week molecular pathology module to feed best practice implementation into curriculum development	• Final curriculum approved • First draft curriculum delivered	• First students to study new curriculum – 2021/2022 • Evaluation of success of new curriculum – comparison of amount of time for molecular pathology in new vs old curriculum • Continuous review and changing of curriculum depending on updates in pathology • Work with institutes to encourage best practice adoption of the curriculum
Deliver interim training in molecular pathology until the new post-graduate curriculum from the RCPath is implemented	• Present proposed agenda to RCPath to co-badge meeting • Deliver first training workshop to 100 trainees in July 2019 • Perform a pre- and post- workshop test to evaluate impact on knowledge • Write implementation and benefits of the educational event for medical education journal • Deliver a complimentary workshop to upskill pathology consultants through 'Train the trainers' workshops • Train at least 25 consultants at first workshop with the aim of them then facilitating a second workshop	• Deliver second training workshop to 100 people • Perform a pre- and post- workshop test to evaluate impact on knowledge • Repeat survey conducted in 2017 to analyse attitudes to academic and molecular pathology to see if CM-Path work has changed these attitudes • Invite 'trained' consultants to facilitate second trainee workshop • Survey all 'trained' consultants to establish activity in on-going molecular pathology training locally	• Adapt workshops to compliment new curriculum and provide continuing 'hands-on' training • Assess the need for continuing workshops for the consultant workforce as they will not benefit from the new postgraduate curriculum. • Based on survey create and provide training packages to facilitate and guide consultants in delivering local training
Develop a structured clinical trial/research training programme for pathologists	• Perform a gap analysis of training in this area and identify the most	• Develop a package for clinical trials training including workshops, online packages, specific GCP module	• Evolve and update training as required and manage training modules

Objective	Deliverables by end of CM-Path Year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
	• Link into RCPath to see what the provision for clinical trial training will be in the new curriculum • Survey pathology and oncology trainees to understand the difference in training for research – have at least 100 responses to the survey • Evaluate survey to identify best practice/ideas we can bring to pathology training	• Design feedback questionnaire to assess the training we have developed • Measure the rates of access on websites where the training is located • Assess number of people who complete the training package • Repeat survey conducted in 2017 to analyse attitudes to academic and molecular pathology to see if CM-Path work has changed these attitudes • Review application numbers for CSG pathology member places to see if this has gone up compared to initial assessment in 2017	• Add supplementary training modules as new areas/techniques evolve and change • Continuous need for upskilling pathologists in clinical trials as trials evolve and change

Establish a CM-Path Network	• Edit the CM-Path website to make the Network page and resources more accessible
	• Develop the offering of the CM-Path Network
	• Scope and develop resources for the website;
	  ○ Costing tools for tissue release
	  ○ How to get an animal licence
	  ○ Commentary on key failings of grant applications
	  ○ Develop a resource for pathology CSG members
	  ○ Training tools
	  ○ Guidance on funding applications – what to expect when filling in an application
	  ○ Funding opportunities
		• Scope useful resources for website
		• Add resources to the website
		• Funding information on the website
		• At least 50 sites signed up to the network to include academic sites and DGHs
		• At least 50 people signed up to the pathology directory
		• Monitor number of requests for the pathology directory to understand success
		• Quarterly newsletter
		• Have linked up at least five people with pathologists through the pathology directory
		• Monitor website traffic to understand impact of the tools on offer through the Network
			• Grow the network to include more sites from across the country
			• Keep the website going to be beneficial to pathologists
			• Keep the pathology directory going to be beneficial to the community
			• This network should ensure that the NCRI has a group of pathologists to call on should they need advice in the future
			• Link centres together between DGH and academic centres
			• Build on more ambitious funding

Objective	Deliverables by end of CM-Path Year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
	○ Case studies for getting research PAs/getting ACF etc ○ Turning your path archive into a biobank ○ SOPs for release of tissue and tissue sampling ○ Negotiating for research PAs in contract • Develop the pathology directory – a resource to connect people to pathologists • Have at least 20 sites signed up to the Network		
Deliver training in 'the role of pathologists in the new Genomic Tumour Advisory Boards (GTABs)'	• Survey consultant's exposure to GTAB and molecular pathology to understand current situation • Develop proposal for the training and liaise with NHSE and HEE to identify if CM-Path have a role in these meetings • Identify a forum for regular publication of educational genomic case studies	• Monitor website usage where we publish genomic case studies • Investigate if we can have questions associated with the case studies and monitor the % of correct responses as the education grows	• Repeat survey of Consultants exposure to Molecular Pathology and compare to original
Evaluate and enhance the level of Molecular pathology in the medical undergraduate curriculum	• Survey medical school students on awareness and role of academic pathology • Design Delphi analysis and identify circulation list for conducting the exercise • Circulate first questionnaire	• Identify medical school events where a presentation about pathology and the role of academic pathology could be added • Organise pathologists from CM-Path network to speak at medical school days to educate on pathology and • Evaluate results of Delphi analysis and revise second questionnaire • Circulate second questionnaire • Publish write up of Delphi-analysis	• Work with medical schools to implement outcomes of Delphi analysis • Follow-up survey of subset of initial medical schools to evaluate impact on course content • Survey number of applicants to pathology and those expressing interest in academia

*This objective and the deliverables have been written according to the RCPath proposed timeline of curriculum development. CM-Path have no control over the timeline. CM-Path have been successful in getting two members on this working group – one senior consultant who is heavily involved in clinical trials and one trainee.

CM-Path are keen to input and work with key stakeholders in the digital pathology innovate UK successful bids. CM-Path is linked to two bids; PathLAKE and NPIC. As these are relatively new initiatives there are currently no concrete plans for objectives on overlapping work, however we will support the group as required. Any timelines for these objectives will be dictated by the project teams.

CM-Path Network

A key objective for CM-Path in years four & five is to establish a national network of CM-Path centres; this inclusive network would capture as many UK pathology departments as possible, extending beyond the main academic centres already represented among the CM-Path membership.

The Network will be a centralised location for pathologists and other researchers/members of the cancer community to access colleagues and resources to aid with training, input on trial work and funding applications.

The aims of the CM-Path Network are broad; to encourage and establish best practice molecular testing across the UK; to support pathologist engagement with tissue-based research; to support academic and clinical training and development. Establishing the network would ensure long-term sustainability of CM-Path work beyond the five-year CM-Path funding period and allow formalisation of links with other networks/stakeholders. The concept of the CM-Path Network has already been enthusiastically received by the MRC/EPSRC Molecular Pathology Nodes, ECMC Network, NC3R, Sanger, Crick and CRUK. The CM-Path Network currently has two members; Southampton and Belfast.

TRIALS

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
Develop SPIRIT- Path: An extension to the SPIRIT guidelines for clinical trials. An international collaboration to ensure that the role of pathology in clinical trials is adequately identified and that pathologist involvement is appropriately built in to protocols and funding applications	• Publish paper 'The role of cellular pathologists in clinical trials- challenges and opportunities' to demonstrate areas pathologists can contribute to trials • Survey pathologists, oncologists and cancer researchers to explore their perceptions of the factors that enhance and limit their working relationships with Histopathologists when designing and implementing clinical studies • Communicate and obtain agreement from SPIRIT team in Canada to deliver extension • Apply for funding to support objective • Recruit trainee/research fellow/student to complete literature search • Start literature search to identify current standards for pathology in clinical trials	• Apply for funding if no funding has been sought yet • Complete literature search to identify current standards for pathology in clinical trials • Identify relevant national and international stakeholders • Perform initial Delphi analysis with stakeholders • Publication of review findings • Apply for funding for consensus meeting	• Consensus meetings with national and international stakeholders • Develop final consensus guidelines to ensure interoperability, quality and standardisation for pathology in trials • Publication of SPIRIT-Path guidelines in a high-profile journal (SPIRIT-PRO was published in JAMA, we would aim for something as high-profile) • Creation of a manifesto for use by medical research charities to ensure that SPIRIT-Path is adopted • Agreement with NCRI partners medical research funders to use SPIRIT Path
Define the role of pathology / pathologists in research: Gain consensus for activities that pathologists deliver in research and have these inform the HRA and NIHR CRN Templates to ensure pathology is costed and adequately resourced for clinical trials.	• Identify relevant stakeholders • Hold a small initial workshop to map out activities that pathologists perform in trials • Develop provisional lists of activities • Develop consultation schedule with first consultation at PathSoc/BDIAP meeting in July 2019 • Send out provisional list and gain input from experts • Hold second workshop to finalise list	• Agree with HRA and NIHR CRNs to adopt these • Utilise the activity list to create more specific tools, for example, cost recovery tool for pathology labs and one for biobanks • Measure access of these tools through website traffic	• Agreement with NCRI partners to encourage use of pathology component of HRA Statement of activities and NIHR CRN costing templates
Develop and enhance the visibility of the NCRI Biomarker Advisory Group	• Develop the offering of the group and standardise review process • Review NCRI partners medical research funders for appropriate committees with applications to review	• Work with one more charity bringing the total to three charities to review applications	• Through development over the next wo years we believe that this group will be key to researchers to help them develop their trials and would like to

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
	• Approach charities • Work with one more charity to review applications • Work with charities to refine the guidance that we offer. Gain feedback and compare success rates of applications for awards before and after • Develop a proposal to hold 'proposal guidance' meetings where researchers can come to present and seek advice early in the development of a trial • Provide one to one guidance for people who approach us throughout the year • Work with CTRad to standardise the offering from the NCRI in this area • Complete a gap analysis of membership to identify new experts that could be recruited to the group to enable us to review a wider range of trials, for example, imaging experts • Develop a communications schedule to publicise the group	• Start to engage with other charities outside the NCRI partnership • Hold pilot 'proposal guidance' meeting to gauge need • Identify other reviews the group might be able to achieve for example • Develop best practice documents, for example, why grant applications fail for translational aspects/pathological/tissue aspects of trails • Develop a feedback from for users of the group to fill in with specific metrics that we can use to demonstrate worth of the group, for example, demonstrating when people are seeking advice, what they might have had in place of this review	continue offering this beyond the initial funding period. • We could continue to work with more charities to review applications for their funding rounds

SPIRIT-Path:

The SPIRIT 2013 Statement provides evidence-based recommendations for the minimum content of a clinical trial protocol. SPIRIT is widely endorsed as an international standard for trial protocols. We are keen to use this objective to ensure pathology is included in the minimum set of scientific, ethical, and administrative elements that should be addressed in a clinical trial protocol. We are also keen to develop international interoperability and quality standards in digital pathology and AI as well as standards for pathology inclusion in clinical trials.

Recently, SPIRIT-Pro set standards for clinical trials reporting of patient outcomes which was published in JAMA. This was achieved via an international collaboration of various relevant groups led by Prof Mel Calvert, University of Birmingham and the SPIRIT team in Toronto and developed using a Delphi process. Prof Calvert and the SPIRIT team have agreed to support our pathology initiative.

Clinical Trial Pathology Advisory Group (CT-PAG)

Poor trial design can lead to the failure to yield meaningful results. This will waste both time and money and is potentially unethical if it delays other treatment options for participants. The Clinical Trials Pathology Advisory Group (CT-PAG), was established in May 2017 in order to provide guidance for applicants and research funders regarding best practice on the use of pathology-based biomarkers in clinical trials – providing input on trial designs and reviewing trial protocols. Currently the group can call on the expertise of over 40 panel members across various disciplines. Currently this group reviews applications for CRUKs EMERP and CERP panels using a review proforma which you can find on the CM-Path website here. This proforma details specific criteria to assess trial proposals against. We have reviewed over 60 applications over two years from these groups and have received strongly positive feedback on how our reviews helps with assessing trials and translational study applications.

Following the SAG meeting we have decided to change the name of CT-PAG to align more with the NCRI other advisory services. CT-PAG will become the NCRI Biomarker Advisory Group. We believe this will clarify our offering and provide a one stop shop for researchers looking for advice from the NCRI for their trial proposals. We hope to link in more over the next two years with CTRad and their offering in this area. We hope to develop. You can find more about the CTRad service here.

Our mission with the NCRI biomarker advisory service is to provide advice on pathology and tissue requirements in clinical trial and translational study design. The remit of the group is broad, including advising on:

- Tissue acquisition, processing, storage and access
- Tissue analytics, including DNA and RNA sequencing, genomic microarrays, DNA methylation, PCR, proteomics, metabolomics, circulating tumour cells and cell-free DNA, immunohistochemistry, in situ hybridisation
- All types of biomarkers including predisposition, screening, diagnostic, prognostic, predictive, pharmacological and surrogate response
- Biomarker discovery, assay development, qualification
- Bioinformatics of large data sets, biostatistical analysis

TIME

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
Explore launching new funding themed calls in molecular pathology with funding bodies such as NIHR/MRC to allow pathologists funding and time in their job plans to deliver research	• Collate funding opportunities for specific molecular pathology research to demonstrate the need for more • Survey current consultants to understand sessional time payments for research; how much, by who, major challenges, solutions (link in with the RCPath who have some data on this work) • Engage with NIHR/MRC and other funding bodies • Go/no go decision as to whether lunching more specific funding calls is possible • Consult with NHS research & development, Universities and other employers and funders to understand current ways in which they support sessional time for research and other academic activity. Including an understanding/model of backfilling • Review above survey in light of employers to understand if there are best practice/models for accessing funding that other institutions can utilise • Write a paper to demonstrate pathologist application success rates	• Dependent on NIHR opinions on this topic as to how we continue and the deliverables for year five • Repeat survey conducted in 2017 to analyse attitudes to academic and molecular pathology to see if CM-Path work has changed these attitudes	• Repeat survey of consultants to understand how sessional funding has changed; number of people with funding • Monitor website activity on guidance documents for models to get sessional funding for their pathologists • Survey institutes to understand if guidance given has helped – specific number of before and after sessional funding time will be asked for

TISSUE

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
Relaunch the Confederation of Cancer Biobanks (CCB) to create more biobanks on the UKCRC TDCC conforming to specific guidelines about visibility and accessibility	• Engage with previous CCB members to renew membership • Discuss standards and agree guidelines for being a member of CCB • Deliver biobanking workshop 14th May 2019 to discuss • Develop new steering group for CCB • Discuss areas of activity with UKCRC TDCC team • Update CCB to the NCRI CCB and reflect this in brand change • Update TDCC website to reflect brand change and any new members • Develop communications about the group to researchers and medical research funding charities so they are aware of the group's objectives • Publish a commentary of progress with the realisation of the 2011 "UK Funders Vision for Human Tissue Resources"	• Deliver biobanking workshop for CCB members and others in order to share best practice and improve standards of sample quality and availability • Assess impact of CCB membership on biobank visibility and utility • Have at least 20 additional biobanks joining (to make a total of more than 50) • Ensure that all member biobanks have a rating of 4/5* according to CM-Path criteria	• Continuous monitoring of the group to ensure they are adhering to CCB standards • Monitor how this has changed the uptake of the directory by surveying members – check website traffic on members sites, number of requests per year, number of successful requests per year
Promote uptake and impact assessment of biobanking tool	• Undertake survey of users and CCB members to assess uptake and utility and to suggest improvements • Publish paper demonstrating the tool and survey data	• Compare value of CCB biobanking tool with new ISO standard in biobanking and other quality improvement mechanisms	• Revise biobanking tool annually in light of new developments with programme of continuous improvement
Create a generic consent form for research that is endorsed by the HRA	• Re-open dialogue with HRA regarding development of a template for generic and enduring consent • Offer support for piloting new scheme in CM-Path network and by CCB members	• Assess uptake and utility of new template, working in collaboration with HRA	• Assess public acceptance of generic consent

CM-Path Biobanking tool

In 2018 CM-Path developed a Biobanking sample quality improvement tool which you can download and find more information about here. The tool is a free, confidential self-assessment for use by biobank staff to review how their current practices impact sample quality.

Questions are completed by selecting the appropriate answer from a dropdown menu. This then leads to commentary and evidence as to why the subject of the question is important when it comes to the quality of samples being stored. Where answers indicate that there is room for improvement, suggestions for such improvement are recorded in the "Flagged Areas" tab.

The tool is designed using Microsoft Excel to ensure it is compatible with most operating systems. This also means you can save your answers and refer to them later to see if you have implemented the relevant changes.

Confederation of Cancer Biobanks (CCB):

In 2011 the UK Clinical Research Collaboration (UKCRC) published the "UK Funders Vision for Human Tissue Resources"

> "Funders aim to maximise the value of human tissue samples and resources while minimising duplication of effort. This requires better characterisation of tissue samples, asking for generic consent, and increased linkage to accurate clinical data. Sample collections must then be made more easily discoverable and accessible for use in high quality, ethical research."

As a result, support was provided in 2014 to establish the UKCRC Tissue Directory and Coordination Centre (TDCC). This biobanking directory has a specific section for the CCB Network which includes over 30 members of the group who agreed to certain guidelines to join this network. You can see the TDCC website and the specific CCB network here. CCB developed standards for biobanks on the directory to abide by in order to create a useful and accessible resource for researchers.

CM-Path feel this is still a worthwhile area of work. While the tissue directory has been launched and this has helped the accessibility according to a recent report generated by CM-Path, the information provided by biobanks on the directory is not transparent which still makes it difficult for researchers to access quickly and easily. We therefore feel that the guiding principles and standards should be updated and more biobanks on the directory should abide by these. We would also like to promote the network for more researchers to access. You will be able to see the specific objectives for the NCRI CCB under the 'Tissue' theme above.

TESTS AND TECHNOLOGY

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021	Deliverables for CM-Path Year 6 and beyond
CM-Path will engage with NHSE to define pathology involvement in the ongoing evaluation, management and updates of the genomic test directory	• Write proposal for pathologists to input on the Genomic Test Directory • Send to NHSE • Agree go or no go for this objective	• Deliverables dependant on agreement from NHSE	• Potentially an ongoing interaction with NHSE that CM-Path will manage. Schedule of review will be determined by NHSE.
Plan and execute an integrated diagnostics workshop on ''the pathology report of the future'' (to aid understanding of the medium-to-long term overarching vision, so as to help co-ordinated planning, prioritisation and delivery of digital pathology and molecular diagnostics)	• Prepare outline strategy position statement • Plans for a white paper to demonstrate current situation and issues to address • Map key stakeholder interactions • Draft agenda	• Hold workshop • Write peer review position paper on outcomes of workshop • Publish paper • Develop a strategic position on integrated diagnostics in oncology • Develop an exemplar model that can be used as a basis for the NHS future planning in this area	• Ensure that NHSE and other stakeholders take on the outcomes and issues identified at the workshop to enable strategic planning for pathology services

TRANSITION

We will come back to the NCRI SAG with a further funding proposal by March 2020 following discussion within the CM-Path Executive Group and wider membership. A proposed timeline to discuss a new funding proposal with NCRI partners is detailed in the 'Transition' table below. Over the next year we will define our strategy for further funding to ensure CM-Path can continue to have an impact and a transformative change in pathology research. We are also keen to explore ways to make the programme more sustainable. We are currently exploring the following two options, and a business case will be written for review by NCRI SAG and funding partners:

Option 1:
We propose following the end of CM-Path that it transitions and is rebranded as the NCRI Pathology Network and that this is maintained as a core NCRI function. This would be a similar structure to a CSG. We would propose that the network becomes a resource that is curated and monitored by the NCRI led by a small steering group which has a term aligned with the standard NCRI Chair terms.

Option 2:
We propose that CM-Path remains as an initiative and submits a request for further funding period with a new strategy, set of objectives and deliverables which we plan to submit to the NCRI SAG and NCRI partners in March 2020 for review.

Objective	Deliverables by end of CM-Path year 4 – June 2020	Deliverables by end of CM-Path year 5 – June 2021
Submit a further funding proposal for CM-Path	• Recruit new Chair and Deputy Chair for CM-Path to lead strategy and funding proposal development • Hold Executive Group meeting in September 2019 to have initial discussion about strategy development • Hold CM-Path Annual meeting in November 2019 to consult with CM-Path members and other stakeholders • Hold a consultation with key stakeholders and other relevant individuals • Present new funding proposal to NCRI SAG in March 2020	• Schedule session at NCRI Partners meeting June 2020 to pitch for further funding • If successful with further funding proposal prepare for further activity • Review terms of office for leadership team in CM-Path • Recruit new members as required • Set up working groups as required dictated by objectives • Engage with key stakeholders ahead of new funding term • Communicate the new funding agreement and raise visibility of CM-Path

Succession plan

With the completion of 3 years in office, both the Chairperson and Deputy Chairperson of the CM-Path programme have decided to step down. Therefore, we will be advertising for two new positions in CM-Path for Chair and Deputy Chair.

This gives CM-Path an opportunity to define a clear succession plan and terms of office with the new role holders. As we have two years of the programme left we propose the duration of the role should be a 2 + 1-year term. Each Chair and Deputy Chair will hold the position for two years initially with the possibility of extending the role an extra year subject to annual review.

The extra year that the Chair and Deputy Chair may hold will depend on further funding being approved for the programme. Should further funding be granted we feel having them stay for an extra one year will ensure consistency and a continued leadership and driving force forward. Following the two or three years of the Chair holding the position we will interview for new role holders. A natural move would be for the Deputy Chair to move into the Chair role. We will have this discussion with the Deputy Chair at the time of role change.

Consumer engagement

Consumers have been integral to several pieces of work that CM-Path have undertaken.

- At the 2016 NCRI cancer conference, CM-Path presented at the consumer session and undertook a survey to learn about the awareness and understanding of pathology in the consumer community. This showed:
    - Virtually all consumers are supportive of the use of tissue and anonymised data
    - There is a good understanding of the role of pathologists and strong support to help increase public understanding of pathologists and their work.
    - Although increasingly aware of the use of tissue surplus to diagnostic requirements in research, most patients had still not been asked about this.
- Consumers have visited pathology departments to learn more about their work.
- Consumers have attended several CM-Path workshops and meetings to put forward the consumer perspective on key cancer research discussion points.

Within this three-year review we have also taken the opportunity to review consumer involvement in the programme. We currently have two consumer members, Raffaella Tate who sits on the CM-Path Executive Group and in the biobanking subgroup of Workstream 3, and Tom Haswell, who sits on Workstream 2. We would like to increase the number of consumers involved in CM-Path as we feel their involvement will make a significant contribution to the success of several of our proposed objectives for years four and five. We have identified at least six roles that we feel consumer input can be beneficial. These role profiles have been worked up by the CM-Path Programme Manager and the Consumer member of the CM-Path Executive Group. These will now be discussed with the NCRI Consumer Lead, Emma Kinloch to approve them and we will then go out to recruit up to two consumers per role profile. This should ensure up to 12 consumer members contributing to these activities.

Looking forwards

The role of the pathologist in the diagnosis and management of patients with cancer is evolving rapidly. In the age of precision medicine, molecular diagnostics, digital pathology and image analysis using techniques of artificial intelligence, the sole reliance on light microscopy to assess morphology is no longer sufficient. The CM-Path initiative has demonstrated that pathologists are willing to embrace new approaches which will improve diagnostic accuracy and reduce the delays which contribute to poor treatment outcomes. There has been a clear recognition that the pathologist of the near future will need to work closely with experts in clinical trials and computer scientists as well as specialised laboratory staff, surgeons and oncologists. With the right training they will be able to take on the responsibility of co-ordinating a modernised diagnostic pathway in cancer.

Investment in digital pathology linked with advanced techniques in image analysis offers the chance of reducing the burden of screening routine histological slides for abnormalities and making morphological diagnoses in simple cases. This will free up time to concentrate on complex cases where, for the foreseeable future at least, human judgement will still be required. Digital pathology will also enable experts from anywhere in the UK or abroad to discuss data interpretation. Such a system will support continuing professional development and help to ensure the rapid dissemination of best practice. The introduction of new ways of working will be essential to meet the challenge of increases in workloads of approximately 3-4% per year set alongside a reducing workforce and budgetary constraints. Pathologists will play a central role in standardising classifications using the new approaches, enabling automated and semi-automated annotation and data sharing.

The importance of pathology in the performance of clinical trials has increased with the introduction of precision and targeted approaches, the increased use of biomarkers to monitor response and the rapid rise in the introduction of novel immune therapies. Trial design has become more complex with the use of “basket” and “umbrella” designs and pathologists will need to have an understanding of the principles underpinning such methods, with their contribution to successful delivery fully recognised and resourced.

By the end of the five-year funding for the CM-Path project we will have met our original objectives to promote research and work with partners to help attract new recruits to academic molecular and cellular pathology. Pathologists will be better placed to help shape the agenda for new ways of working and to contribute to the delivery of specialist training which incorporates new and emerging diagnostic techniques and digital technology.

Pathologists will be increasingly required to develop, integrate and evaluate complex data, alongside artificial intelligence tools which will support rather than supplant clinical expertise. We anticipate that new training and approaches to implementation will be needed for these new opportunities in integrative data science, which have the potential to be immensely exciting and important both clinically and in research – and CM-Path will be well-placed to play a key role. In parallel with these new developments, we believe that there will be considerable value in maintaining and continuing to build the CM-Path pathology and CCB networks and Biomarker Advisory Group, beyond the initial commitment of five years, to support the continued involvement of pathologists and high-quality pathology in translational research and clinical trials.

Appendix A: Membership of CM-Path

CM-Path Chair – Dr Karin Oien, University of Glasgow

CM-Path Deputy Chair – Prof Andy Hall, Emeritus Professor, Newcastle University

WS1 – Prof Louise Jones	Barts Cancer Institute
Tomoko Iwata	University of Glasgow
Kikkeri Naresh	Imperial College London
Caroline Young	University of Leeds
Hayley Morris	University of Glasgow
Emily Shaw	Southampton General Hospital
Nick West	University of Leeds
Marie Calaminici	Barts Health NHS Trust
Richard Byers	University of Manchester
Mohammed Ilyas	University of Nottingham
Shirley Henderson	Genomics England
Kathryn Griffin	University of Leeds
Manuel Salto-Tellez	Queens University Belfast
Cornelia Szescsei	Cheltenham General Hospital
Vinaya Srirangam	Royal Free Hospital
Kezia Gaitskell	University of Oxford

WS2 – Dr Abeer Shaaban	University of Birmingham
Owen Driskell	NIHR
Newton Wong	North Bristol NHS Trust
Max Robinson	Newcastle University
Manuel Rodriguez-Justo	University College London
Dennis Zhang	Imperial College London
Jackie McDermott	University College London
Elena Provenzano	Cambridge University Hospitals
Tim Kendall	University of Edinburgh
Kathreena Kurian	University of Bristol
Dan O'Connor	Medicine Healthcare Regulatory Agency (MHRA)
Tom Haswell	Consumer Representative
Aisling Longworth	University of Birmingham
Robert Pell	Royal Berkshire Hospital
Lisette Martin	University of Sheffield

WS3 – Prof Gareth Thomas	University of Southampton
Mark Arends	University of Edinburgh
Craig Robson	University of Newcastle
Valerie Speirs	University of Aberdeen
Philip Sloan	Newcastle University
Maggie Cheang	Institute Cancer Research (ICR)
Scarlet Brockmoeller	University of Leeds
Philip Elliott	Barts Cancer Institute

Keith Hunter	University of Sheffield
Guy Betts	Manchester Royal Infirmary
Andy Hall	Newcastle University
Jane Hair	Honorary Glasgow NHS
Harry Haynes	University of Bristol
Susan Richman	University of Leeds
Sidonie Hartridge-Lambert	Bristol-Myers Squibb
Raffaella Tate	Consumer Representative
Vijay Sharma	University of Liverpool

WS4 – Prof Clare Verrill	Nuffield Department of Surgical Sciences, Oxford
David Snead	Coventry Hospitals NHS Trust
Tony Sackville	BIVDA
Richard Colling	University of Oxford
Bethany Williams	Leeds Teaching Hospital NHS Trust
Sarah Coupland	University of Liverpool
Clare Craig	Genomics England
Sophie Scott	Abbvie
Gabi Rees	Oxford
Jayson Wang	St Georges Hospital NHS Trust
Abhi Ghosh	Royal Berkshire Hospital
Elza Tjio	Hull Royal Infirmary
Philip Macklin	University of Oxford

Within the CM-Path membership we have 18 trainees, three representatives from Industry, two patient representatives, one regulator (MHRA), one representative from funding body (NIHR), representatives that sit on or hold roles within RCPath and PathSoc committees, and two representatives from Genomics England.

Figure 2: Locations of CM-Path members across the UK

Appendix B: List of partner organisations with links to CM-Path

Stakeholders with whom we are linking or aim to link to achieve our objectives include:

- NHS organisations including NHS England, NHS innovation, NHS digital, Health Education England (HEE) and NHS trusts and equivalents in devolved nations
- National Institute for Health Research (NIHR)
- Deaneries for post-graduate clinical training and training programme directors
- Genomic Medicine Centres (GMCs)
- Genomic Laboratory Hubs, GLH (as part of the Genomic Medicine Service)
- General Medical Council (GMC)
- Genomics England
- Regulators including Medicine Healthcare Regulatory Agency (MHRA), the Health Research Authority (HRA), the National Institute for Health and Care Excellence (NICE)
- Medical research funding organisations
- Royal College of Pathologists (RCPath)
- Pathological Society (PathSoc)
- Innovate UK and the digital pathology centres of excellence
- Genomics Education Programme
- British Division of the International Academy of Pathology (BDIAP)
- Industry including British In Vitro Diagnostic Association (BIVDA) and the Association of the British Pharmaceutical Industry (ABPI)
- UK Clinical Research Collaboration (UKCRC) and UKCRC Tissue Directory Coordination Centre (TDCC)
- Other NHS workforce specialities
- Genomics groupings including Training Residents in Genomics (TRIG) Working Group in the US, and genomics subgroup of Association for Clinical Genetic Science in UK
- Research funding organisations including CRUK, MRC, and their initiatives including the ECMC network
- Molecular Pathology Nodes
- Medical Schools' Council
- Association of Clinical Pathologists (ACP), publishers of pathology journals
- Other clinical and scientific specialities and their organisations including e.g. British Association for Surgical Oncology (BASO)
- NCRI groupings e.g. CSGs, CT-Rad, Chairs' Forum
- Scottish Pathology Network (SPAN)

Appendix C: List of meetings organised by CM-Path

Activity	Date
CM-Path Launch event *CM-Path Annual meetings*	*06/06/2016* *05/06/2017* *22/11/2018*
Once members had been appointed to CM-Path and workstreams everyone met for the first time at the launch meeting to discuss how to take the CM-Path proposal and proposed objectives forward. The whole membership of CM-Path meets once face to face annually to review progress, re-enthusing the members, re-prioritise and focus on key challenges facing CM-Path in the coming year. In the most recent meeting we used it to conduct the majority of the CM-Path Year three review and highlight our Network developments. We have invited representative colleagues from stakeholders and other disciplines to our CM-Path meetings and have benefited from their perspectives and feedback. Our face-to-face meetings have proven to be popular with our CM-Path membership, and useful and productive in terms of moving forward on our activities.	
CM-Path Industry Forum *CM-Path Molecular Diagnostics Forum*	*05/10/2016* *26/01/2018* *11/10/2018*
To advance research in pathology, providing scope for wider and faster implementation of novel technology for patients' benefit, CM-Path recognises the value of collaborating with industry. To this end, a roundtable meeting of CM-Path WS4 and industry representatives took place in October 2016, to identify and attempt to address challenges and solutions for technology adoption in pathology within both the NHS and academia. Focusing on the need for "better communication between the pathology community and industry", a CM-Path Molecular Diagnostics Forum was established to promote interactions between pathologists, industry representatives and regulators aiming to promote and enable faster uptake of emerging technologies. Two meetings of the molecular diagnostics forum have taken place to date. You can find the report from the initial CM-Path Industry meeting here. You can find the report from the first CM-Path Molecular Diagnostics Forum meeting here.	
Training Days on Clinical Trials for Pathologists *A Pathologist's guide to research and clinical trials* *Training a new generation of clinical trial pathologists*	 *09/12/2016* *09/02/2018*
These training events were held in partnership with the RCPath and each brought together more than 50 attendees to share knowledge and experience. We included stratified medicine exemplars and discussed how to effectively participate in clinical trials and translational research, quality assurance in clinical trials, statistics and clinical trial design as well as an introduction to navigating the academic career pathway. Find more information about the first workshop here. Find more information about the second workshop here. Next workshop proposed for September 2019.	
Workshop on Quality Assurance for Pathologists in Clinical Trials	*21/03/2017*
CM-Path held a one-day workshop on 21st March 2017 in London on quality assurance in clinical trials. Key representatives from NHS and academic pathology, the research community, regulators and industry came together to discuss issues related to quality	

assurance in clinical trials and how to ensure that laboratories and pathologists undertaking clinical trial work were aware of the current regulatory framework governing clinical trial laboratories, what training is appropriate for pathologists undertaking clinical trial work and how to ensure that any laboratory work is both reproducible and accurate. Four papers have been submitted for publication on the back of this workshop: Regulation and Accreditation for Laboratories Undertaking Trial Work Training for Pathologists Undertaking Clinical Trial Work Scoring and Reporting – Guidance for Laboratories Undertaking Trial Work Use and Validation of Digital Pathology and Image Analysis for Clinical Trials and Research These papers should be of help to the pathology community in undertaking clinical trials work and sharing their guidance more widely forms part of our future plans.	
Biomarker Workshops: *Current and Future Challenges for Innovative Biomarker development* *The Liquid Biopsy: ctDNA, Circulating Tumour Cells and Bloodborne Biomarkers* *A Practical Guide to Pathology Research*	 *12/04/2017* *08/03/2018* *02/04/2019*
The biomarker workshop series aims at discussing the current and future challenges of innovative biomarker developments and agreeing on the barriers for delivery of clinical diagnostics assays. Find more information about the first workshop here. Find more information about the second workshop here. Find more information about the third workshop here.	
The Impact of Genomics in Diagnostic and Academic Pathology Pt 1	*20/07/2017*
This meeting was held in collaboration with HEE and RCPath. CM-Path invited the creator of the Training Residents in Genomics (TRIG) programme, Richard Haspel to facilitate training in genomic pathology. This one-day workshop combined two smaller workshops: Trainee workshop on Genomic Medicine for Pathologists; and Train the Trainer workshop on Teaching Genomic Pathology. 85 participants, mainly histopathology trainees, joined in a mix of didactic, self-direct and facilitated teaching and learning: and this was a well-received proof-of-principle of provision of “hands-on” interactive genomic training.	
The Impact of Genomics in Diagnostic and Academic Pathology Pt 2	*21/07/2017*
This round-table meeting brought together UK leadership and international experts in pathology training especially for molecular and academic pathology. Representatives included CM-Path, RCPath, PathSoc, CRUK, industry partners and trainees. Our aim was to address challenges in training and to discuss potential solutions including a range of models of molecular pathology training, and consideration of how that might be implemented. This workshop was important in building CM-Path’s relationship with the RCPath and has facilitated future collaboration around the histopathology postgraduate curriculum.	
CM-Path Consent Roundtable meeting	*02/02/2018*
A review in 2016 by the Academy of Medical Sciences, Cancer Research UK and the Wellcome Trust highlighted the importance of proportionality in the regulation and governance of health research. This has led to new guidance to be issued by the HRA on the importance of proportionate consent. The roundtable meeting aimed to explore the	

possibility of introducing a standard generic consent form, supported by multimedia patient information, for the donation of tissue which is surplus to diagnostic requirements for research. This would cover the sharing of associated data and would streamline access to samples from the large archive of material currently stored as part of the NHS record. Since the meeting the HRA has assumed responsibility for this work and CM-Path are supporting where available.	
Genomic MDT Day	*18/12/2018*
CM-Path supported this event alongside RCPath, Genomics England, ACP and HEE, with the event primarily led by NHS England. The aim was to train pathologists in the role they will be expected to take in multi-disciplinary Genomic Tumour Advisory boards. This workshop was a very useful first step and represents a basis for training to be made more widely available for pathologists to access. CM-Path will be looking to work with NHS England to create and deliver further workshops on this topic.	
Biobanking best practice workshop	*28/05/2018*
Biobanking is now a central discipline, which is necessary to accelerate translational research and is typically pathology-led. To use tissues to best effect, sample quality is paramount, and biobanks have a responsibility to ensure this is achieved. One goal of the CM-Path biobanking subgroup was to create a Biobanking Sample Quality Improvement Tool. The tool is a confidential self-assessment of current practices within a biobank, focusing on tissue quality and identifying areas with potential for improvement. The aim of this workshop was to demonstrate the importance of sample quality in biobanking and to engage the biobanking community to encourage uptake of the CM-Path Biobanking Sample Quality Improvement Tool. You can find more information about the day here. You can find more information and download the Biobanking Sample Quality Improvement Tool here. The Tool has been downloaded over 60 times from different countries across the world.	
Digital Pathology Quality Assurance Workshop	*07/06/2018*
CM-Path joined forces with the British In Vitro Diagnostics Association (BIVDA) and organised a workshop with academic, clinical and industry leaders to look at the use of AI in a clinical histopathology environment. The aim was to understand the path from technology concept, through development to full roll-out in a routine Histopathology workflow, understanding the roadmap and the challenges at each stage. This was looked at with a view to understanding why such tools have had limited uptake thus far, in order to understand the barriers before a larger number of products hit the market. Understanding the process involved in clinical adoption from concept through to clinical practice will enable more confidence in understanding the steps necessary to support appropriate adoption.	

List of meetings CM-Path has had a presence at but not led on

Activity	**Date**
NCRI Cancer Conference	*06/11/2016-09/11/2016* *05/11/2017-08/11/2017* *04/11/2018-07/11/2018*
At the 2016 conference, CM-Path held a session chaired by Karin Oien on molecular pathology where pathologists discussed the challenges and opportunities afforded by these approaches and how we can engage with them. This complemented the joint CM-	

Path/RCPath stand where Bridget Wilkins and sponsored CM-Path trainees used the journey of a breast cancer biopsy with pathology as an exemplar to showcase its role and what pathologists contribute, to the professional and public conference attendees. In 2017, CM-Path joined the main NCRI stand with presentations from Karin Oien and Andy Hall highlighting pathology and our role studying tissues with tests and technology to provide diagnosis and guide treatment including trials. This theme continued in a session on breast cancer led by BASO (British Association of Surgical Oncology) with CM-Path, linked by Abeer Shaaban, who talked about her experience with translational studies and CSGs. In 2018, Karin Oien chaired a session on digital pathology where key leaders Manuel Salto-Tellez, Nasir Rajpoot and Yinyin Yuan described current status and next steps in research and implementation: this was a topical and popular session, especially with the recent award of the Innovate UK digital pathology initiatives, which include NCRI partnerships, In 2018 applications opened for new members of the Scientific committee. Previously a CM-Path member, Prof Manuel Salto-Tellez, sat on this group and we are pleased that another pathologist has been appointed to the committee for 2019.	
UK Biobanking showcase	*27/11/2018*
Organised by UKCRC and the TDCC, CM-Path have had a presence at several of these annual meetings which relate to the biobanking subgroup within WS3 of CM-Path. At the most recent meeting a CM-Path member, Dr Valerie Speirs presented on CM-Path and on the Biobanking Sample Quality Improvement Tool that CM-Path have developed.	
JING – Junior Investigator Network Group	*30/01/2017-31/01/2017* *29/01/2018-30/01/2018* *28/01/2019-29/01/2019*
The two-day JING meetings are organised each year by the ECMC team at CRUK. Trainees from disciplines involved in cancer research, including medical and radiation oncology, surgery, statistics and translational science, and now pathology, meet with senior faculty in an informal environment for plenary lectures and workshops to support learning on how to develop and run studies. CM-Path has been delighted to contribute for the past three years, with Karin Oien then Elena Provenzano describing the role of pathology and how pathologists can contribute to and be involved in clinical trials.	
International Pathology Digital pathology conference	*06/12/2018-07/12/2018*
Prof David Snead presented at the conference in 2018, and highlighted the work of CM-Path, specifically the joint meeting with BIVDA that was held in June 2018. CM-Path also presented a poster at this event. We have had a presence at this event over several years now.	
PathSoc/BDIAP Annual Meeting	*20/06/2017-23/06/2017*
CM-Path trainees Dr Scarlet Brockmoeller and Dr Caroline Young received over 300 responses to their survey that aims to determine consultant pathologist attitudes towards academic and molecular pathology and were successful in gaining a plenary presentation at this meeting to outline their preliminary results.	

Appendix D: Publications

1. Moore, D., Young, C., Morris, H., Oien, K., Lee, J., Jones, J. and Salto-Tellez, M. (2017). Time for change: a new training programme for morpho-molecular pathologists? Journal of Clinical Pathology, 71(4), pp.285-290. http://jcp.bmj.com/content/71/4/285

The CM-Path initiative recognises there is a genomics knowledge and skills gap within cellular pathology that needs to be bridged through an upskilling of the current workforce and a redesign of pathology training. Bridging this gap will allow the development of an integrated 'morpho-molecular pathology' specialty, which can maintain the relevance of cellular pathology at the centre of cancer patient management and allow the pathology community to continue to be a major influence in cancer discovery as well as playing a driving role in the delivery of precision medicine approaches. This paper presents, appraises and discusses several alternative models of pathology training, designed to address this challenge.

2. Jones, J., Oien, K., Lee, J. and Salto-Tellez, M. (2017). Morphomolecular pathology: setting the framework for a new generation of pathologists. British Journal of Cancer, 117(11), pp.1581-1582. https://www.nature.com/articles/bjc2017340

This editorial follows on from paper 1 above to discuss the training needs of pathologists in the changing NHS landscape of genomic and molecular profiling of the diagnosis of cancer.

3. 'Pathology risks being left behind as conceptual and technological advances accelerate' BMJ Opinion blog http://blogs.bmj.com/bmj/2017/12/20/pathology-risks-being-left-behind-as-conceptual-and-technological-advances-accelerate/

A commentary blog which summarises papers 1 and 2 above.

4. Macklin PS, Hall A, Lee J, et al. Barriers to the release of human tissue for clinical trials research in the UK: a national survey of cellular pathology laboratories on behalf of the National Cancer Research Institute's Cellular Molecular Pathology (CM-Path) initiative. Journal of Clinical Pathology 2019; 72:52-57. https://jcp.bmj.com/content/early/2018/10/01/jclinpath-2018-205476

A 30-item questionnaire was sent to survey UK cellular pathology departments regarding their attitudes and practices relating to release of human tissue from their diagnostic archives for use in clinical trial research. A range of practices were reported in relation to selection of the most appropriate sample to release, consent checking, costing and governance frameworks. This survey demonstrates wide variation in practice across the UK and identifies barriers to release of human tissue for clinical trial research. Until we can overcome these obstacles, patient samples will remain inaccessible to research. Therefore, this study highlights the urgent need for clear and coordinated national guidance on this issue.

5. 'Awareness amongst pathologists of National Cancer Research Institute Clinical Studies Groups' - http://cmpath.ncri.org.uk/wp-content/uploads/2018/02/Awareness-among-pathologists-of-National-Cancer-Research-Institute-Clinical-Studies-Group-PDF.pdf

Top class clinical research requires seamless collaboration between front-line teams and supporting laboratories. This article reports on a survey of pathologists examining whether there are barriers to this optimal approach. An online survey was carried out to investigate the participation of UK pathologists in various CSGs with a long-term objective to encourage the integration of pathologists into the wider cance4r research landscape.

6. Symposium Summary Report of 'The Liquid Biopsy: ctDNA, Circulating Tumour Cells and Bloodborne Biomarkers' written by CM-Path WS3 member, Dr Susan Richman. A shortened version of this report was published in the July 2018 edition of the RCPath

College bulletin.http://cmpath.ncri.org.uk/wp-content/uploads/2018/03/The-Liquid-Biopsy-CMPath-Symposium-Report.pdf

7. Consensus statement of the role of pathologists in implementation of liquid biopsy practices. Published in the RCPath College Bulletin July 2018 edition. http://cmpath.ncri.org.uk/wp-content/uploads/2018/06/CM-Path-CRUK-PHG-Foundation-ctDNA-consesnsus-statement-.pdf

This statement was written in collaboration with the PHG Foundation, CRUK and was badged later by Genomics England. The statement emphasises the role of cellular pathologists in supporting the implementation of innovative technology into diagnostic pathways across the NHS.

8. Williams, B., Lee, J., Oien, K. and Treanor, D. (2018). Digital pathology access and usage in the UK: results from a national survey on behalf of the National Cancer Research Institute's CM-Path initiative. Journal of Clinical Pathology, 71(5), pp.463-466. http://jcp.bmj.com/content/71/5/463.info

A 15-item survey was circulated to National Health Service and academic pathology departments across the UK to canvass the UK pathology community to ascertain current levels of digital pathology usage in clinical and academic histopathology departments, and prevalent attitudes to digital pathology. Challenges and proposed solutions are identified in the report. It is clear from this survey that there is high interest across the UK in digital pathology with usage likely to increase in the coming years. In light of this, pathologists are seeking more guidance on safe and best practice use.

9. Digital pathology best practice recommendations for implementing Digital Pathology - https://www.rcpath.org/resourceLibrary/best-practice-recommendations-for-implementing-digital-pathology-pdf.html

CM-Path members inputted into these guidelines which are now published on the RCPath website.

10. Quality Assurance in clinical trial work for pathologist's papers – these papers have come out of the workshop referenced in Appendix C of this report. Three out of the four papers that were written following this meeting have been published in the Journal of Pathology; Clinical Research. The papers have the following subject topics:
    a. Rees, G., Salto-Tellez, M., Lee, J., Oien, K., Verrill, C. Freeman, A., Mirabile, I., West, N.P. (2018). Training and accreditation standards for pathologists undertaking clinical trial work. https://onlinelibrary.wiley.com/doi/10.1002/cjp2.124
    b. Robinson, M., James, J., Thomas, G.J., West, N.P., Jones, J., Lee, J., Oien, K., Freeman, A., Craig, C., Sloan, P., Elliott, P., Cheang, M., Rodriguez-Justo, M., Verrill, C. (2018). Quality assurance guidance for scoring and reporting for pathologists and laboratories undertaking clinical trial work https://onlinelibrary.wiley.com/doi/10.1002/cjp2.121
    c. Use and Validation of Digital Pathology and Image Analysis for Clinical Trials and Research https://onlinelibrary.wiley.com/doi/pdf/10.1002/cjp2.127

11. 'Survey of UK histopathology consultants' attitudes towards academic and molecular Pathology' – this has just been published in the Journal of Clinical Pathology https://jcp.bmj.com/content/early/2019/03/24/jclinpath-2018-205568

Over the past 15 years, the Medical Schools Council (MSC) has documented a continuing decline in the number of UK academic pathologists (69.8%). Currently 6% of academic pathology posts are unfilled. This decline is posing a major threat to cellular pathology's capacity to innovate. Furthermore, the nature of cellular pathology is changing with the adoption of an increasing number of molecular tests. The aim of this CM-Path survey was to assess the current attitudes of UK histopathology consultants towards research and molecular pathology.

12. Hall, A.G., Speirs, V., Hair, J., Thomas, G.J., Peach, J. 'Improving the discoverability of cancer biobanks' (2019) – Published in the RCPath College Bulletin 2019 April edition

Access to high quality, well-annotated samples of malignant and matched normal cells is an essential pre-requisite for most forms of translational research in cancer. In order to meet this need in the United Kingdom many institutions have set up research tissue banks supported by government, charity or local funding. To serve the research community effectively, research tissue banks need to publicise their existence widely and give clear information regarding the nature of the samples that they hold and the requirements that they have in place to access them. Most researchers and sample donors will expect this information to be available via the internet. In this paper CM-Path reviewed the internet presence of research tissue banks containing samples from patients with cancer in the UK listed on the publicly available Health Research Authority database. This analysis showed only 16 of a possible 45 have websites which give sufficient information for a researcher to decide whether to proceed with an application without making further enquiries. To improve access to samples for research a simple minimum dataset, available on a standard web page, could be used by biobanks to provide clear information regarding the samples that they hold. This would greatly reduce the time taken for research teams to identify the source of samples that they need.

13. Other CM-Path reports including Annual reports, Updates and meeting reports - http://cmpath.ncri.org.uk/reports-and-publications/

Papers currently being written or submitted but not yet published:

The following papers have either been submitted and are awaiting an outcome or are currently being finalised before seeking a journal to publish in.

1. *Quality Assurance in clinical trial work* for pathologist's papers – these papers have come out of the workshop referenced in Appendix C of this report. The papers have the following subject topics:
    a. Regulation and Accreditation for Laboratories Undertaking Trial Work

CM-Path members are finalising this paper and seeking an appropriate journal for publication.

2. *The National Cancer Research Institute (NCRI) Cellular Molecular Pathology (CM-Path) Initiative Molecular Diagnostics Forum – position paper on a consensus process roadmap for the development and implementation of molecular diagnostic tests in the United Kingdom*

To advance pathology in the UK and thus ensure that patients receive the highest quality of care possible, CM-Path recognises the value of collaborating with industry, regulators and other key stakeholders. To this end, members of CM-Path workstream 4 ('Technology and

Informatics') convened the first CM-Path Molecular Diagnostics Forum on 26th January 2018 at the Royal Society of Medicine in London. The aims of the forum, which was attended by 25 individuals including clinicians, academics and representatives from industry and regulatory bodies, were to define a 'roadmap' for molecular diagnostic test development and NHS implementation and to identify the challenges (and possible solutions) that are likely to be encountered during these processes. This position paper presents our proposed roadmap and the likely challenges and proposed solutions.

3. *Image analysis and artificial intelligence applications in histopathology: a development road map*

In June 2018 CM-Path joined forces with the British In Vitro Diagnostics Association (BIVDA) and organised a workshop with academic, clinical and industry leaders to look at the use of AI in a clinical histopathology environment. The aim was to understand the path from tool concept, through development to full roll out in a routine Histopathology workflow, understanding the roadmap and the challenges at each stage. This was looked at with a view to understanding why such tools have had limited uptake thus far, in order to understand the barriers before a larger number of products hit the market. Understanding the process involved in clinical adoption from concept through to clinical practice will enable more confidence in understand of the steps necessary to support appropriate adoption. In this article, we report a summary of the discussions from the workshop, present our road map for developing new tools and outline the components needed in AI tool development for clinical use in the UK.

4. *The role of pathologists in clinical trials- the UK model*

High quality pathology is critical for clinical trials, and histopathologist input is essential at all stages of trial design and delivery. Histopathologists make an invaluable contribution to clinical trials as part of their day to day work, sometimes without realising it. More complex evaluation of surgical specimens and ever expanding 'minimum' datasets add to the workload of every pathologist, not just academic pathologists in tertiary centres. Providing essential pathology support for trials at grassroots level requires funding for adequate resources including pathologist time, education and training, biomedical scientist and administrative support, and greater recognition of the contribution made by pathology. This paper will discuss the many ways pathologists are involved in clinical trials with a special emphasis on the UK model, and the significant challenges faced in meeting the additional demands posed by trial participation given current workforce and financial constraints and ways to address this.

5. *The CM-Path Biobanking Sample Quality Improvement Tool: A guide for improving the quality of tissue collections for biomedical research and clinical trials*

Biobanking is now a central discipline, which is necessary to accelerate translational research, and is typically pathology-led. To use tissues to best effect, sample quality is paramount, and biobanks have a responsibility to ensure this is achieved. One of the goals of the CM-Path biobanking subgroup was to create a Biobanking Sample Quality Improvement Tool. The tool is a confidential self-assessment of current practices within a biobank, focusing on tissue quality and identifying areas with the potential for improvement. In this paper we will describe the development and implementation of this tool and discuss what it can offer to the biobanking community.