

## RCSEd Bursary for Undergraduate Vacation Studies

**Name:** Etienne Chew

**University:** The University of Edinburgh

**Dates:** 7 June 2018 – 2 August 2018

**Location:** Department of Urology, Western General Hospital, Edinburgh

I spent the past summer conducting a retrospective cohort study in the Department of Urology at the Western General Hospital, Edinburgh. I was bitten by the research bug after completing an intercalated degree prior to my clinical years of medical school. Consequently, I was involved in various wet laboratory, prospective cohort and retrospective cohort studies. I chose to conduct this research project over the summer because of my budding interest in academic urology. I had previously conducted another study in the specialty, and thoroughly enjoyed the research that I had completed. It was therefore a no-brainer for me to do continue working on further projects with the same department at the Western General Hospital.

The Royal College of Surgeons of Edinburgh Bursary for Undergraduate Elective or Vacation Studies offered an excellent opportunity to further my interest in academic urology. The bursary also provided me the opportunity to further engage in the exploration of academia as a potential career pathway, which can sometimes be difficult to do so within the regular medical curriculum. Through the application process, I gained a deeper understanding of preparing grant proposals. I have also gained a greater insight into how retrospective cohort studies are conducted, as well as its limitations.

Having done previous cohort studies, I was able to quickly navigate my way through the process of data collection and optimised the duration taken to retrieve the relevant data. I also opted to conduct a retrospective cohort study due to the time constraint of having to complete the project within eight weeks. Additionally, such a project could largely be done at my own time and pace. This meant that I was able to plan my schedule around other commitments, such as other conferences to further hone my presentation skills. It also meant that I was able to achieve a great work-life balance, which made conducting the research more enjoyable.

With the project completed, I was able to write up a manuscript which allowed me to further hone my statistical and writing skills. I have also been able to present it at local and international conferences. I have had the opportunity to practise presenting in front of a crowd, and also gained feedback directly from other researchers. I was able to network with these researchers, and gain an insight into contemporary research topics in the field of urology. Through my interactions with my project supervisor and several academics, I gleaned a thorough understanding of academic urology as a feasible career pathway.

I chose to do the project in Edinburgh, where I am currently a medical student. This is mainly out of convenience, and also because I have completed previous research projects with other researchers in the same department at the Western General Hospital. However, the University of Edinburgh and its medical school are renowned for research. Having completed research projects in Edinburgh, most of my supervisors were well regarded in their fields. There is a strong culture for research, and therefore many opportunities to be motivated by and to engage in cutting edge research. Furthermore, most medical students will invariably be involved in research at some point in their medical career, especially for curriculum vitae-building purposes. Being paid to do research while in medical school is an excellent way of doing so, and it was through such paid research experiences that an interest in academia was sparked in my case.

As an international student who has only been in the United Kingdom for less than half a decade, it was definitely an unforgettable experience having done this vacation project here in Scotland. The summer in Edinburgh is warmer than the typically rainy weather during the academic year. I was able to spend my free time travelling and attending festivals that I would not have had the opportunity to do so back at home. There are also multiple national and international academic conferences going on within the United Kingdom and Europe in the summer, which are easily accessible via a short train or plane ride. These offered an opportunity to combine work with play, and also to hear about how research may differ in other countries. The bursary also provided the necessary funds to attend some of these academic conferences, which may often be expensive for students.

All in all, the various skills that I have acquired and honed through this project have and will be invaluable for future research projects. Even if one does not intend to pursue an academic career, conducting research in medical school allows medical students to gain a deep appreciation of how translational studies eventually lead onto clinical and longitudinal studies, which ultimately affect clinical guidelines. A thorough appreciation of the process as well as the limitations of research can greatly inform one's clinical opinion and application of such research. In addition to these, having had a dedicated eight-weeklong block to complete the project provided ample time to reflect upon my research. It allowed me to appreciate and enjoy what the project was able to offer in terms of improving my research and communication skills. It also further solidified my decision in pursuing a career in academia.

I would definitely urge students to apply for the Royal College of Surgeons of Edinburgh Bursary for Undergraduate Vacation Studies if they were thinking of doing a research project over the summer. It is also a great opportunity to decide whether academic surgery is a feasible career option, while receiving money for your daily expenses. Considering the minimal opportunities to engage in research during the academic semester, conducting such projects over the summer is an option that medical students should seriously consider.

This is especially so in earlier years when vacation periods can be longer than three months. Doing so at an early stage of your career can only be beneficial, even if one does not eventually decide to pursue a career in academia. I would therefore strongly recommend the bursary to any student interested in a career in academia, and even to those who are merely curious about whether it is a viable career option for them.

## Shivank Keni – Undergraduate Bursary

Evaluating instrument tracking metrics in a take-home laparoscopic simulator & benchmarking performance  
Aug-Sept 2018

Last summer I was fortunate enough to receive a RCSEd vacation studies bursary to allow me to undertake a research project focusing on surgical simulation. I was hosted by EoSurgical Ltd., a medical technology spin-off based at the incubator Codebase, just down the road from Edinburgh Castle. EoSurgical had been founded by a trio of surgeons, in recognition of the importance of surgical simulation as a training tool as well as the need for affordable laparoscopic simulators that trainees could use in their own time.

One of the major impediments to the widespread adoption of laparoscopic simulators had previously been the lack of objective performance assessment. Until recently, assessment was dependent on trainers observing trainee performance, which was extremely time-intensive. In response to this EoSurgical developed SurgTrac, an innovative instrument tracking software that can be used with laparoscopic box trainers and provides real-time feedback using previously published metrics. However, research was needed to assess how training affected outcomes in SurgTrac performance metrics and benchmarks needed to be set accordingly. Doing so would inform the design and delivery of training programs.

This is where I stepped in. It was my task to interrogate data drawn from over 30,000 individual task attempts recorded by SurgTrac on EoSurgical box trainers, to see if I could evaluate the validity of their tracking metrics, benchmark performance and draw learning curves that could act as a barometer to gauge improvement. The large size of the dataset (the largest available box trainer simulated task database to date) precluded me from using tools such as SPSS or Microsoft Excel for analysis. My supervisor felt the most appropriate analysis software would be RStudio, which uses the programming language R and is well suited to handling big data sets.

The only catch - I had no knowledge of programming in any language (beyond some rudimentary html I learned at school), let alone R, which is sometimes sold as being quite challenging to learn. I found the latter out the hard way. Before even attempting to interrogate our dataset, I spent a week going through the basics, including familiarizing myself with the RStudio interface and learning how to execute basic commands. The plethora of free online resources including datacamp.com helped me pick up the fundamentals (vectors, matrices, factors, data frames etc.) and learn how to navigate essential packages (dplyr, ggplot2) which I thought might be useful. However, I soon realized that learning theory without applying it was useless and often self-defeating – I'd garner a lot of useless knowledge, without hitting the important points.

So I took the plunge, beginning with perhaps the most time-intensive and frustrating part of the process – cleaning the data. It had become apparent that a glitch within the SurgTrac software meant we had numerous duplicated task attempts, which needed to be removed. Even such a basic obstacle such as this proved to be a substantial impediment to a novice, and for days I resorted to scavenging the numerous RStudio Online Forums for how to best overcome this. Interestingly, I learned that concepts such as debugging are seldom covered in introductory R, even though they would be of immense value to a beginner, underscoring the importance of learning on the job.

After a couple of weeks, I picked up in proficiency, being able to transform and manipulate the data more intuitively. All the while I was in discussion with my supervisor how we should tackle issues like benchmarking and metric validation. In the end, we decided to look at individual user performance over time for a given task and for given metrics, which necessitated that I write code that could stratify at multiple hierarchical levels and run commands across strata. After consulting with computer science friends and colleagues I realized I'd need to develop a rudimentary application to allow us to cycle through multiple parameters easily. The RStudio package Shiny facilitated this and in the end I was able to determine the 25th, 50th and 75th percentile performance for any given task and metric, between 0-50 user attempts. I also established correlations between user attempts and metrics, so we were able to determine 'trainability' across different tasks.

The project turned out to be fruitful – we have recently submitted an abstract for a poster presentation at the International Conference of Surgical Educators in March. However, the greatest value of the elective has undoubtedly been my acquisition of proficiency programming in R. I can now do in hours in RStudio, what previously would have taken me days in software such as SPSS. I'm keen on taking this interest in surgical informatics further and have recently employed my newly found R programming skills by working on a dataset for the GlobalSurg collaborative. I'm tackling an entirely different field to surgical simulation, but the essentials for data manipulation, transformation and analysis are the same. Big data is in the vogue these days and I'm sure that my skills in R will be useful in numerous medical fields and beyond. Concurrently, I've gained a much deeper understanding of the fundamentals of surgical simulation, including curricula design, assessment and metric evaluation. Surgical simulation is undoubtedly going to become increasingly important in future and I'm now well placed to partake further research within the subject. I also have a much greater appreciation of the dynamics of the interface between academia and industry and have seen first hand how both can collaborate for mutually beneficial purposes. Lastly, the ability to train on EoSurgical laparoscopic simulators, doing things ranging from stacking dice to untangling paper clips, has undoubtedly improved my technical and visuospatial abilities. I'd like to sincerely thank the College for giving me the opportunity to undertake this research project. I am also grateful to Mr. Paul Brennan for his supervision, and to the rest of the EoSurgical team for being so welcoming. I not only acquired a host of new skills and a greater understanding of an exciting new field, but I also have strengthened my desire to partake in research as a clinical academic in future.

## Undergraduate Bursary – Tausif Huq

### **Background:**

Colorectal cancer causes a huge burden on the society in terms of its high prevalence, with high mortality and morbidity. Colorectal cancer is often treated with surgical procedures in order to remove the diseased bowel. I was very keen to be involved in colorectal cancer research, as it can have a profound impact on those who are affected by it. I was also particularly drawn to this project as it had elements of both laboratory research and clinical work (patient recruitment). Specifically, it was a pilot project looking at how human stool can be used in order to better predict colorectal cancer, thus can be used in the wider population as an early detection screening tool. I was very excited to have found this project as it used a novel technology to analyse human stool which had been successfully used to analyse human tissues to detect cancer. My supervisor Mr James Kinross, who is a consultant colorectal surgeon was very supportive and encouraged me to design my own pilot project. As well as feeling humbled to part of such a cutting-edge research, I also felt a sense of responsibility to ensure that I design and properly execute a scientifically sound research project which can stand-up to the scrutiny of scientific peer review. Along the way, I was guided and supported by Mr Kinross and Dr James Alexander, who is a clinical research fellow in his final year of PhD.

### **Clinical experience:**

The clinical aspects of this research project involved visiting outpatient two-weeks wait colorectal clinical to recruit patients for the study. During recruitment, I have recognised the importance of patience and perseverance, as some days it was difficult to recruit even a single patient. This has made me appreciate the amount of collaboration and effort required to conduct large multi-centre randomised controlled trials.

During recruitment, I often faced with the dilemma of strictly adhering to the exclusion and inclusion criteria of this pilot study, which has been made all the more difficult by the lack of patient willing to take part in the study. It was tempting to recruit patients who just fell short of the inclusion criteria. However, during the process of this project, I have recognised the importance of staying within the 'ground rules' to ensure that the research is scientifically valid.

While recruiting patients, I have used my clinical communication skills learned from my medical training to interact with the patients. Initially, I would approach each potential patient and ask to take part in the study. However, I have recognised the importance of building a rapport with the patients- I have ensured that patients are given adequate time to consider the research proposal. Recruiting patient with cancer created an added challenge as these patients were just been told about their diagnosis. Therefore, I was very careful and sensitive in approaching these patients, often supported by a senior research nurse. I ensured that I give each patient plenty of time to consider in taking part in the study and answer any questions that they may have. I found this approach to be successful in building trust with the patients.

During my time in clinics, I have realised the importance of collaborating with healthcare professionals, including staff nurses, healthcare assistants, receptionist and doctors. I have built a working relationship with everyone in the team to ensure that everyone is aware of the project and encouraged everyone to be involved with the recruitment process.

On reflection, the recruitment aspects of this research project has made me realise the importance of collaboration with clinical and non-clinical staff and the sensitivity required in approaching patients.

**Lab/data experience:**

I have particularly enjoyed the laboratory experience of this project. The 'back to basics' approach in the laboratory environment, which involved understanding the basic concepts of colorectal cancer at a molecular level was useful in breaking down the problem we were trying to solve i.e. to create a population-wide screening test for colorectal cancer. Furthermore, I felt it had helped me conceptualise and understand every step of the experiments I was running.

During the data process phase of this project, I was supported by Dr Alexander. I was especially excited to use a new statistical software. However, I had soon recognised the complexity of using such software, which can take many years to master. Nevertheless, using new statistical methods were a steep learning curve for me and I was soon generating data. Generating data was a stressful phase of this project, which I believe was also a reflection of my inexperience in research. I found it stressful to have generated data which cannot prove our hypothesis. However, I have recognised that conducting a scientifically valid research is more important than generative positive results.

**Conclusion:**

I was very grateful to my supervisors to be able to design and execute my own research project. Although this had created a sense of responsibility, in hindsight, I believe my inexperience in research meant that I was naïve in expecting a positive result from this study. As explained by my supervisors, It is more important to carry out a valid research, making sure that all the confounders are tightly controlled, instead of focusing on the end result. If the former is carried out diligently, one can rest assure that their outcome can stand up to strict scientific scrutiny.

Overall, This project was an ideal opportunity for me as a medical student, as it integrates both clinical and basic science research. I was exposed to specialties such as engineering, chemistry, and medicine, including electronic engineers, analytical chemist and colorectal surgeons. It was an enlightening experience to see such a wide variety of specialties working together and sharing ideas. Before joining this research group, I did not consider anything other than practising medicine. However, this research experience, thanks to the generous bursary from the Royal College of Surgeons of Edinburgh, I have started to explore new avenues and career opportunities in medicine and beyond.

I am hoping to pursue a career in academic surgery, particularly in areas of oncology and surgery. The experience from this project has provided me with a definitive, high impact experience of research that will help me in realising this goal. Importantly, I believe this

experience has made me a better scientist, critically evaluate data and carry out research under strict conditions.

## **RCSEd Bursary for Undergraduate Vacation Studies**

Name: Etienne Chew

University: The University of Edinburgh

Dates: 22 May 2017 – 14 July 2017

Location: Department of Urology, Western General Hospital, Edinburgh

I spent part of my summer doing a retrospective cohort study in the Department of Urology at the Western General Hospital, Edinburgh. I had previously completed wet laboratory projects and a prospective cohort study as a student at the University of Edinburgh, the latter of which I was involved in patient recruitment. This retrospective cohort study was a markedly different experience from the others. Data collection required searching through past medical records and identifying relevant parameters for the study. On top of that, I had to weigh up the available evidence at times and make sensible deductions. It was a challenging and mentally demanding task, but I am still grateful for having the opportunity to do so with the aid of this bursary from the Royal College of Surgeons of Edinburgh.

Reflecting back on my time spent during the summer, there has been so much that I have gained without even realizing until recently when I started my first clinical rotation of medical school. Having just intercalated and having little to no clinical experience, immersing myself in the various patient records gave me a sense of familiarity as I stepped onto the wards during my first clinical rotation of medical school. Unknowingly, I had learned how doctors clerked and managed renal cancer patients requiring nephrectomies. I learned the ins and outs of a patient's journey from being referred to the urology department until their eventual post-operative discharge. This was largely applicable to most other medical and surgical disciplines and this greatly assisted my learning and appreciation of the various clinical modules I have undertaken.

Working on this project also provided me with an insight into clinical research as well as how the hospitals in NHS Lothian operate. I had the opportunity to work with staff in the medical records library who taught me how to be more efficient at data entry and processing. With the help of my supervisor, I also learned how to better navigate the TrakCare® Electronic Medical Record System as well as the intranet that they use here in NHS Lothian. This has been useful during my clinical rotations, as it has greatly aided my learning with respect to how patients are being diagnosed and managed.



Another positive aspect of the project was the networking opportunities it offered. Knowing the various urology registrars in the department was definitely useful in terms of collaborating in future projects. My immediate project supervisor who was a urology registrar was keen on helping me develop my research skills. It was extremely beneficial to have a supervisor who was nurturing and willing to take time to impart his knowledge on me. I felt well supported throughout the whole experience, which was integral to the successful completion of this project. He also encouraged me to enrol my project for various conferences and this has helped to hone my oratorical skills. The vacation bursary ultimately gave the opportunity to invest my time and effort over the summer on a project that I would have otherwise not done.

I chose to do my project here in Edinburgh mainly because of the esteemed academic reputation of the University of Edinburgh Medical School. I appreciated the fact that data collection was done in my own time, and that I had the freedom and opportunity to plan my schedule around other commitments. This included conferences for other projects that I have completed. Working on my own meant that I often had to create daily and weekly targets for myself so that I would not lag behind. Regular meetings with my supervisor allowed me to identify and thereafter rectify any issues. This allowed the project to be completed on time. As an international student from Singapore who has only been in Scotland for a few years, it was definitely a memorable experience having done this vacation project here in Edinburgh. The summer in Scotland is starkly warmer as opposed to the typically grim weather during the academic year. It was definitely a delightful experience being able to engage in activities and festivals that I would have otherwise not have been able to back in Singapore.

As someone who has previously done wet laboratory projects and a prospective study where I had to recruit patients, this experience was definitely beneficial in shaping my outlook of what academic surgery and medicine is like. The bursary allowed me the opportunity to further explore various types of research, which can sometimes be difficult to do so within the regular medical curriculum. I have gained an appreciation of how retrospective cohort studies are performed, as well as the limitations to such a research design. The various skillsets that I have acquired from this project have also been invaluable and will only prove to be useful in future research projects.

In addition to this, having a dedicated block of eight weeks to complete the project without the nervous anticipation of how well one will do grade-wise was relieving. It made me appreciate and enjoy what the project was able to offer in terms of improving my research and communication skills. This offered an experience that may be difficult to otherwise replicate in the normal medical curriculum, and it has only solidified my decision in pursuing a career in academia.

All in all, I do urge students to apply for the Royal College of Surgeons of Edinburgh bursary even if it is just for a summer project. Immersing oneself in full-time research as a medical student enables one to explore their options within medicine as well as glean a greater appreciation of clinical research. Considering the limited opportunities to do so during the regular medical curriculum, conducting research projects over the summer can be a useful way to determine whether an academic career is suitable for you. Furthermore, while there are always research projects available for students to engage in, the financial incentive from this bursary is a tremendous bonus that budding academics should consider taking advantage of. I would strongly recommend the bursary to anyone interested in academia, and even to those who are merely curious about a career in academic medicine or surgery.

**Elective Report**  
Maurice Samake  
A summer in the Breast Cancer unit  
RVI, Newcastle upon Tyne  
2018

This summer, I undertook a research project in breast cancer surgery, which focused on how breast reconstruction using Latissimus Dorsi (a muscle in the back) can impact shoulder mobility in the long-term. I spent 8 weeks in the Breast Cancer Unit in the Royal Victoria Infirmary in Newcastle, supervised by Mr Cain.

The experience has been very rewarding; I cannot thank Mr. Cain and his team enough for welcoming me and teaching me more about the management of breast disease. I would like to extend my thanks to the Royal College of Surgeons of Edinburgh, Newcastle University and the Susan Channon Breast Cancer trust for their financial support with this project.

Breast cancer is the most common cancer in women in the UK. Breast reconstruction is one of the main surgical procedures used when part of the breast, or the whole breast, has been removed. Latissimus Dorsi can be used as a flap to reconstruct a new breast shape, but despite its many advantages, the procedure has been associated in literature with reduced shoulder mobility. In the RVI unit's experience, this risk can be minimised by using a painkiller injection around the shoulder during the reconstructive surgery procedure. This additional pain control allows for more rapid mobilisation, as well as an apparent reduction in shoulder problems once the patient has been discharged from hospital.

The aim of my study was to confirm a low incidence of shoulder morbidity in patients at the RVI who underwent a breast reconstruction with a Latissimus Dorsi flap. To achieve this objective, I designed a protocol for a questionnaire-based study which would assess shoulder function using the DASH (Disability of Arm and Hand) questionnaire. To briefly summarise my findings, preliminary results show a low average DASH score in the cohort, indicating a low incidence of shoulder dysfunction. A big part of my project involved data collection to assess post-operative outcomes such as complications and re-operations. I hope to disseminate my final results in the near future.

During my time at the RVI, I was given the opportunity to observe various procedures in theatre including breast tumour excisions, breast reconstructions using flap, lipofilling and sentinel node biopsies. Seeing these procedures first-hand provided me with some invaluable insights to contribute towards my research project and overall medical study.

Setting up the project was a good learning experience. I needed to obtain multiple approvals from different regulatory bodies (the Health Research Authority, hospital research departments and ethical approvals among others). This taught me about the detailed and sometimes sensitive process of setting up a research project, which is something I will find useful as I take on further research in my career. I worked alongside many different people to get the project off the ground, and I believe this has developed my professionalism and interpersonal skills.

The information I gathered during this project has given me an appreciation of the importance of long-term follow up. My previous knowledge about surgery was focused more on the immediate aspects of surgical procedures, such as the skills and knowledge required to carry out surgery. I believe that in undertaking my project, I gained a good understanding of the impact of surgery on patients' lives. I have a better appreciation of the long-term implications surgery, and how important the post-operative management of patients is.

Working with Mr. Cain, I was really made to feel like part of the team. I was given the opportunity to scrub in to assist the surgeons, and I will never forget what an insightful and rewarding experience this has been. I have learnt so much, not only in terms of medical knowledge, but also in a professional sense. Every member of the care team I worked alongside was fantastic at their job. Just observing them in action taught me a lot about teamwork and what makes a good healthcare professional. I hope to put that knowledge into practice when I myself become a doctor.

## **Vacation Research Project Report**

I would like to start off my report by sincerely thanking the Royal College of Surgeons Edinburgh and the Pathological Society of Great Britain and Ireland for financially supporting my Summer Vacation Research Project. Further, I would like to extend my deepest gratitude to my supervisor Dr Jason Parsons, as well as members of the Parsons group and the Department of Translational Medicine for allowing me this opportunity to experience laboratory research in the surgical field, and for guiding me during my time there. Lastly, I want to thank Dr Asterios Triantafyllou for his assistance conducting the histopathological analysis, and Professor Terrence Jones for his steadfast support of the project and sponsorship from the bursaries.

The Head and Neck Research at the University of Liverpool has been at the forefront of research into the various forms of head and neck cancer as well as diagnostic and treatment options for such cancers. As such, I applied to do my research here in the University of Liverpool due to my motivation to work in the NHS, as well as the exemplary standard of research that is done at the University.

Over half a million cases of head and neck squamous cell carcinoma (HNSCC) are diagnosed each year, and The past three decades have seen a rise in the incidence of human papillomavirus type 16 (HPV) associated cancers of the oropharynx, with over half a million cases of head and neck squamous cell carcinoma (HNSCC) being diagnosed yearly. Interestingly, studies have shown that patients with HPV-positive oropharyngeal squamous cell carcinoma (OPSCC) have improved survival rates in comparison to their HPV-negative counterparts. This is despite the fact that HPV-positive cancers typically present with clinicopathological features (ie. nodal metastasis and extracapsular spread) that are considered strong prognosticators of poor outcome in HPV-negative cancers. Furthermore, HPV-positive OPSCC are more sensitive to radiotherapy and chemotherapy than HPV-negative tumours which contributes to the improved prognosis. Research from the Parsons Group has recently shown that radiosensitivity of cells derived from HPV-positive OPSCC is as a consequence of reduced expression of proteins involved in repair of ionising radiation-induced DNA double strand breaks (DSB), but interestingly that the levels of base excision repair (BER) proteins that repair DNA base damage/single strand breaks are actually elevated. However further research of these proteins as prognostic biomarkers of OPSCC and predictive biomarkers of radiosensitivity, particularly in patient samples, are necessary.

My research project was divided into two distinct phases. I started out learning how to quantify levels of protein biomarkers in tissue samples by means of Western Blotting, before progressing to running the Western Blot process myself to collect data on a series of patient tissue sample. This sample set comprised of normal tissues, HPV positive tumour tissues, and HPV negative tumour tissues. We sought to identify levels of potential protein biomarkers of interest; namely X-ray cross-complementing protein 1 (XRCC1), a protein that is involved in DNA single strand break repair. Preliminary analysis of the data showed that HPV positive tumours had increased levels of XRCC1, but largely due to the low sample numbers, this difference was not statistically significant. We then proceeded to the second phase of the project, which sought to further investigate this hypothesis.

The second phase of the research project involved histopathological analysis of tissue microarrays (TMAs) comprising of tissue from the same patient sample set that was being investigated, but now with significantly increased patient sample numbers. These TMAs contain HPV positive and HPV negative OPSCC, complete with clinical data. Sections were prepared, and immunohistochemistry performed using an autostainer with primary antibodies for the proteins of interest, particularly XRCC1. The degree of staining was then blind scored by a pathologist and myself, and comparisons between HPV-positive and HPV-negative samples are currently in the process of being drawn. This process was time consuming yet strangely stimulating. Starting out, I had numerous discussions with the pathologist learning how to differentiate tumour and non-tumour cells, whilst coming to a consensus regarding the scoring system for degree of staining of tissues. Initially, I found it hard to identify the difference between types of cells, but as I progressed I soon picked up the characteristic differences and my eyes were soon attuned to identify them. This did wonders for my confidence, as I was soon able to score the samples independently before comparing my scores with the pathologist. In total, there were 2 researchers (including myself) who scored the TMAs before we compared our scores with the pathologist. This segment of my research allowed me to appreciate the interplay between clinical medicine and laboratory research, especially in the area of diagnosis and prognosis. Being from a clinical background, I was also able to appreciate that these tissues had a story behind them, where they were from patients whose lives were gravely impacted and disrupted by head and neck cancer. I felt humbled knowing that it wasn't merely a diseased tissue sitting in front of me, but something that had far more significant and impact on the person who donated the tissue to research than I could ever empathize with.

Being part of a research group in a department that is geared towards research, I had the opportunity to attend monthly research meetings, department seminars, talks, and conferences. I had the pleasure to see how researchers presented their findings to their peers, how constructive criticism and advice was sought and given to one another. These meetings

and seminars helped me keep abreast of what everyone around me was doing, and allowed me to better appreciate the work that is done to understand more about various diseases.

As a medical student, this opportunity was one of the rare few moments to experience and get a taste of research outside of our hectic schedule that is based in the hospital. It was an excellent chance for me to experience research outside the realms of the hospital, to learn some laboratory techniques that might come in handy in any future postgraduate study. I was allowed to work independently with minimal supervision, which meant I had to take responsibility for my work. This forced me outside of my comfort zone, where during the process I was able to learn from any mistakes that I may have made. One such example was when I failed to smoothen out the air bubbles when constructing the transfer stack in the Western Blot. The mistake was immediately evident when the scans showed a giant patch in the middle of the blot. I proceeded to take extreme care when smoothening the transfer stack to rid it of air bubbles, preventing the error from occurring again.

Having completed a research project, I can say I've had a better insight to daily research, in particular the amount of effort researchers put in to answer questions in the areas they are passionate about. I was able to trace the process of the translational paradigm, from the bench work done to know more about the disease, to the bedside where the treatment and diagnostic developments are implemented. This gave me a better appreciation of the work clinical researchers does to enable doctors to easily diagnose and treat patients. The hard work of thousands of researchers ultimately helps us to better understand ourselves and the world around us, with the knowledge gained used to improve the lives of humans. Most researchers encounter numerous rejections and failures throughout the course of their work, and I've learnt tremendously from the indomitable spirit and never-say-die attitude of the researchers in the team I was working with. We faced numerous unexpected results and setbacks over the course of the project, but nonetheless kept up the positive attitude and proceeded to brainstorm ways to improve and solve the problem.

The studentship helped to reinforce in me the passion to conduct research. I feel I've benefitted from the constant drive for quality in the work that is done, with accuracy required in the different techniques to collect data and subsequently analyse it. Having seen how much time and effort is required to carry out laboratory techniques to collect data, I now have doubts as to whether I'd have enough time as a practising doctor to be engaged in laboratory work. It also helped raise a new career option to enter full-time research instead of practising medicine.

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**Project Title:**

Risk of complications and mortality following prostate biopsy: A retrospective longitudinal study

**Objective and Aims:**

1. Establish rate of complication and mortality for patients undergoing PBx.
2. Identify cause of mortality in patients undergoing PBx
3. Determine the impact of baseline clinicopathological variables on outcome and complication rate of PBx.
4. Determine if previous PBx or the number of PBx core samples obtained affect complication rate.

**Reflection of Experience:**

In the summer of 2017, I had the opportunity to work under the supervision of Professor Ghulam Nabi and Dr Catherine Paterson from the Department of Academic Urology based at the University of Dundee. My project aimed to determine if age at time of prostate biopsy was associated with increased risk of post-biopsy related complications. The project involved looking through the medical records of patients who have undergone prostate biopsies and recording their complication rates and finding associated risk factors.

I was given the opportunity to be involved in the study from the stage of its conception. This involved first searching through the literature for articles investigating similar areas of research. This helped determine the variables to be collected from the patient's medical records. Through this I was introduced to concepts such as assessing patient fitness using the American Society of Anaesthesiologists (ASA) physical status classification system which I had never learnt in medical school thus far. The rigorous thought process behind conceiving the study also got me thinking about the inclusion and exclusion criteria when deciding which patients, I should include in the study for analysis. This, as my supervisor explained was essential to account for known confounding variables which could affect the significance of the result of the study.

Prior to data collection, I completed a Good Clinical Practice (GCP) e-learning module from NIHR which gave me a grounding on the expected standards for ethical, scientific and practical standards in the conduct of research. Over a few weeks I looked through the electronic health records (EHR) of approximately 600 patients who underwent prostate biopsy at Ninewells Hospital, Dundee, UK. Through this, I was exposed to the heterogeneity present in the manner health records were documented and the different forms it existed in. This made it challenging to identify some of the data as it constantly required alternate sources of records to be sought.

Following preliminary data collection, I had the opportunity to learn and apply various methods of statistical analysis to interpret the data collected. Understanding the rationale behind choosing the appropriate statistical test was one of the most challenging aspects of the studentship. I relied on several resources including online tutorials and textbooks to supplement the support I received from statisticians within the department to understand the basic principles underlying the statistical tests I had chosen. Subsequently this allowed me to better appreciate and critically evaluate the data analyses performed in studies present in the literature.

Being part of a research team allowed me to appreciate how in a study, the contributions of the different members is important for its successful completion. This determined the quality of the study methodology and its potential for publication in a peer-reviewed journal to add value to the existing literature in the field. The other staff present in the department were also very friendly and accommodating. Engaging with these staff also exposed me to the different types of studies they were involved in. This ranged from investigating new MRI techniques for prostate biopsy to evaluating the feasibility of novel surgical imaging equipment. Some of these certainly piqued my interest and highlighted the different forms of research ranging from pre-clinical laboratory studies to more translational studies investigating the use of surgical equipment.

In addition to being involved in my research project, I also had the opportunity to spend some time observing cases in the Urology theatre. The procedures I observed included cystoscopies, trans urethral resection of bladder tumours, laparoscopic nephroureterectomy and laparoscopic radical prostatectomy. I also participated in weekly multi-disciplinary team meetings which gave me an insight into clinical practice in Urology and the type of surgical cases one would expect to be involved in. Observing the laparoscopic surgical cases were an opportunity for me to apply pelvic anatomy learnt from textbooks to a surgical context which are learning opportunities I greatly treasured.

Relevant to my research project, I shadowed a prostate cancer nurse during her weekly clinic session to observe the experience of a patient being consulted for a biopsy. This clinic primarily comprised of men either referred from their GPs with suspicious rectal exams or elevated PSAs or on follow-up for an enlarged prostate. I got the opportunity to sit in the consultations and with the permission of the patients, observe the ultrasound guided trans rectal prostate biopsy being performed. This helped me put into perspective the relevance of the data that I was collecting and how its findings would help improve our understanding of whether advanced age should be considered as a contraindication for prostate biopsy.

Thus far, I have completed the collection of a significant amount of patient data and am returning to the department regularly during the rest of the year to complete the data collection. I hope to put together the complete data analysis and write up in time for a conference next year.

Overall this summer studentship was immensely beneficial for me especially because it gave me valuable insight into a career in academic Urology which I am considering. I was exposed to a wide breadth of different research types and clinical experiences in addition to my



dedicated project. Through this, I gained an invaluable portfolio of clinical research skills which I am certain will be immensely useful in my future career.

I would like to thank all patients whose data I have collected to answer my research question, all staff within the Department of Urology at Ninewells Hospital and most importantly the Royal College of Surgeons of Edinburgh for allowing me this opportunity. I highly recommend this experience for any student considering a career in academic Urology and am happy to be contacted to share my experience in greater detail.