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The Anger of Achilles (Jacque-Louis David, 1819) Kimbell Art Museum, Fort Worth, Texas

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The Ulster Medical Journal

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Editorial

The Anger of Achilles

David J Armstrong

Cover Image *'The Anger of Achilles'* by Jacques-Louis David (1748-1825), Kimbell Art Museum, Fort Woth, Texas

Μηνιν – anger – the first word of Homer's Iliad,[1] the foundation work of Western literature, and also it seems the theme of a great deal of writing ever since. It certainly features heavily in newspapers, news websites and social media concerned with health care in Northern Ireland. Didn't every generation believe their health system was in crisis? Maybe so, but there can be no denying the deep trouble in which we find ourselves in 2023, and that many parts of our health service appear to be in existential difficulty.

Who is angry? Perhaps easier to consider who is not. Patients certainly appear angry, and express extreme dissatisfaction at the length of waiting lists to access secondary care, perceived difficulties in accessing GP services and the suspension of some acute services from local hospitals.[2]

Interestingly, doctors express anger at many of the same things, albeit from a different perspective. Both primary and secondary care medics are as deeply unhappy with waiting lists as patients. No-one wants to work in a failing system. Despite discussion of salaries doubled or tripled by moves to Australia (or even the Republic of Ireland), the main motivation for doctors to leave Northern Ireland and the NHS appears to be the demoralising effect of working punishing hours in a failing system, rather than for monetary gain.[3] There is genuine anger from many GPs at the media portrayal of the closed surgery door. Primary Care colleagues are seeing more patients both face to face and virtually than ever before, and with ever-increasing list sizes due to other GP surgeries closing.[4] The media may ask angrily why younger doctors do not choose to become general practitioners in rural areas, and yet immediately run hyperbolic stories of angry patients, managers and politicians declaiming those same services.

Those of us who teach students and supervise junior doctors continue to be impressed – astonished maybe - at the caring and intelligent young people who still choose medicine as a career regardless of the storm of negativity which surrounds every part of the system. There is no doubt early career medics nowadays are a lot more willing to voice their concerns about pay and conditions than previous generations, but they are no less deserving of nourishing and protection than those of us who trained in the 1980s and 90s. The opening of the new Medical School at Ulster University is welcome,[5] and those of us involved with teaching the post-graduate students enrolled continue to be impressed with their maturity, focus and enthusiasm. It must be understood though, that despite breezy encomia from politicians and media, there is no guarantee these talented young people will stay to work in Northern Ireland any more than undergraduates from Queen's University if the system is failing, working conditions are poor and the atmosphere in the public domain is sour and depressing.

To quote Tolstoy, what then must we do?[6] The single greatest asset Northern Ireland medicine possesses is its staff – doctors, nurses, physiotherapists, radiographers, dieticians, porters, everyone who contributes to the care we deliver. The ease with which staff trained in Ulster can go around the world and excel is a testimony to their quality. Review after review emphasizes that the important thing in healthcare is to get the right person with the right support in front of the right patient at the right time.[7] More important than buildings, more important than votes, more important than Trust boundaries. 'I wouldn't start from here' may be the motto for the Northern Ireland health service, with hospitals in the wrong places, asymmetrical Trusts constructed on geographical or political lines rather than according to practicalities or ability to deliver a service, crippling waiting lists and closing GP surgeries. We might add politicians who follow rather than lead when it comes to local health issues. But here we are, and start we must.

The next few issues of the Ulster Medical Journal will run articles on the Current Health Crisis, where voices of doctors from all parts of the health service and levels of experience will be heard, discussing their experiences, their hopes for the future and perhaps amongst the anger even some optimism. In this issue contributions from some local medical leaders start us off, but in subsequent issues diverse contributions from medical students to consultants, from GPs working West of the Bann to sub-specialty surgeons in Belfast and many others, will hopefully shine a light in the pervading gloom.

A big thank you to my predecessor as editor Dr Michael Trimble for his invaluable advice in passing on the baton, and for the work he has done in steering the ship through the extremely challenging seas of the COVID-19 pandemic. His voice has been clear, and his editorials have shone with integrity. Michael is the first contributor to another new section of the journal on Medical Ethics.

Controversy for my first edition of the journal as new editor? Perhaps, but we are in crisis, and I feel it is important for the pages of the Ulster Medical Journal to contain the opinions of doctors in the front line of the battle, even if only for the record and interest of someone writing a history of this period in fifty years' time. Let us hope that, like Achilles, we can eventually convert some of this anger into positive action on the battlefield.

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Northern Ireland Healthcare Crisis

The next few issues of the Ulster Medical Journal will contain contributions from a wide of Northern Ireland doctors on the subject of the current crisis in local healthcare.

Previous generations have no doubt felt that the local health service was under pressure, but at no time in living memory have more than a dozen GP surgeries handed back their contracts through difficulty in attracting new doctors, or have acute surgical services been suspended in a large teaching hospital because of inability to attract and retain consultant surgeons. Routine outpatient appointments for some specialties are so long as to be meaningless in terms of the presenting complaint. Patients, doctors and politicians are angry, and there is more than a hint of despair.

I have asked contributors to be frank and honest, conscious of the passion with which many views are held and the pressures under which we now work. I have suggested they might reflect on how their own practices have changed over the years, and what (if anything) we have learned to do better. I have gently inquired if they can provide any note of optimism amidst the general plangency of the media.

The first three contributions are from local medical leaders, but subsequent pieces will hopefully reflect the full diversity of voices across the medical workforce in Ulster. If nothing else, the articles will provide documented proof that in 2023 local doctors really cared about what was happening to patient care, and were concerned to do our best in extremely testing times.

David J Armstrong, Editor

NHS 2023, WHERE DO WE GO NOW?

It goes without saying and without hyperbole that this is the most difficult situation that any of us have ever faced in the NHS in Northern Ireland. We see every sector of the service struggling considerably. In particular in general practice we see the huge effect this is having on our patients; not only on their health, but also on their lives in general, critically including their employment.

General practice itself is doing more and more for less and less. The need for our services is at a level that we have never seen before, and is generated by multiple sources including an ageing population, constant recycling of patients currently on waiting lists who are often becoming sicker, earlier and complex discharges from hospital, a multitude of public health issues and concerns, and a worrying increase in poor mental health and in social stress.

General practice and primary care are absolutely the correct place for many of these patients, and the strategy of shift out of hospital and care closer to home is the right one, but only if we have a strong foundation of funding and staff. Unfortunately, we are a million miles from this.

Perhaps, and the most frustratingly for me, is that we have the reports and the plans that not only predicted the current problems, described as the 'burning platform' in the Bengoa report, but they also suggested and described many of the solutions. There are actually written plans and policy in these areas, but they have not been implemented. Raphael Bengoa himself foresaw the problems when he said that making the plans was the 'easy' bit, actually implementing them was where we as a system recurrently fall short. He was entirely correct.

I am a huge believer in local government, local accountability and local responsibility. Health is and will remain devolved, and we have the flexibility and autonomy to make decisions that are reflective and responsive to our local challenges and local populations. Health of course also involves far, far more than simply health, and a proper, co-ordinated cross departmental strategy is required to not only stabilise our current system, but also to plan properly for the future.

A budget is also critical, not even the exact amount, but the knowledge of what is available to allow for proper planning. The current political hiatus has resulted in full blown crisis management, which is not only expensive, but also fails spectacularly to plan properly for the future. Given the current position, and the huge challenges that we all know we face, there is a real fear that we are moving to an irrecoverable position.

Staff morale is also a major, major problem right across health, and we can see clear evidence of this from the range of industrial action across the country, and I fear that the days of goodwill, that have always been so important to prop up our service, have now gone forever.

No service can run without staff and they need to be valued, respected, paid properly and be enabled to work in a safe and supported environment. Without supported staff our NHS will fail.

I am still a firm believer in an NHS that is free for all and is there for all when they need it. We need to fiercely protect this, and I am still optimistic that we can do. We need strong leadership and we need courageous conversations about what our priorities are and about what we can realistically expect from our health service.

We also need strong, mature public conversations about how we pay for it.

We need to trust our staff and trust those that are working in the service who see the problems first-hand every day. I am constantly encouraged in any meeting of clinical staff where solutions and real change can be identified and described often very quickly. This needs to be listened to, enabled and acted on.

I have begun many a talk recently with the words 'if only…', and I still stand by this. We do not need to be overwhelmed or to make things over complicated. We need to understand what we already know; we need to have a clear vision of what we want our health service to look like into the future, and we need to commit to many of the plans that already exist. And we need a Health Minister.

Alan Stout
GP Partner, Belfast
Chair, GP Committee BMA(NI)

UNPLANNED COLLAPSE OR EMBRACE CHANGE

"The stark options facing the HSC system are either to resist change and see services deteriorate to the point of collapse over time, or to embrace transformation and work to create a modern, sustainable service that is properly equipped to help people stay as healthy as possible and to provide them with the right type of care when they need it".[1]

Words from the Bengoa report of 2016 which unfortunately have come to pass as evidenced by the collapse of emergency general surgical services in two of our hospitals. It is also well recognised that we have the largest waiting lists in the UK with over 122,267 patients waiting for surgery or treatment with 378,411 patients waiting to see a consultant for first time.[2] My own specialty of General Surgery is in the top four of the longest waiters alongside ENT, Trauma & Orthopaedics and Urology. This has been one of the biggest challenges for my colleagues and I over the past number of years. The moral distress, associated with clinicians seeing people and putting them on surgical lists knowing that it may be several years before they receive the treatment they need, is well recognised. My colleagues and I see on a daily basis the impact of such waiting lists with advanced disease presentation, recurrent emergency admissions with the problem requiring surgery (e.g., gallstone disease, incarcerated hernia) and patients no longer able to have the surgery due to a change in their comorbidity. In addition, there is a 'hidden waiting list' of people who have not yet come forward or who have not yet been referred for hospital treatment.

The waiting lists have built over many years, mainly because of rising demand, reduced capacity (particularly during Winter) and lack of predicted recurrent funding of the health service. Previous attempts to reduce by using the independent sector has resulted in brief periods of reduction but once the funding was stopped the lists steadily increased again.

Presently, more than ever we need to unlock the potential of the health service in meeting the needs of patients now and into the future. Patients deserve the right to timely surgery and even more so in a post-pandemic world.[3] The waiting lists are further creating health inequalities where those who have the financial means seek private healthcare whilst others have no choice but to remain on NHS waiting lists. These delays are resulting in conditions deteriorating and management of chronic pain. This contributes to an overwhelmingly negative picture of life described as being 'on hold' or in 'no man's land'[4].

It is also critical to recognise that the landscape of surgery has changed in recent years within the UK. In my own specialty, General Surgery we do not have the General Surgeon of the past who was trained in all aspects of surgery. The future is all about subspecialisation with colleagues providing expert care in one part of General Surgery. Such subspecialisation has brought about the necessity to consider new ways of working (e.g., separating emergencies of an upper GI nature from emergencies of a lower GI nature). Similarly, modern emergency general surgery has much more dependency on the use of interventional radiology and other disciplines. Such circumstances led Minister Swann to commission a Review of General Surgery which I was honoured to chair.[5] The review was an extremely robust, evidence-based process. One of the principal aims was to develop a set of standards for the delivery of emergency general surgery with the recognition that separation from elective practice greatly benefits both aspects of General Surgery. It was particularly evident during the pandemic that the creation of 'standalone' surgical hubs allowed elective surgery to continue despite the pressures on the system.[6] Therefore, if I had the ability to influence one major change in the current delivery of health care in Northern Ireland, I would push on with the creation of 'protected surgical hubs' separate to unscheduled pressures which would allow the increased capacity we so badly need to address our waiting lists and the future increased numbers of people requiring surgery.

It is also becoming very clear that specialist clinicians are increasingly reluctant to take up posts in smaller units with low patient throughput. This has been witnessed across many different jurisdictions for good reason. It's not about Trusts simply "trying harder" to recruit. Smaller units inevitably mean smaller clinical teams, with the burden of punishing work rotas resting on all too few shoulders. As colleagues leave for roles with bigger teams elsewhere, services are increasingly propped up by locum cover, with all the care continuity problems that this entails. Crucially, when patient numbers are lower, clinicians are also deprived of the necessary case mix to maintain and develop their skills and subspecialise in their chosen fields. It is critical to address such situations and in the Review of General Surgery a 'redesign' of the hospital services in Northern Ireland has been suggested with some centres becoming 'overnight stay surgical centres' with the capability to still have functioning emergency departments and associated medical interdependencies. Such implementation has the potential to unlock the door to further reviews of surgical specialties all with the aim of ensuring that no matter where one lives in Northern Ireland, they will have access to the same high standard of timely emergency and elective surgical care.

In conclusion change is needed if we are to celebrate our health service in the years to come. It is critical that society grasp this opportunity to implement fully reports such as the Bengoa report[1] and allow changes to hospitals such as fewer emergency centres but with the creation of robust elective centres. Future proofing our health care system has never been more important. Do we have the maturity to embrace change or continue to see collapse?

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NO BUILDING IS SAFE WITHOUT STRONG FOUNDATIONS.

What is it about general practice that after more than 20 years of work, it continues to keep me interested and invested? It's partly the clichéd *cradle to grave* aspect of what we do but more than that, it is the relationship that we develop with our patients over a lifetime and the stories that we are told that help us understand how illness impacts on them.

Building that picture over time and the impact of continuity is the foundation of good care and better outcomes for patients. It is no surprise that general practice has been described as the foundation or the bedrock upon which the NHS as a whole system is built. The front door or the gatekeeper, an integral part of the system that's function is vital to the health and wellbeing of our population.

Healthcare provision has always been moving towards better care, better outcomes, new advances, and new treatments but with that comes the expectation that the service will provide and need more resource to do so.

General practice has seen many changes over the last 20 years not least the move from a more reactive service to one of improved proactive health care through the introduction of the current contract in 2004. This includes a greater emphasis on chronic disease management and optimisation of care alongside dealing with the urgent and unscheduled. In addition, continuing with health promotion and the vital role we have in screening. That shift to proactivity certainly felt like a positive thing to do for our patients despite the concerns that shifting more care to the community was always going to need more resource to follow and the worry was that such a resource both financially and in terms of workforce would be found wanting. Unfortunately, these fears were realised; austerity, underinvestment, and the lack of a comprehensive general practice workforce plan has been catastrophic in the last decade. However, the challenges we face in our GP surgeries are not isolated as colleagues in every part of our health service are feeling similar impacts as we all try to do more with less and manage patients with increasing medical complexity medical.

That said, given our unique role and proximity to the communities we serve, we see the manifestation of pressures elsewhere in the service daily as we are often the only part of the system that patients can access. The fracture lines that are opening up right across the system are having a catastrophic impact on our foundations. Patients languishing on a waiting list for years with no specialist access are trying to scrape together money to go privately in the hope of being seen. In the interim, the only place those patients can go is to our surgeries and we do our best to support them when they are being failed by other parts of the system.

In my view, there has never been a more difficult time to be a GP. Managing compounding morbidity alongside urgent need is squeezing our proactive care, as something needs to give. There is a growing demand capacity mismatch, and its impact is devastating for patients and general practice teams. Workload is unmanageable and burnout is rife.

But it didn't have to be so. Had we been able to implement transformation that saw a real proportionate investment in community-based care we might have entered the pandemic with some reserves. The fact we did not further compounded the pressures for general practice.

GPs across the UK are now facing intolerable pressure but uniquely in Northern Ireland, we are being let down by a lack of Assembly or Executive at Stormont. When the Executive collapsed in February 2022, so did our first opportunity to have a multiyear budget. Having no functioning institutions or political leadership is hugely frustrating and risks our ability to deliver on basic services, let alone take any steps towards vital transformation.

We are fighting a losing battle over access without an adequate workforce and delivery of essential transformation that would see real and sustained investment and support for primary care. That we have seen an unprecedented number of practices hand back their contract in the last 12 months is a stark reminder to all that the foundation of the NHS that was slowly crumbling pre-pandemic, is now facing a seismic shift towards collapse.

It will take years to make the general practice foundation fit to bear the weight of the NHS that sits upon it, but there are ways to help stabilise and support it in the interim. Action is needed to expand our workforce through increased training and recruitment. Urgent support through a region wide roll out of Multidisciplinary Teams and investment in our physical and digital infrastructure, would go some way to tackling unsustainable workload. In addition, a real focus is required on strategies to retain our current exhausted workforce. While none of these solutions are easy and none alone can treat our crisis, our elected representatives and senior leaders cannot afford to continue ignoring the challenges we face because no one can afford for general practice to fail.

Ursula Mason
Chair RCGPNI
GP Partner Carryduff Surgery

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Clinical Paper

'Factors influencing future career choices of Queen's University Belfast Medical students.'

Madden S[1], Martin N[1], Clements JM[1,2], Kirk SJ[1,2]

Keywords: Career aspiration, medical student, influencing factors, mentorship, finance

ABSTRACT

INTRODUCTION

Decisions made by medical students on future career choice have demonstrated concordance with subsequent postgraduate career path. This study aimed to understand the factors that impact undergraduate career decision making.

METHODS

An anonymous voluntary survey consisting of binominal, Likert and free text responses was distributed to all medical students registered at Queen's University Belfast (QUB). Data was collected over 6 weeks in April-May 2021. The primary outcome was future career aspirations. The secondary outcomes were the impact of mentorship on career choice, the likelihood of students completing their medical degree and practicing medicine upon graduation. Local ethical approval was obtained.

RESULTS

202 responses were received (response rate 15%). 67% (n = 135) were female. One third of respondents remained undecided about their future career choice. Surgery was both the most popular definite career choice (16.3%) of respondents, but also the specialty marked most often as 'Least preferred Specialty' (33%). Factors positively influencing career choice were academic interest and flexibility in working hours. Negative predictors of career choice were lack of interest in the area, perceived workload, and duration of training schemes. 71% (n=144) of respondents reported that a subspecialty mentor would positively influence their career choice and two-thirds of respondents reported that financial factors would influence their career decision. 11% (n= 22) of respondents were unsure or undecided if they would continue medicine as a career upon graduation.

CONCLUSION

Uncertainty over future career intention remains common with surgery the least popular speciality. Mentorship, integrating flexibility in training and enhancing academic interest should be considered by educational stakeholders as mechanisms to generating undergraduate interest in a subspecialty. Furthermore, the reported rate of students intention to leave their medical degree prior to graduation by this cohort is concerning, warranting further investigation.

Introduction

Medicine offers many potential career paths. However, health services require a supply of medical graduates willing to train in all specialties, in proportion to population and patient need, to provide safe and effective health care to the public[1].

Effective workforce planning ensures that health care needs are met with the ability and aspirations of the individual doctors, thus minimising the financial and personnel costs of attrition from the medical education and training system. Understanding the needs and staffing of the healthcare system guides how medical students are educated, trained, and inspired to enter various career paths. Studies have demonstrated that the decisions made by medical students whilst in university regarding their choice of future career is consistent with their resulting postgraduate career path[2]. Yang et al [3] identified that numerous individual, specialty and economic factors play a role in the decision-making process. This systematic review demonstrated that academic interest appears to be the primary determinant, with flexible working, career opportunities, workload and length of training all considered valuable in the decision-making process. Historically, financial remuneration drove career choice[4], however more recent studies[5,6,7] have highlighted a trend toward lifestyle factors, with an emphasis placed on quality of life.

Identifying factors that positively and negatively influence a career choice have the potential to influence stakeholders in how they may adapt or develop their perceptions of the specialty to improve future uptake and diversity.

The number of UK medical students is increasing annually[2,8] and despite a growing body of evidence into career decision making in this undergraduate cohort [3,9], no study has achieved an accurate representation to outline the situation in Northern Ireland. Furthermore, it is evident that gaps in recruitment exist in various specialties such as surgery and

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general practice[10,11]. Therefore an understanding of early influencing factors may identify ways to offset this balance for future workforce planning.

The aim of this study was to identify the factors influencing future career choice amongst medical students at Queen's University Belfast in Northern Ireland.

METHODS

A voluntary 12 question electronic survey (GoogleForms) was distributed to all medical students (n=1377) at a single institution, Queens University Belfast (QUB), an undergraduate medical school in Northern Ireland over a six-week period from April-May 2021. The survey consisted of twelve questions using binomial, Likert, and free text responses. The survey was disseminated alongside a participant information sheet via the electronic QUB portal notice boards and year group social media pages. Reminders were sent out at week 2 and 4 respectively. The survey was voluntary, no identifiable information was collected, thus all completed surveys were anonymous. There were no formal, financial, or other incentives to complete the survey. Ethical approval was granted prospectively by the Faculty of Medicine, Health & Life Sciences Research Ethics Committee at Queen's University Belfast in early April 2021 prior to survey distribution. The survey is attached in Appendix 1.

All students studying medicine or pursuing an intercalated degree as part of their primary medical degree at QUB were included. Students from specialities outside of a medicine degree programme or from other University institutions were excluded.

The primary outcome was future career aspirations by speciality and the positive and negative influencing factors. Secondary outcomes included the impact of mentorship and financial circumstance on career choice, and the reported likelihood of practising medicine after graduation.

Statistical Analysis

Only fully completed survey responses were included in the final analysis. Data was analysed using SPSS® (v.27.0) software (SPSS, Chicago, IL, USA). Univariable comparisons between groups were performed using the student's t or Mann-Whitney U tests for continuous variables, and Chi2 or Fischer exact test for categorical variable. *One*-way analysis of variance (ANOVA) test was performed for non-parametric continuous data comparing more than two groups (year groups). Logistic regression was conducted to identify factors influencing specialty choice. A p-value of <0.05 was considered statistically significant. Free text responses were analysed using a thematic approach.

Results

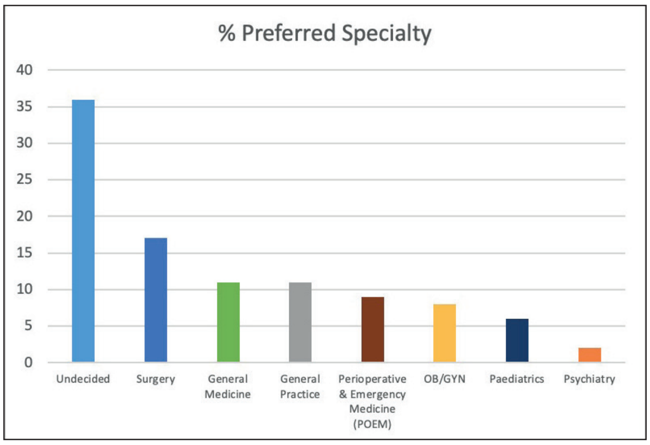
202 complete responses were received (15% response rate). Two-thirds of respondents were female. Respondent demographics are summarised in table 1, which were representative of the general demographics of the medical student population at QUB which are summarised in appendix 2.

Table 1. *Respondent Demographics*

Gender		
Female	136	67.3%
Male	66	32.7%
Age		
18-22	122	60.4%
23-27	69	34.2%
27+	11	5.5%
Degree status		
Undergraduate	148	73.3%
Postgraduate	54	26.7%
Year Group		
1	20	9.90%
2	30	14.85%
3	95	47.03%
4	45	22.28%
5	12	5.94%

Figure 1 summarises respondents subspecialty career choice. 34% of respondents remained undecided with regards to their future career choice and students appear to be more certain of their career choice with increasing seniority. Surgery (16.3%), general medicine (10.4%), general practice (10.4%) was the most popular preferred career choice selected by respondents. There was a statistically significant association between preferred career specialty and gender (p 0.018), year group (p 0.022), age (p 0.004), and degree status (p 0.041).

Figure 1. *Respondents career choice*



Individual determinants of career choice are summarised in Table 2. General academic interest was considered, by far, to be the largest individual determinant of career choice with almost two-thirds of respondents selecting it as the most important factor when considering a career in a subspecialty. A flexible work schedule and a positive clinical experience were also recognised as important factors.

Table 2. *. Summary of Individual determinants of career choice*

Individual Determinants of career choice	NO.	%
General academic interest	127	62.8
Having a flexible work schedule	37	18.3
Having a positive experience on clinical attachment	21	10.3
Opportunity for career progression	9	4.5
Advice from others (family, friends, other medical professionals)	6	3.0
Having a clinical mentor in this speciality	2	1.0

Female students placed greater importance on 'having a flexible work schedule' as a contributing factor to career choice compared to their male counterparts (21% vs 12%) (p 0.044). In addition, postgraduate students selected 'having a flexible work schedule' as an important factor when making future career decisions compared to their undergraduate counterparts (37% vs 15.5%) (p 0.04).

Specialty related factors are summarised in Table 3. Competencies and skills, patient-centred orientation and the workload associated with a subspecialty were determined as the most important factors that this cohort would consider when making a career decision.

Table 3. *Summary of specialty specific determinants of career choice*

Specialty specific factors	NO.	%
Competencies and skills required	59	29.2
Patient centred orientation of specialty	53	26.2
Workload associated with specialty	30	14.9
Undecided	20	9.9
Length of training scheme	16	7.9
Potential for career progression	15	7.4
Earning potential	5	2.5
Prestige of specialty	4	1.9

Figure 2 summarises respondents least preferred subspecialty. Respondents were least likely to pursue a career in Surgery (32%) or Psychiatry (31%). There were no statistically significant associations between least preferred specialty and gender, year group, age, or degree status. Table 4 summarises factors that dissuaded respondents from selecting a career in a certain subspecialty. Over two-thirds of respondents stated that a lack of academic interest was the greatest deterrent for selecting a subspecialty. The perceived workload of a specialty, a lengthy training scheme and a negative clinical experience were also considered negative factors.

Figure 2. *Respondents least favoured subspecialty*

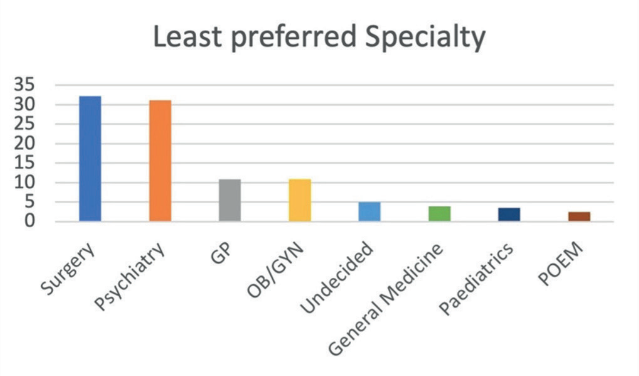


Table 4. *Summary of factors which negatively influence subspecialty choice*

Negative factors influencing career choice	No.	%
Lack of academic interest	137	67.8
Perceived workload	17	8.4
Lengthy training scheme	12	5.9
Negative clinical experience	12	5.9
Lack of control over working hours	9	4.4
Not applicable	7	3.4
Limited opportunities for career progression	3	1.4
Advice from others	2	1
Lack of mentorship	2	1
Earning potential	1	0.5

71% of respondents commented that a having a subspecialty mentor would make them more likely to consider a career in that area. There was no statistical significance for the variables age, gender, previous degree status and year group. A thematic analysis of the free text responses for this question found that career guidance, support, insight, and information into the subspecialty were the most common reasons for respondents' decisions.

62% of respondents stated that financial circumstances, including student debt and financial dependence, would not influence their career choice. However, 53.7% of post-graduates considered financial circumstances as an important factor when deciding a future career (p 0.004, 95% CI 0.212, 0.759).

11% of respondents were unsure or undecided if they would continue medicine as a career upon graduation (unlikely, very unlikely, undecided, unsure about completing their degree). Of the cohort that stated they were unlikely or unsure about furthering their medical career, approximately seventy-five percent were in clinical years 3 – 5 and two-thirds had previous degrees. There were no statistically significant associations between the likelihood of practicing medicine and gender, year group or degree status respectively. However, there was a significant association between the likelihood of practicing medicine and age group (p 0.001). Forty-five percent of students in the 27+ age group stated that they were undecided or unlikely to pursue medicine as a career compared to 9.8% and 7.2% of students in the 18-23 years and 23-27 years respectively.

A thematic analysis of free text responses from this question revealed the following as contributing factors: the pressures of making mistakes as a junior doctor, other interests, a perceived poor work-life balance, the length of postgraduate training and a perceived poor working environment. Free text responses are attached in Appendix 3.

Discussion

This study is the first to quantify the future ambitions of QUB medical students on a national scale in Northern Ireland. Over one-third of medical students remain undecided about their future career preference. Academic interest remains the most important individual factor for selecting a subspecialty and is comparable to studies in other geographical regions[3].

With the advent of the new C-25 medical student curriculum at QUB, this study highlights the importance of fostering academic interest in subspecialties and ensuring that strategies are in place to promote positive and immersive clinical experiences with patients focusing on practical skill acquisition. Increasing duration of clinical exposure to subspecialties and at an earlier stage in medical education, as well as mentorship, where there is a clear appetite, may be of value. The use of digital technology such as simulation-based learning and virtual reality (VR) teaching may also act as useful adjuncts. Both are increasingly utilised in medical education and are shown to provide an immersive and positive experience for medical students[12]. VR could be utilised as an adjunct to clinical attachments to allow students to experience a subspecialty in more depth, including competencies and skills, and thus sparking a greater academic interest in that area.

Surgery was identified as a polarising subspecialty in this study with 16% of respondents selecting it as their preferred specialty while almost one-third of this cohort did not wish to pursue a career in surgery. This further highlights the uncertainty regarding career choice at an undergraduate level. Of the 34 respondents who wish to pursue Surgery, 25 respondents (74%) selected general academic interest as the strongest influential factor for selecting a career in this specialty. Factors that appear to negatively influence a career in surgery amongst our cohort were a lack of academic interest, a lengthy training scheme and the perceived workload of the specialty. This correlates with other studies on this topic[10,13]. The factors dissuading foundation doctors from applying to core surgical training were the working hours, the impact on work/life balance and the working environment. The findings of this study are comparable to other studies of a junior doctor cohort, suggesting that the decision not to choose a surgical career is consistent with the decisions of medical school and not influenced by the early practice of clinical medicine. Interestingly, more senior medical students in our survey were less likely to select a surgical career, suggesting that these decisions may be influenced by clinical experience, advice from senior peers or interactions with clinicians. Other studies have determined that lifestyle factors had the greatest negative influence when pursuing a surgical career with up to two-thirds of respondents across several studies selecting lifestyle as the most common reason for avoiding a surgical career[13-15]. In our study, 23% of respondents who would not pursue surgery as a career, selected ‘workload’ and ‘lack of control over working hours’ as lifestyle factors that would negatively influence their career choice. It is also important to note that ‘having a flexible work schedule’ was considered the second most important positive factor for selecting a subspecialty in this cohort, especially amongst female students and those with a previous degree. This study serves to further highlight that although academic interest plays a significant role in career choice, the current population of medical students’ favour ‘work-life balance’ over other factors when selecting their subspecialty.

Furthermore, of those respondents who would not choose a surgical career, approximately three-quarters were female, highlighting that gender remains a barrier for selecting a career in Surgery. Interestingly, the number of female medical students in the UK is steadily increasing. In 2020, 64% of students accepted into medicine and dentistry courses in the UK were female[16]. The reasons for female students and medical students in general not choosing surgery is most likely multifactorial. However, the perceived workload of surgery as a specialty and lack of work-lifestyle balance prevails as one of the main deterrents to choosing surgery as a career. This apparent lack of interest amongst medical students in our study to pursue a career in surgery correlates to previous similar studies in the UK and Ireland[11,14] and could have implications for subsequent workforce planning. Compounding this, surgical applications globally are declining, and a higher proportion of core surgical trainees are not completing their training with an attrition rate of up to 25%[15]. Furthermore, due a shortfall in general practitioners in the UK and the demand in primary care expected to rise in the coming years[11], there is a greater drive to recruit medical students into careers in primary care[14]. In 2016, the House of Commons, in their report on primary care in the UK, stated that medical schools have a ‘responsibility to prepare half of all graduates for careers in general practice’[17]. The By Choice, not by Chance report sponsored by Health Education England and the Medical Schools Council also made recommendations for medical schools to boost recruitment in general recruitment at an undergraduate level[18]. This Governmental agenda may “divert” students from hospital specialities (and specifically surgical) training in the future towards the specialty of General Practice.

One in ten medical students were either uncertain or unlikely to continue their degree or their medical career after graduation. Due to a relatively low response rate, it is difficult to ascertain if this rate (4%) is representative of the entire medical student cohort at QUB and requires further investigation. Although this figure does not represent the attrition rate at this university, it provides a narrative on future intent of students in years to come and requires further investigation. Numerous studies[19-25] have addressed attrition rates amongst medical students and the results of these studies vary from 3% to 26%. It is difficult to compare the attrition rates across the studies as they have been conducted across different medical schools and across vastly different timelines, with the last UK based study conducted almost twenty years ago in Nottingham, with an attrition rate of 6%[21]. Naturally, it would be unrealistic to expect every medical student to complete their degree or to pursue a career in medicine after graduation. Equally, it possible that this uncertainty about completing the medical degree or pursuing a medical career is a result of poor timing due to the COVID-19 pandemic which has posed many issues for medical education and the medical workforce. However, further thematic analysis of these responses provides a stark warning for the future of the medical workforce in the UK. Alarmingly, three-quarters of this uncertain cohort were in clinical years, whilst two-thirds of respondents were post-graduates pursuing medicine as a second degree. It is evident that students already feel overwhelmed by the prospect of poor working conditions and the pressures of making a mistake as a junior doctor when they graduate. This sentiment is mirrored among the medical workforces. In a recent BMA tracker survey (February 2021), of the doctors surveyed, 21% of were 'more likely' to leave the NHS for another career citing workload, stress, and burnout as reasons for leaving their career[26]. Presently, it costs the government approximately £230,000 to educate a UK or EU national through medical school[27]. Paradoxically, in recent years, there has also been an initiative to increase the number of medical student places in the UK to meet the demand of a rapidly ageing population. However, this may be a fruitless endeavour if almost one in ten medical students are unsure if they will ever practice as a doctor while almost one in five doctors are considering a career change. Perhaps some of these resources would be better served to retain medical students and reduce the attrition rate amongst the medical workforce.

Limitations

We recognise the limitations of this qualitative study. Firstly, the method of survey distribution may have impacted the response rate. The survey was only permitted to be advertised on social media channels such as year group Facebook pages and online noticeboards which may have precluded anyone who is not active on social media from participating in this study. In addition, this study did not seek data on those intercalating medical students. This subset of students did not have an identifiable online Facebook group or noticeboard for survey distribution. However, these students may have completed the survey via other means including their previous year group Facebook page but were not isolated in our analysis. Academic interest in a subspecialty and/or to improve future employment opportunities[28] are primary determinants of decision to intercalate which are reflected in our findings. The timing of survey may have also limited our response rate as it was disseminated four weeks before end of semester exams. In addition, the survey response varied among year groups with lower responses from years 1 and 5 with higher uptake from years 2, 3 and 4. Thus, the year 1 and year 5 groups may be considered underrepresented in this study. Notwithstanding these limitations, and a response rate of 15%, the demographics of the participants of this study are comparable to the demographics of the student cohort at this institution in terms of gender, age, and degree status.

Conclusion

Our study has highlighted indecision in this cohort. It has identified common factors that influence undergraduate medical student career choice which may provide educators the opportunity to craft curriculae to entice and inspire students into certain specialties. It has highlighted that gender remains a barrier for some subspecialties such as surgery. Regarding continuing a medical degree or practicing medicine upon graduation, this study has identified that the rate of uncertainty amongst medical students at this institution is significant. Attrition rates amongst medical students and the likelihood of continuing a medical career in the UK is not widely discussed in the literature and warrants further review by key stakeholders.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Clinical Paper

Mapping Two Decades of Paediatric Down Syndrome Research Literature.

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ABSTRACT

Background

While research has led to significant advancements in the health and life expectancy of children with Down Syndrome (DS), there remains a significant burden of disease and health inequity. Further research, focused on areas of greatest need, is imperative to address this. An understanding of what research has been undertaken, and any existing gaps, helps to guide future academic efforts.

Methods

We utilised an epistemological approach to summarise two decades of paediatric DS literature. Publications were categorised according to the country of origin, methodology, primary health themes and subcategory research themes.

Results

Across 5,800 paediatric DS publications we demonstrate a general increase in the number of publications in this field between 2000 and 2014, with a trending decline thereafter. The majority of publications were affiliated with Institutions based in Western countries. The majority of studies utilised a cross-sectional methodology (33.3%), while relatively few were interventional (5.6%), qualitative (2.7%) or mixed-method studies (1.6%). Most publications focused on development & cognition (13.1%), neurology (9.9%) and oncology (9.8%), with fewer focusing on genitourinary health (0.9%), growth (0.9%), mortality (0.9%) and child protection (0.2%).

Conclusions

These findings highlight areas of relative paucity within the paediatric DS literature which may warrant increased academic attention.

Introduction

Research has informed significant advancements in the treatment and care of individuals with DS, and contributed to a significant increase in life expectancy over recent decades [1,2]. However, individuals with DS continue to have a greater mortality and morbidity compared with both the general population, and also compared with individuals who have other forms of intellectual disability[3]. This demonstrates a need for ongoing research, to improve the quality of health, and duration of life for those with DS.

Existing studies have suggested a general decline in the proportion of all academic publications focusing on DS, and a shift in focus away from childhood and towards prenatal diagnostic studies.[4] However, there are no existing studies which provide an overview of the existing paediatric DS literature.

Mapping of academic literature according to themes can be described as an 'epistemological approach'. As with traditional systematic reviews, it employs a standardised, repeatable approach to select, review and synthesise the literature; however, its applications and outcomes differ. While traditional systematic reviews may address a more specific research question, a mapping exercise provides a broader overview.

A broader overview of the existing DS literature assists in identifying 'gaps' and areas of relative research paucity in this field. Such an understanding will help guide future DS related research, and funding allocation, in order to direct resources to the areas which are potentially most in need of academic investment.

The aims of this literature mapping exercise were to determine (i) the annual number of publications which have focused on children with DS, per year, since 2000; (ii) the geographical distribution of those publications; (iii) the current distribution of research methodologies used in the paediatric DS literature; (iv) the current distribution of 'primary health themes' in the paediatric DS literature; (v) the current distribution of 'subcategory research themes' in the paediatric DS literature; and (vi) to identify gaps in the evidence base, and thus guide future research.

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Methods

Search strategy

Literature searches were performed using the online databases Pubmed, Embase.com, CINAHL-Plus and the Cochrane Library. The search terms for each database are available in Supplementary information 1. Duplicate titles were removed using Endnote X7 duplication recognition software. The resultant titles were independently screened by two authors to assess eligibility ,and only those with a unanimous decision to exclude were removed at this stage. The abstracts of the remaining titles were obtained, and independently assessed by two authors according to the inclusion / exclusion criteria (Figure 1). Discrepancies were resolved by consultation between the two reviewers and, if necessary, reviewing the full text of the papers and/ or discussing with a third reviewer from the research team. If a consensus was not reached the wider research team was consulted.

Figure 1: Abstract inclusion/ exclusion criteria

Inclusion criteria for publications:

- Literature published between the 1st January 2000 and 1st January 2020.
- Observational or interventional studies which include children (aged ≤18 years) with DS (either as the focus or control / comparator group).
- Review articles which focus on DS in childhood, morbidities in children with DS, or reviews which are not specifically focused on DS but contain a relevant sub-focus on paediatric DS.
- Articles which had an available English language abstract.

Exclusion criteria for publications:

- Where participants, or the focus, is on adulthood only. However, such articles were included if children with DS constituted a subgroup or, for example, in a DS case report where a reasonable description of childhood was included. Review articles about adult-related or adult onset disease (e.g. dementia) were not included.
- Prenatal studies, including those which looked at risk factors for non-disjunction, or publications focusing on parental experience of being given a prenatal diagnosis of DS.
- Articles focusing on mosaic DS / partial translocations or trisomy 21 plus another aneuploidy.
- Where an abstract or English language abstract was not available.
- Publications which use animal models of DS or animal models of DS associated morbidity.
- Publications where DS is not the focus or a specific sub-focus of the article.
- Articles which do not describe research (e.g., a summary of a DS related seminar or presentation).

Each abstract was categorised according to year of publication, country of first author Institution, methodology, ‘primary health theme’ and ‘subcategory research theme’. The categories for methodology and subcategory research theme are presented in.. The ‘primary health themes’ correspond to key areas of medical research, which in turn largely correspond to clinical specialties and body/ disease systems: Behaviour/ Mental Health, Cardiac/ Circulatory, Child Protection, Dental, Dermatological, DS Prevalence Study, Development & Cognition, Endocrine, Nutrition & Metabolic, Ear, Nose and Throat (ENT), Gastrointestinal, Growth, Haematological, Infection and Immunology, Mortality, Musculoskeletal, Neurology, Non-specific/ General, Oncology, Other, Renal/ Genitourinary, Respiratory, and Surgical/ Anaesthetics.

Governance

Research Design approval was sought and obtained from the Joint Research and Development Office at the Great Ormond Street Institute of Child Health, UCL (R&D number 17PP09)

Results

Publications included/excluded

A total of 11,066 titles were downloaded from the literature databases, of which 5,800 were included in the final analysis (Figure 2).

Number of Publications Per Year

Figure 3 summarises the number of publications per year, which were included in the final analysis. There was a general trend of an increase in the number of publications per year until 2014, and then a general trend of decline thereafter.

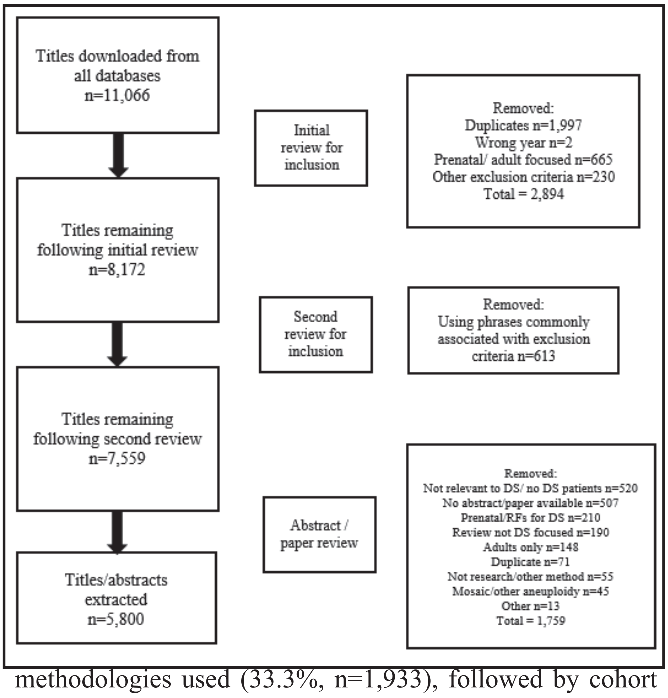
Country of First Author Publication

Publications originated from institutions in 101 different countries. For 5.2% (n=304) of publications it was not possible to identify the country of first author institution. The largest proportionate contributions were from the USA and UK.

Research Methodologies

Cross-sectional studies made up the largest portion of

Figure 2: Flow chart illustrating the number of titles identified through literature searches (N=11,066) and the final number of publications which were included in the mapping exercise (n=5,800).



methodologies used (33.3%, n=1,933), followed by cohort studies (15.7%, n=913) and case reports (13.7%, n=792). There were relatively few interventional studies (5.6%, n=322), basic science studies (5.5%, n=321), qualitative studies (2.7%, n=158) and those utilising mixed methods (1.6%, n=94).

Primary Health Themes

Publications focusing on development & cognition (13.1%, n=757), neurology (9.9%, n=576) and oncology (9.8%, n=569) made up the largest proportions. Relatively few publications focused on renal and genitourinary (n=53), growth (n=50), mortality (n=50) and child protection (n=10).

Subcategory Research Themes

Publications focusing on prognosis and the natural history of individuals with DS made up the largest proportion (24.9%, n= 1,445), followed by those that focused on treatments and prevention of disease (20.5%, n=1,191) and full or 'general picture' (e.g. case reports and case series describing a patient's history, treatment and outcomes) (14.3%, n=831). There were relatively few publications focusing on the postnatal diagnosis of DS (n=45), economic analysis (n=15) and ethics (n=6).

Discussion

This unique systematic literature mapping exercise of 5,800 paediatric DS publications, over two decades, provides a broad overview of the existing literature.

The findings demonstrate a general increase in the number of publications focusing on paediatric DS between 2000 and 2014, with a trending decline thereafter. The majority of publications were affiliated with Institutions based in the USA and UK. The majority of studies utilised a cross-sectional methodology, while relatively few studies were interventional, qualitative or mixed method. The distribution of 'primary health themes' in the paediatric DS literature was more spread. Overall, most publications focused on development & cognition, oncology and neurology, with fewer focusing on genitourinary health, growth, mortality and child protection. With regard to 'subcategory research themes', the majority of paediatric DS publications focused on prognosis and/or the natural history of individuals with DS, and treatments.

The literature mapping exercise was performed using a systematic approach. Relevant titles were extracted from multiple medical literature databases and the search terms were highly inclusive. The definitions used for methodologies and 'themes' were based on those frequently utilised in research. These definitions were refined to optimise applicability to the paediatric DS literature and trialled by multiple researchers, reaching a high degree of consensus. The assessment for inclusion and exclusion of all titles, and subsequent data extraction for those publications, was performed by two independent reviewers and discrepancies were resolved by discussion with a third reviewer, or the wider research team where appropriate.

While this systematic approach reflects a high degree of academic rigor, it is possible that some titles may still have been misclassified. However, given the large number of publications included in the mapping exercise infrequent misclassifications would not be expected to significantly impact the overall findings.

It should be noted that for the majority of publications, categorisation was based on the contents of the abstract only, as opposed to review of the full text publication. However, where the methodology or 'themes' were unclear, and in the case of reviewer discrepancy, the full-text was consulted. It is possible that in some cases the content of the abstract was a poor reflection of the study, thus leading to misclassification. However, extracting data largely from abstracts had the advantage of making it possible to include a larger number of publications, over a longer time period, than would have been practical if the full text article was consulted for every paper.

This is the first study which attempts to map paediatric DS literature.[5] Venekamp et al. employed a similar 'epistemological approach' to map 5 years of literature focusing on obstructive sleep apnoea in childhood (non-DS). In this field they too found a predominance of publications focusing on treatment and prognosis, and few publications focusing on service delivery and health economics. Also reflecting the findings of this mapping exercise, the majority of the studies utilised an observational methodology, with very few interventional or qualitative studies.[5]

The general trend of an increased number of publications

Figure 3: The number of paediatric DS publications per year, Jan 1st 2000-Jan 1st 2020 (n=5,800).

Review - systematic	A systematic, standardised, and repeatable, approach to select, review and synthesise relevant studies on a particular topic. Defined as a 'systematic review' in the title or abstract or including details of those databases searched. This definition also includes publications which statistically synthesise data from separate but similar/ comparable studies, leading to a quantifiable summary of the results (i.e. Meta-analysis). The review must focus on DS or include a specific sub-focus on DS. *For the purpose of the analysis, Review – systematic & Review – unspecified were combined into "Review (combined)".
Review - unspecified	A literature review where it is unclear if the approach was systematic or narrative. The review must focus on DS, or include a specific sub-focus on DS. (See Inclusion/ Exclusion criteria). *For the purpose of the analysis, Review – systematic & Review – unspecified were combined into "Review (combined)".
Interventional study/ trial	A study in which participants are assigned to a treatment/intervention group or a comparison/control group, and followed prospectively. It may also include "before and after" studies where there is no standard control group, i.e. the outcome is described in the participants before and after treatment. It may also constitute a retrospective comparison for one treatment group with another, however it must include measurements of the outcome before and after treatment, and/or the primary focus is the impact of the intervention. The aim of the study is usually to evaluate the effectiveness of a treatment/intervention compared with none, or the status quo.
Cohort study	An observational study in which a group of patients are followed over time with observations, in the same individuals, at >1 point in time. These may be prospective or retrospective.
Cross-sectional study	A study in which the participants are characterised/ measured at one point in time or multiple patients characterised/ measured within a set period of time. Note, the same patients characterised/ measured at multiple time points should be defined as Cohort Study.
Case control study	Retrospective comparisons between a DS group with an associated morbidity and a control group (DS without associated morbidity). The study retrospectively observes/measures/describes attributes or suspected risk factors in order to identify potential relationships/ associations.
Case series	A descriptive account of the presentation, management or prognosis of a group of patients with DS (>1 ≤20) with a full description of the clinical picture. If the articles includes multiple patients but only 1 with DS, record as Case Report.
Case report	A descriptive account of the presentation, management or prognosis of a single case. It usually includes a full description of the clinical picture. May include case series where only one patient described has DS.
Qualitative study	A study which aims to explore the experiences, opinions or motivations of patients, and/or related groups, through interviews, focus groups, reflective field notes and other non-quantitative approaches.
Mixed methods	A study which combines both quantitative and qualitative methodology.
Basic science / underpinning	Lab based studies with non-human participants but may include human cell lines. Note animal studies should be excluded.
Guideline	A clinical guideline/ protocol relating to DS. For the purpose of the analysis these articles were reclassified as "Other".
Opinion piece / letter to the editor	Expert opinion or editorial piece which reflects on DS or related topic. Does not include systematic or non-systematic literature reviews (see above). This definition includes 'letters to the Editor'. For the purpose of the analysis these articles were reclassified as "Other".

Table 1: Methodological categories and definitions
The definitions of the research methodologies are based upon those presented in the A Dictionary of Epidemiology(Porta, 2014), the (National Institute for Health Research) NIHR Glossary, Evaluation, Trials and Studies(NIHR, 2016) and research group consensus.

Aetiology / risk factors for DS associated morbidities	The study aims to identify factors which may be associated with the development of DS associated morbidity. This also includes studies where DS is a risk factor for a disease or a specific outcome.
Prevalence/ incidence of DS associated morbidities	The study aims to determine the number of individuals with a DS associated morbidity, or health event, in a defined population, within a specified period of time. Also includes studies where the prevalence of DS is described in a disease subgroup.
Prevalence/ incidence of DS	The study aims to determine the prevalence/ incidence of DS within a defined population (e.g. geographical). If the study determines the prevalence of DS in a disease subgroup this should be defined as Prevalence/ incidence of DS associated morbidities.
Diagnosis / health surveillance for DS associated morbidities	The study focuses on the diagnosis of/health surveillance for DS associated morbidities.
Diagnosis of DS (postnatal)	The study aims to determine the accuracy of diagnosis of DS in a post-natal population (e.g. comparing clinical diagnosis with molecular diagnosis).
Treatment (including Rx outcomes)/ prevention	The study focuses on a treatment/intervention that aims to improve the health or well-being of a patient(s) with DS, or to prevent associated morbidities. It includes studies which look at outcomes of treatments/interventions. This definition does not include studies which look at the outcomes of health service interventions, i.e. interventions which target the way in which health care is organised or functions (see Service delivery).
Prognosis / Natural history of DS	The study aims to describe/inform/further the knowledge base on the natural course of DS, or a morbidity in the context of DS. This includes studies which aim to define ‘normality’ or normative values within the DS phenotype. This definition also includes studies which further the knowledge base on the development of the DS phenotype, but does not include studies which focus on the aetiology or risk factors for DS associated morbidities (see Aetiology / risk factors for DS associated morbidities). Where the focus is on prevalence (proportion, rate, count) of an associated morbidity, these should be classified as Prevalence/ incidence of DS associated morbidities). (Note these are usually cross-sectional studies). This definition does not include studies which focus on the outcomes of treatments/interventions (see Treatment (incl Rx outcomes)/prevention).
Economic analysis	The study focuses on the economic evaluation (e.g. cost-benefit) of services, interventions or treatments.
Family impact	The study focuses on the impact of DS on any aspect of family life, including familial experiences and perceptions. However, those studies with a prenatal focus should not be included (see Inclusion/ Exclusion criteria).
Service delivery	The study focuses on the organisation, functioning, and performance of health services relevant to those with DS. Such research is usually concerned with relationships between needs, demand, supply, use, and outcomes of health services.
Ethical issues	The study primarily focus on ethics or ‘moral principles’. This does not include publications which focus on the ethics of prenatal diagnosis or terminations, these studies should be excluded.
Outcome research	The study assesses the validity / reliability of specific outcome measures such as (generic or disease specific) quality of life instruments and the inter-reliability of diagnostic tests.
Full/ general picture	Typically case reports, case series or review articles which include multiple health and ‘subcategory research themes’.
Other	Those studies not clearly covered by other definitions.

Table 3: Paediatric DS publications according to country of first author institution, limited to those countries contributing ≥1% of the total (N=4,923).

Country of 1st author institution	n=	%
USA	1,535	26.5
UK	450	7.8
Italy	322	5.6
Unknown	304	5.2
Japan	295	5.1
Brazil	259	4.5
Spain	204	3.5
India	195	3.4
Canada	184	3.2
The Netherlands	169	2.9
Turkey	167	2.9
Australia	160	2.8
Germany	133	2.3
France	117	2.0
Israel	86	1.5
Saudi Arabia	77	1.3
Poland	75	1.3
Sweden	68	1.2
China	65	1.1
Ireland	58	1.0
Total (N=5,800)	4,923	84.9

focusing on paediatric DS per year, over the majority of the study period (2000-2014), is somewhat promising (146 per year, to 450 per year). However, the number of publications should be considered in the context of all research articles published over the same time period. As has previously been illustrated,[4] while there may have been an increase in the number of DS research publications over time (not limited to paediatric DS), there has been a proportionate decline, relative to all academic publications. This suggests that DS is receiving relatively less academic focus and attention.

The trend of decline in the number of publications focusing on paediatric DS from 2014-2020 noted in this study may represent a shift in focus away from childhood studies and towards the prenatal period. This follows significant advancements in the prenatal diagnosis of DS via non-invasive techniques over recent years.[4,6] Research focusing on the prenatal diagnosis of DS does not inform improvements in the health and care of live-born children with DS. The findings of this study provide support for a "rebalancing" of focus in DS research, by increasing investment in studies which aim to improve the health and well-being of children, and adults, with DS.

Table 4: Paediatric DS publications according to methodology (%) (N=5,800).

Methodology	n=	%
Cross-sectional study	1,933	33.3
Cohort study	913	15.7
Case report	792	13.7
Review (combined)*	512	8.8
Case control study	363	6.3
Case series	328	5.7
Interventional study / Trial	322	5.6
Basic science/ underpinning	321	5.5
Qualitative study	158	2.7
Mixed methods	94	1.6
Other*	64	1.1
Total=	5800	100

** Publications categorised as guidelines, opinion pieces and letters to the editor were combined as "Other". Systematic and 'unspecified' review articles were combined into one category (Review (combined)).*

Academic institutions in the UK, and particularly the USA, appear to dominate paediatric DS publications. This may be a recurrent pattern in the wider field of research and academia. However, the over-representation of research from certain regions, where the population is predominantly White and 'high income', may limit the generalisability of findings in paediatric DS research. Therefore, these findings provide some support for investment in research which includes patient groups which are likely under-represented in the paediatric DS literature (e.g. low resource settings, non-white ethnicity).

The mapping exercise also demonstrates a predominance of observational studies (cross-sectional, cohort and case control studies, case reports and case series). In particular, there were a large number of case reports (13.7% of publications). While case reports make a valuable contribution to research literature they are considered further down the 'hierarchy of evidence'. Robust, large-scale interventional studies will be required to advance the evidence-based healthcare of children with DS. These findings support increased investment in interventional studies aimed at children with DS.

The study findings also highlight a relative paucity of qualitative and/or mixed method studies. Improving healthcare for children with DS requires, not only a quantitative approach, but also an understanding of the experience of the child and family. Qualitative research is ideal to identify areas of health priority for patients and carers, and also to identify opportunities to optimise their interactions with the healthcare system.

Looking at 'primary health themes', the distribution of categories was more evenly spread than that observed for the

Table 5: Paediatric DS publications according to 'primary health themes' (%) (N=5,800).

Primary health theme	n=	%
Development & Cognition	757	13.1
Neurology	576	9.9
Oncology	569	9.8
Other	518	8.9
Cardiac/ Circulatory	468	8.1
Endocrine, nutrition, metabolic	383	6.6
Musculoskeletal	366	6.3
Behaviour / Mental health	351	6.1
Ear, Nose & Throat (ENT)	303	5.2
Gastrointestinal	247	4.3
Dental	228	3.9
Infection & Immunology	204	3.5
Surgical/ anaesthetics	194	3.3
Respiratory	118	2.0
DS prevalence study	106	1.8
Dermatological	88	1.5
Haematological	82	1.4
Non-specific, general	79	1.4
Renal, genitourinary	53	0.9
Growth	50	0.9
Mortality	50	0.9
Child protection	10	0.2
Total =	5,800	100

other outcomes. The 'primary health themes' which appeared to receive the greatest attention are not surprising and reflect important, well established areas of DS child health (i.e. development & cognition, neurology and oncology). However, it is notable that relatively few publications focus on respiratory health, infections and immunological disease, as these are recognised as significant causes of mortality and morbidity in children with DS.[1,7] The findings of this study support investment in these areas of DS child health, as well growth, mortality and child protection, as these health themes appear to have received the least attention in the existing paediatric DS literature.

Finally, with regard to 'subcategory research themes', the majority of publications described the natural history of children with DS (i.e. they aimed to define normality or normative values within the DS phenotype, or to further the knowledge base on the development of the DS phenotype over time). For example, studies determining the average lipid profiles among individuals with DS, the typical trajectory of speech and language development in children with DS, or average activity levels among teenagers with DS. While it is valuable to understand normative health characteristics in the DS population the findings suggest that, more than 150 years since the condition was first described, the natural history of individuals with DS is relatively well documented. The findings of this study support investment in other areas of DS research which appear relatively under-represented e.g. the diagnosis of and screening for DS associated morbidities, service delivery and economic analyses.

Table 6: Paediatric DS publications according to 'subcategory research theme' (%) (N=5,800)

Subcategory research theme	n=	%
Prognosis / natural history of DS	1,445	24.9
Treatment (including outcomes) / prevention	1,191	20.5
Full / general picture	831	14.3
Prevalence/ incidence of DS associated morbidities	592	10.2
Aetiology / risk factors for DS associated morbidities	561	9.7
Diagnosis / health surveillance for DS associated morbidities	301	5.2
Family impact / parent experience	228	3.9
Other	202	3.5
Service delivery	138	2.4
Outcome research	125	2.2
Prevalence/incidence of DS	120	2.1
Diagnosis of DS (postnatal)	45	0.8
Economic analysis	15	0.3
Ethical issues	6	0.1
Total=	5,800	100.0

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Clinical Paper

The effect of COVID-19 on the cervical screening programme within a Northern Irish Health and Social care trust

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Precis

COVID-19 has had a significant impact on the waiting times for cervical screening and colposcopy but no impact on the severity of disease outcomes.

Abstract

Objectives/Purposes of the study: To assess the impact of the COVID-19 pandemic on the cervical screening programme and colposcopy services in Northern Ireland.

Methods: All new patients referred to colposcopy following an abnormal cervical smear result from September to November 2019 and 2020 were included. Review patients and those referred to colposcopy for another indication in the same time frame were excluded. Data collected included the presenting smear result and the time to report, time interval to colposcopy review, cervical biopsy method, result and the time to report. Statistical analysis was performed using JASP (JASP V.0.16.1, 2022) and included Shapiro-Wilk normality test and Mann-Whitney U test to compare means.

Results: There was an 11% reduction in the number of presenting cervical smears (7155 vs 6379) in 2020 with a 46% reduction (158 vs 85) in the number of colposcopy referrals. In 2020 there was a mean increase of 6 days to report the presenting smear ($P<0.01$), mean decrease of 49 days to attend colposcopy ($P<0.01$) and a mean decrease of 36 days to report the cervical biopsy result ($P<0.01$). An increase of 14 days ($P= 0.01$) and 15 days ($P=0.01$) respectively to attend colposcopy for moderate and severe dyskaryosis in 2020. No statistical difference was seen in the frequency of presenting smear results, method of cervical biopsy and cervical biopsy results in 2020.

Conclusions: COVID-19 has had a significant impact on the number of patients referred to colposcopy and the time intervals in cervical screening but no significant short term impact on the severity of disease outcomes.

Key words

COVID-19, cervical screening, smear, HPV, colposcopy, cervical cancer

Introduction

Screening programmes are an important aspect of disease prevention worldwide through early detection of precancerous lesions in the asymptomatic population. In April 2020, in response to the COVID-19 pandemic, the Northern Irish government paused all routine invitations for the cervical screening programme. Only those who required non-routine screening (e.g., on request of colposcopy or the laboratory) were included in the screening programme.[1] The aim of this was to allow reallocation of funds and resources as well as reducing risk to invitees and staff.[2] Colposcopy services continued within certain health and social care trusts with reduced capacity due to PPE and infection control measures.[3,4] A phased return began in June 2020 and priority was given to those deemed high risk. Routine invitations were not recommenced until August 2020, starting with those who had been waiting the longest, resulting in a backlog of women waiting for screening invitations.[5] The screening programme suspension has raised concerns within the NHS and media that patients may have a delayed cervical cancer diagnosis or treatment delayed. [1,3]

The introduction of Human Papilloma Virus (HPV) testing along with cytology was rolled out in December 2019 to help identify high risk patients which has led to an increase in diagnostic accuracy,[5] and a reduction in the absolute disease burden. Persistent oncogenic HPV infection is the primary contributing factor to cervical cancer.[6] More specifically, HPV 16 and 18 contribute to 70% of cervical cancer cases worldwide and a further 10 to 12 HPV subtypes account for the remaining 30%.[6] Cervical screening is offered on a 3 yearly basis to women aged 25-49 and a 5 yearly basis for women age 50-64.[5] The cervical smear is primarily tested for HPV and, if positive, a cytological assessment is performed. It is based on this that a referral to colposcopy is made, if necessary.[2] Cervical cancer (rates, mortality, and morbidity) is now well below that of breast or colorectal cancer secondary to the introduction of the HPV vaccine.[4] HPV and COVID-19 have reagents in common within laboratory testing and therefore compete for limited resources.[4] The concern is that the temporary postponement of services will affect the success we are now seeing in relation to early

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detection of cervical cancer which is only achieved through screening at regular intervals.[4,5] A negative screening result is only indicative of a low risk of developing disease[4] and relies on follow up screening to prevent progression.[4] It is felt that the postponement of the cervical screening program has the potential to disrupt the chain in cancer detection.[5]

Data was collected to assess the impact of the disruption to cervical screening within a health and social care trust in Northern Ireland in response to COVID-19 and to identify any delays in screening, diagnosis, and treatment. Numerous recovery strategies have been hypothesised to help recover from this potential delay in cervical screening including self HPV testing,[7] the use of telemedicine for risk assessment[8,9] and an age-related risk-based invitation to cervical screening.[4,6,7] Changes to recall intervals based on risk is another potential strategy to help manage any potential backlog in primary care which may be achievable given the role of HPV testing in identifying high risk patients. The World Health Organisation (WHO) set a global strategy to eliminate cervical cancer as a public health problem,[10] but this relies on screening 70% of women aged 35-45[11] with an estimated seven-fold increase in risk of cervical cancer in those who are unable or unwilling to attend for routine screening.[5] The current disruption in services affects two key pillars of this strategy - screening and timely treatment of detected disease.[10]

Methods

The setting was a health and social care trust in Northern Ireland serving a population of approximately 470,000 patients across 1733 square miles, making it the largest geographical health and social care trust within Northern Ireland. There are six consultant colposcopists accredited with The British Society of Cervical Pathology (BSCCP) as well as one cervical screening nurse specialist within the health trust.

A MEDLINE literature review was performed to assess the impact of COVID-19 on the cervical screening program. A retrospective cohort study was conducted of all patients within the health and social care trust described who were invited to colposcopy following an abnormal cervical smear result from September to November 2019. The same data was then collected for patients invited to colposcopy from September to November 2020, during the peak of COVID19. Patients who were already under review at colposcopy from a previous abnormal cervical smear result and those directly referred to colposcopy for another indication (e.g., clinically suspicious cervix) were excluded. The two cohorts were then compared, and statistical analysis performed. Data was collected using the Excelicare regional colposcopy database and the Northern Ireland Electronic Care Record (NIECR) and exported to Microsoft Excel (Excel V.16.59, 2022).

Data collected included patient demographics, date the presenting smear was collected, the presenting smear result, interval time to report presenting smear in days, interval time to attend colposcopy in days, colposcopists performing cervical biopsies, method of cervical biopsy, interval timing to report cervical biopsy in days and the cervical biopsy result.

Statistical analysis

Data was collected using Excelicare and exported to Microsoft Excel (Excel V.16.59, 2022). JASP software (JASP V.0.16.1, 2022) was then used to calculate descriptive statistics and the Mann-Whitney U test was used to compare the mean time results following the Shapiro-Wilk normality test which found the data to be non-gaussian in distribution. P values <0.05 were considered statistically significant.

Results

A total of 6379 cervical smear results were processed from September to November 2020 compared to 7155 in 2019 indicating an 11% reduction in the total number of cervical smears collected in 2020. Of those patients with an abnormal cervical smear result and therefore referred to colposcopy, 158 patients were included from 2019 and 85 patients from 2020 giving a total cohort of 243 patients. This is a 46% reduction in the number of patients referred to colposcopy with an abnormal cervical smear result in 2020 (See Figure I).

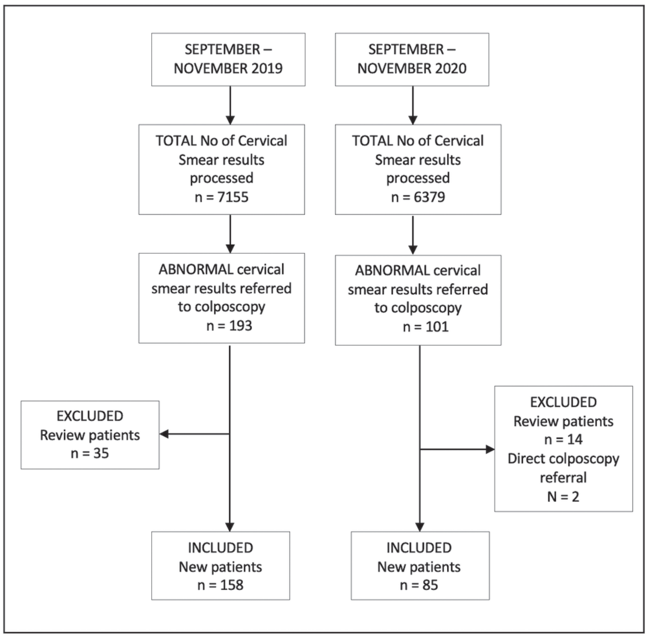

Figure I: Formation of the study cohort

Presenting Smear

The most common presenting smear result for both 2019 and 2020 was a borderline result with positive high-risk HPV. (See table IA). There was a 6.4% decrease (P 0.16) in moderate dyskaryosis results and a 9.1% increase (P 0.06) in severe dyskaryosis results in 2020 compared to 2019 but no statistical significance was found in the frequencies of individual presenting smear results.

The mean time from smear collection to colposcopy attendance for all smear grades in 2019 was 124 days (see table IB). For high grade results the mean time was much less, as moderate dyskaryosis, severe dyskaryosis and potential invasive disease had mean time intervals of 46 days, 56 days, and 25 days respectively (P <0.01). In 2020 the mean overall time interval from smear collection of all grades to colposcopy attendance was 75 days, showing a 40% overall decrease in mean time to colposcopy in 2020 (P <0.01), with mean time intervals for moderate dyskaryosis and severe dyskaryosis of 57 and 69 days respectively. There were no presenting smears with potential invasive disease identified in the 2020 cohort. This is a mean increase in time between smear collection and colposcopy review of 11 days and 13 days for moderate and severe dyskaryosis respectively between 2019 and 2020.

Presenting Smear Results	Year 2019	Year 2020	P Value	Total
Borderline Changes	63 (39.9%)	34 (40%)	0.98	97
Glandular	2 (1.3%)	1 (1.2%)	0.95	3
HPV Only	1 (0.6%)	1 (1.2%)	0.65	2
Inadequate	2 (1.3%)	0 (0%)	-	3
Mild Dyskaryosis	42 (26.6%)	22 (25.9%)	0.91	65
Moderate Dyskaryosis	25 (15.8%)	8 (9.4%)	0.16	33
Negative	1 (0.6%)	1 (1.2%)	0.65	2
Severe Dyskaryosis	19 (12%)	18 (21.1%)	0.06	37
? invasive disease	3 (1.9%)	0 (0%)	-	3
Total	N = 158	N = 85	-	N = 243

Table IA: Presenting Smear. Results of presenting smears in September-November 2019 and 2020.

Presenting Smear	Time to report smear (days)		P-Value	Smear to Colposcopy Interval (days)		P-Value
	2019	2020		2019	2020	
Inadequate	27	N/A	N/A	214	N/A	N/A
Negative	28	38	0.3333	157	83	<0.0001
HPV Only	21	38	1	141	77	1
Mild Dyskaryosis	32.5	41.5	0.0051	160.5	68.5	<0.0001
Borderline Changes	36	39	0.7763	161	67.5	<0.0001
Moderate Dyskaryosis	21	35	0.0190	43	57	0.0098
Severe Dyskaryosis	21	33.5	0.0033	41	56	0.0083
Glandular	28	38	0.3333	40	49	0.3333
? Invasive Disease	17	N/A	N/A	28	N/A	N/A

Table IB: Presenting smear. Median time to report presenting smear (days) and median time interval from presenting smear to colposcopy review (days) in September-November 2019 and 2020.

Cervical Biopsy

The most common method of cervical biopsy was excisional biopsy in both 2019 (38%) and 2020 (43.5%). No statistical significance was seen between the method of cervical biopsies between 2019 and 2020 (see Table IIA). The most common cervical biopsy result for both 2019 and 2020 was cervical intraepithelial neoplasia (CIN) 1 however, a 6.5% increase of CIN 1 was seen in 2020. There was a 2.8% reduction of CIN2 and a 2.7% reduction of CIN3 in 2020 compared to 2019 but no statistical significance was found between the individual cervical biopsy results between 2019 and 2020 (See Table IIB).

Method of Cervical Biopsy	Year 2019	Year 2020	P Value	Total
Directed Biopsy	55 (34.8%)	31 (36.5%)	0.7963	86
Excisional Biopsy	60 (38%)	37 (43.5%)	0.3991	97
Multiple directed biopsies	41 (25.9%)	14 16.5%)	0.0922	55
Other	2 (1.3%)	3 (3.5%)	0.2359	5
Total	N =158	N = 85		N = 243

Table IIA: Cervical Biopsy. Method of cervical biopsy at colposcopy in September-November 2019 and 2020.

Cervical Biopsy	Year 2019	Year 2020	P Value	Total
CIN 1	53 (33.5%)	34 (40%)	0.3168	87
CIN 2	23 (14.6%)	10 (11.8%)	0.5446	33
CIN 3	45 (28.5%)	22 (25.8%)	0.6655	67
Cervical Cancer	1 (0.6%)	2 (2.4%)	0.2469	3
Cervicitis	1 (0.6%)	0 (0%)	-	1
Fibroid	0 (0%)	1 (1.2%)	-	1
HPV Only	9 (5.8%)	5 (5.8%)	0.9526	14
Inadequate	0 (0%)	1 (1.2%)	-	1
No CIN / HPV	25 (15.8%)	8 (9.4%)	0.0855	33
Polyp	1 (0.6%)	2 (2.4%)	0.6547	3
Total	N = 158	N = 85		N = 243

Table IIB: Cervical Biopsy. Results of cervical biopsies in September-November 2019 and 2020.

	Time to report biopsy (days)		Time to inform patient (days)	
	2019	2020	2019	2020
Median	36	10	6	5
Mean	50	14	10	7

	P
Time to report biopsy	< .001
Time to inform patient	0.004

Note. Mann-Whitney U test.

Table IIC: Cervical Biopsy. Time to report cervical biopsy (days) and time to inform patients of the result (days) in September-November 2019 and 2020.

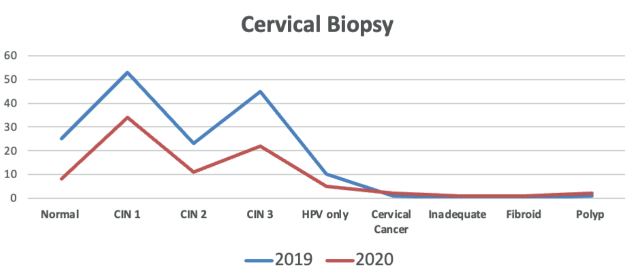

Figure II: Comparison of cervical biopsy results of patients attending colposcopy in September to November 2019 and 2020

Discussion

This retrospective cohort study identified a 46% reduction in the total number of colposcopy referrals following an abnormal cervical smear result during the COVID-19 pandemic with only 85 new patient referrals during the

3-month period at the peak of COVID-19 compared to 158 patients the previous year. This could be attributed to the postponement of routine invitations to the cervical screening programme with an 11% reduction in the overall total number of smears processed in 2020. This raises concern regarding the implications of delaying cervical screening within the asymptomatic population as it may lead to a reduction in early detection and treatment of cervical cancer. As stated above, the cervical screening programme success relies on at least 70% of women attending for cervical screening[11] and this data suggests that this was compromised during COVID-19. Not only does this affect the potential severity of disease in women attending colposcopy in the long term but also produces a backlog of women requiring routine screening following the reintroduction of the cervical screening programme.[4]

Primary and secondary care services are likely to struggle with capacity to facilitate the number of women requiring routine screening and colposcopy assessment if an abnormal result is obtained.[5] At a primary care level, reduced access to cervical screening services may arise because of the need to implement alternative services, including the vaccination programme, whilst trying to recover from existing difficulties. In secondary care, even if routine screening is increased to facilitate the backlog of patients, colposcopy services rely on trained accredited BSCCP colposcopists for which there are a limited number.[4] To train more BSCCP accredited colposcopists will take time and further resources and is not a short-term solution to address the potential backlog of patients following the reintroduction of routine cervical screening. Therefore, primary care, colposcopy services, and laboratory facilities in secondary care are likely to struggle to facilitate the increase in patients due to the reintroduction of routine screening.[5]

The most common presenting smear result both pre and during COVID-19 was a borderline result. The categorical data suggests that patients are more likely to present with severe dyskaryosis during the COVID-19 pandemic with a 9.1% increase and a 6.4% decrease in those presenting with moderate dyskaryosis. However, no statistical significance was found in the overall frequency of individual presenting smear results in 2020 compared to 2019 suggesting that there was no immediate impact on the severity of presenting disease following the postponement of the cervical screening program. Concern remains regarding the long-term effects on the success of the cervical screening programme which relies on screening the asymptomatic population at regular intervals to detect pre invasive disease.[5]

There was a mean increase of 6 days to report the presenting smear result but there was a significant reduction of 88 median days ($P<0.001$) in the time interval from cytologic recognition of an abnormality on the presenting smear and arrival at colposcopy in 2020 (152 median days 2019 to 64 median days 2020), representing over a 2-fold reduction in waiting times for colposcopy review. The concern lies, however, in the specific time delays for high grade smear results with an increase of 14 days ($P = 0.01$) and 15 days ($P = 0.01$) for moderate and severe dyskaryosis respectively to attend colposcopy in 2020. This has the potential to impact the treatment pathway for patients as high grade results require timely assessment and treatment to prevent invasive disease. Furthermore, there was a reduction of 36 mean days to report the cervical biopsy results in 2020 ($P<0.001$). This could have a positive impact on the overall patient experience with a reduction in patient anxiety in response to receiving an abnormal cervical smear result. This also ensures timely investigation and diagnosis of cervical disease in 2020 during COVID-19.

To our knowledge most of the published literature on the impact of COVID-19 on the cervical screening programme is international and provides service provision strategies to prevent harm from the postponement of services due to COVID-19 based on a hypothetical harm caused. This study assessed the impact of the postponement of the cervical screening program within a large United Kingdom (UK) health and social care trust and therefore gives insight into the potential effects on patients requiring colposcopy services. There is limited data in the literature on the affects and potential difficulties for the future within the UK and this study is the first within a Northern Irish population. Limitations of this study include the relatively small numbers overall and the follow up time, as only those patients during the peak of COVID-19 were captured. More work is needed in the years following the recovery from COVID-19 and the reintroduction of the cervical screening programme to assess the long-term impact of the potential backlog of patients,[4] waiting times and severity of disease outcomes.

Conclusion

COVID-19 has infiltrated every health care service within the UK and the cervical screening programme has not been immune to this. The cervical screening program within the UK has been praised for its success with the absolute disease burden of cervical cancer being well below that of breast and colorectal cancer.[4] The postponement of routine cervical screening because of COVID-19 poses significant risk to this success which relies on screening at regular intervals to prevent patients presenting with advanced disease.[5] Not only is there now a risk of patients with high grade disease having a longer waiting time for colposcopy review, but there is also a predicted increase in the number of patients who will require routine screening, producing a potential backlog of patients.[4] As stated previously, numerous recovery strategies have been suggested to help aid the recovery from this temporary delay in cervical screening. These include self HPV testing,[7,9] which has a higher negative predictive value than cytology,[4] the use of telemedicine,[8,9] and age-related risk-based strategies.[4,7] A risk-based strategy seems to be the most effective option for the cervical screening program to recover [4,7] and would include inviting patients deemed to be at highest risk of developing cervical cancer first and extending the screening interval for those women at lower risk thereafter.[4,12]

Abbreviations

HPV = Human Papillomavirus

WHO = World Health Organisation

BSCCP = The British Society of Colposcopy and Cervical Pathology

NIECR = Northern Ireland Electronic Care Record

CIN = Cervical Intraepithelial Neoplasia

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Clinical Paper

Ask an FY1 'Expert' - Peer Assisted Learning in Smoothing the Transition from Medical School to Clinical Practice

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BACKGROUND

The transition from medical school to clinical practice has long been regarded as a stressful transition and is associated with high levels of anxiety and burnout among trainees(1–6).

The anxiety and stress are secondary to a complex mix of factors including shift work, increased workload, increased responsibility, a shift in working relationships and in their professional identity.

A systematic review seeking to understand how prepared UK medical graduates are for practice and the effectiveness of workplace transition interventions noted that in many aspects of this difficult transition medical students have not been well prepared by their training institutions. These aspects include multidisciplinary team working, understanding how the clinical environment works, time management, clinical reasoning and making diagnoses (4).

Whilst induction, shadowing and assistantships are of some benefit, graduates continue to be unprepared in many areas for this transition with it generating high levels of stress and burnout, particularly for those individuals with an anxious disposition (1). Considering this and in order to address the unmet and difficult-to-reach areas of unpreparedness, there is a need for a novel approach to help smooth the transition into clinical practice. This is not only important for junior doctor well-being but also for patient safety(7,8).

Peer Assisted Learning (PAL) is defined as "the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions" (9). PAL has the potential to address some of the challenges associated with the transition from medical school to clinical practice. Its strengths are based on the use of teachers with experience, empathy, and expertise specific to the challenges of the transition. For instance, they can help with issues relating to the formation of their professional identity, the provision of practical and emotional support for trainees, and creating a non-judgemental environment where anxieties can be explored more openly(10,11). Some of the key strengths PAL brings to assisting in this transition are cognitive and social congruence, with their value being demonstrated in supplemental PAL teaching programmes such as Lockspeiser et al(12). Cognitive congruence refers to the ability of a peer to teach at an appropriate level approaching the subject matter with a shared or similar understanding(13). Social congruence then refers to a willingness to engage with the peer in an authentic and sincere manner(13,14).

The peer-assisted perspective is important in the induction process as medical technology and structures are constantly changing and therefore experts in the current challenges facing those about to transition are those who are going through or have just transitioned. The recent COVID pandemic made this particularly pertinent as the normal healthcare and organisational structures were in constant flux.

AIMS

Our goal was to smooth the transition for final-year medical students as they stepped into clinical practice using PAL in two main ways:

1. By reflecting on our own experience of the transition identifying catch points of particular difficulty. Our goal was then to develop a "bespoke teaching programme" to pass on our learning in these areas expediting and soothing their learning experience.
2. Creating a relaxed environment encouraging social congruence and facilitating the development of professional identity while establishing freedom to explore their anxieties. This allows the student to discuss topics they would not feel confident or appropriate to bring to a superior or supervisor, stimulates discussion and helps the student process the learning at a deeper level.

METHOD

We carried out a pilot study of PAL for final year medical students on their final year assistantship at the Western Health and Social Care Trust (a final placement with opportunity

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to shadow a Foundation Year 1 (FY1) doctor and grow in confidence in completing the ward work of a FY1 doctor). We wanted to assess the feasibility and carry out an initial assessment of its effectiveness in improving the levels of preparedness of graduates transitioning from medical school to clinical practice.

A FY1 focus group of doctors identified 6 aspects of the transition from medical school to professional life. The doctors were selected for having had different experiences of the transition, from doctors native to the area who had studied abroad and had not been previously exposed to the hospital, doctors who were not local but studied at the medical school, international doctors who had started with no prior knowledge of the hospital structure or medical school, and finally doctors who were local and studied at the medical school. The focus group elicited from personal experience, areas that had not been fully addressed in their undergraduate training or Trust induction. The areas identified were as follows: The role of a FY1 doctor, preparing for nightshifts, working with nurses, well-being and managing stress, finances and e-portfolio.

A wider perspective was sought from a larger group of FY1s. A pre-course survey established baseline data from a group of 30 final-year students who were currently doing their final-year assistantship. This survey used a self-reported measure of how prepared the students felt in 5 of the areas we identified before asking for their input into areas of concern or anxiety they wanted to address. Six 30-minute teaching sessions were then developed incorporating all input received. These were scheduled by the Western Trust Medical Education Department over the lunch breaks of the FY1 doctors leading the sessions. Of note their breaks were extended to ensure an adequate rest period). Sessions were in the student's free time with attendance not being compulsory. The sessions were then delivered in a comfortable environment with an emphasis on designing a safe space. In order to create this environment we delivered the session over food/coffee and were sitting around a table together. The sessions were structured as a discussion, avoiding formal presentations or didactic teaching and by addressing and treating the students as contemporary colleagues. Iterative evaluation of each session was sought with dynamic response to individual feedback. A post-course survey was completed to measure self-reported sense preparedness and identify areas for improvement. This was in the form of free text questions followed by statements of preparedness with which they could agree or disagree or remain neutral.

CONTENT OF SESSIONS

The role of a FY1 doctor: Detailed description of day-to-day responsibilities and shift structure, how this differs from medical to surgical jobs, how to hand over and how to meet your FY1 responsibilities most efficiently within the hospital structure and processes.

Preparing for nightshifts: Common worries, preparation pre and post nights, responsibilities, prioritisation, escalation and common scenarios.

Working with nurses: Understanding the differences in responsibilities, priorities and culture, Common clash points and how to deal with them and the importance of communication.

Wellbeing: Physical and mental strain of starting F1, supporting colleagues, recognising when you need a break, managing chaos: organisation and prioritisation, post-work anxiety and 'switching off'.

Finances: Pay, tax, student Finance, locums, medical unions and pension.

E-portfolio: Understanding *TURAS, ARCP requirements & the FY1 curriculum and Career progression (*Online e-portfolio platform for demonstrating competencies as required by the FY1 Curriculum).

RESULTS

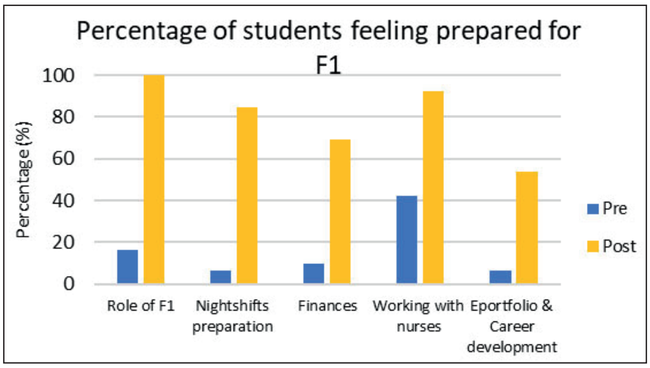
Our pre-course survey was completed by all 30 students completing their assistantship at the time. The post-course survey was completed by 13 of the participants.

In response to the question "How do you feel about starting FY1?", 70% responded by describing feeling "nervous", "scared" or "underprepared". In response to the statement "I understand the day-to-day role of an FY1 doctor" only 16% agreed or strongly agree with this statement. In the post-course survey, this increased to 100%. In response to the statement "I feel prepared for working nightshifts as a Fy1 doctor" only 6% responded with agree or strongly agree with the statement increasing to 85% in the post-course survey. In response to the statement "I understand the UK Foundation Programme ARCP requirements" only 6% agreed or strongly agreed, increasing up to 54% in the post-course survey. When asked about working with the multidisciplinary team 42% had a positive response increasing to 92%. When asked about the salary of a junior doctor and the expenses they should expect 10% responded positively increasing to 69%. When asked what the students would most like to learn or have covered at the sessions the majority responded with issues that we already were planning to incorporate into one of the 6 sessions. Common themes included work-life balance, general tips for being an effective FY1, prioritising jobs, coping with stress, CV building, rotas and annual leave, expectations from seniors and the multidisciplinary team, ward politics and ward cultures, who to approach for support and dealing with nights.

Key findings:

All areas saw significant improvements in self-reported preparedness.

The session with the biggest increase in self-reported preparedness (16% to 100%) was the "Role of a FY1 doctor".



100% of participants found the teaching programme helpful in their preparation for practice.

DISCUSSION

This pilot study showed that PAL can be facilitated for final-year medical students transitioning into clinical practice. It also showed that PAL can be a method of improving levels of preparedness for graduates transitioning from medical school to clinical practice. It received high levels of positive feedback from both students and the medical education staff at the Western Health and Social Care Trust.

The strengths that PAL offers in this difficult transition practice include the experience of support for trainees, the building of professional identity and teaching from "experts" in dealing with the challenges of the transition. All of these have been shown to help relieve student anxiety, smooth the transition, and contribute to doctor well-being and patient safety. Another strength of PAL is the individual nature that it allows with tailoring specific both to the student, the teacher and the institution involved. This not only allows flexibility for different personalities and individuals to express and discuss their concerns but allows effective navigation for particular challenges in each hospital, its context, and the culture of its working environments.

This study has several limitations. The evaluation does not provide insight into the student's experience after their transition into professional life at the start of F1 and so fails to assess if the transition was truly smoothed. Additionally, there is no control group for comparison. The results were gained through survey feedback to tutors known to the students throughout the teaching programme. Students may have responded more positively in a natural desire to express appreciation and goodwill towards their tutors. The survey response was low at 43%. This may have introduced a response bias where the most enthusiastic students were the primary ones to respond. Furthermore, it can be expected that trainees as they make this transition would naturally become more comfortable with their job over time, particularly as they complete their assistantship. While the improvement in how prepared they felt about 'the role of the Foundation doctor' is striking it is not clear to what degree the improvement is attributable to our course or to the final year assistantship given that they were completed simultaneously.

The trainees undergoing this transition were Queen's University Belfast (QUB) medical students following the universities assistantship curriculum, based on GMC advice for curriculum design. It is therefore reasonable to expect similar results elsewhere in the UK. However, the sample size is small and has only been conducted in hospitals within Northern Ireland. Hence the generalizability of the success of this study to other contexts and cultures is uncertain. Furthermore, the identification of the unmet learning requirements in the medical curriculum for doctors as they make this transition was drawn from a small number of doctors in a 3–4-week time frame. The focus group and discussion were therefore more of a snapshot of doctors' reflections of their transition at a stationary point and from a limited perspective in the Western Trust of the Northern Ireland Deanery. Following individuals through the transition at multiple points in time and from several different perspectives would be more effective in uncovering the layers of complexity involved in this difficult and complex transition.

RECOMMENDATIONS

Healthcare Trusts and Medical Schools should consider the use of PAL to help final-year students transition into clinical practice. It can add value as a formal part of Trust induction, or the final year assistantship as final year students get expert advice from those who have just experienced the challenges of the transition. They also develop their professional identity and experience support from their colleagues as they step into training.

More formal and detailed qualitative work using focus groups similar to the one described in this paper delving into the gaps in the current medical education curriculum for final-year medical students as they make this transition would be invaluable. Well-planned longitudinal qualitative research will provide a much greater understanding of the challenges experienced and possible solutions while a more robust measurement of the effectiveness of PAL in addressing these gaps in training will create more reliable and generalizable data for medical schools and healthcare trusts alike.

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Clinical Paper

A Six Year Experience of a National Leadership Fellowship in Northern Ireland: Achieve, Develop, Explore Programme for Trainees (ADEPT)

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Key Words
Leadership, Fellowship

ABSTRACT

Introduction

The Achieve, Develop, Explore Programme for Trainees (ADEPT) Clinical Leadership Fellowship Programme was established in response to growing recommendations to underpin healthcare reconfiguration in Northern Ireland with a collective leadership strategy. The fellowship combines a leadership development programme with a project carried out within a host organisation. With the fellowship now in its sixth year, a need was identified to assess its impact on the fellows' leadership skills, career choices, achievements, and views on both the fellowship and how to develop future leaders.

Methods

Demographic data for all ADEPT fellows was held centrally through Northern Ireland Medical and Dental Training Agency (NIMDTA) and assessed anonymously. A mixed-methods questionnaire was composed using Smart Survey. Likert scale questions were designed to determine the extent to which participants believed ADEPT supported their development of strong and exemplary elements of the nine dimensions of the NHS Healthcare Leadership Model. The questionnaire was distributed electronically to all ADEPT alumni in November 2021 and remained open for 4 weeks.

Results

There have been 46 ADEPT fellows to date (72% female; all fellows were white). ADEPT fellows were most commonly from Psychiatry (33%), Paediatrics (17%) and Obstetrics and Gynaecology (15%). There were 19 responses from the alumni cohort of 46 (41%). 75% of respondents reported that their project resulted in publication, presentation or award. Leadership skill development was identified as best in "Evaluating Information" and "Engaging the Team", whereas skills in "Sharing the Vision" and "Developing Capability" saw less improvement. The majority felt that the fellowship had been useful in securing their position as a consultant or general practitioner and 50% went on to pursue senior leadership positions.

Conclusion

The ADEPT Clinical Leadership Fellowship delivers effective leadership training as measured by the nine domains of the NHS Healthcare Leadership Model. It provides value for host organisations through the projects undertaken and by developing doctors who are more likely to engage in future formal leadership roles. ADEPT alumni saw the value in their leadership experience and felt it should be embedded in standard postgraduate training schemes to reach a wider audience.

Introduction

In response to the increasing challenges faced by the Health and Social Care (HSC) system in Northern Ireland (NI) the executive commissioned an independent panel of national and international experts in 2016 with the remit of producing a set of underpinning principles for healthcare reconfiguration.[1] This report set out an ambitious vision of how healthcare could be transformed to better serve the current and future population of NI. A key component of implementing these recommendations was creating a collective approach to leadership.[1] This was recognised in the Department of Health's "Delivering Together" 10-year plan which called for an HSC-wide leadership strategy to develop collective leadership behaviors across the system.[2] The four components of this strategy went on to consist of: leadership being the responsibility of all, shared leadership in and across teams, interdependent and collaborative system leadership and compassionate leadership.[3]

On this backdrop of both organisational and leadership reform, the Northern Ireland Medical and Dental Training Agency (NIMDTA) developed the Achieve, Develop, Explore Programme for Trainees (ADEPT) Clinical Leadership Fellows' programme in 2015.[4] This is a Clinical Leadership Fellows' programme available to specialist, general practice and dental trainees in NI as an out of programme experience year. It is recruited competitively through a scored application followed by a 3-part interview. The fellowship programme is

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coordinated with host organisations, who sponsor fellows to work with organisational leaders in an apprentice model and undertake a self-directed project. This leadership training was provided by the HSC Leadership Centre until 2020, which supported achievement of an Institute of Leadership and Management (ILM) level 7 Certificate. The 2021-22 cohort joined the Faculty of Medical Leadership and Management (FMLM) Fellow Scheme. Both structures focus on developing personal leadership skills aligned to the nine domains of the NHS Healthcare Leadership Model.

Leadership theories have developed and changed over the years. The Leadership Framework was published in 2011 and brought forward the concept of leadership not being restricted to people who hold designated leadership roles. Storey and Holti carried out a review on behalf of the NHS Leadership Academy exploring leadership research in various fields, including the health service. They sought to re-think the interrelationship between distributed leadership and the expected behaviours of those in formal leadership positions. Both publications informed the NHS Healthcare Leadership Model which aimed to reflect what is known of effective leadership, the values of the NHS and the expectations of today's leaders.[5, 6] This model outlines nine dimensions of leadership behaviour which are all weighted equally in their value to an individual's leadership role.

The need for leadership development throughout all aspects of healthcare has never been more evident with the additional burdens on service delivery and staff well-being created by the COVID-19 pandemic. With the programme now in its sixth year and many of its graduates consultants or general practitioners (GPs), a need was identified to assess how the fellowship has shaped participant career performance, decision making and views on leadership training. This study aimed to determine the demographics of ADEPT Fellows and evaluate the impact of the fellowship as perceived by ADEPT alumni on career goals, choices, achievements, and development of leadership skills related to the NHS Healthcare Leadership Model.

Methods

Baseline demographic information was obtained confidentially from the NIMDTA trainee database regarding gender, medical school, stage of training and specialty. A mixed methods questionnaire with four sections containing seventeen open, closed and Likert scale questions was composed using Smart Survey.

The first section explored key demographics including gender, ethnicity, medical school, specialty and career stage at the time of undertaking the questionnaire and ADEPT. It also identified the fellows' host organisations and project outcomes, including succession planning and accolades such as publications, presentations or prizes.

The second section focused on self-assessment of leadership skills before and after the ADEPT Fellowship as defined by the nine dimensions of the NHS Healthcare Leadership Model. Each dimension is separated into qualities and behaviours progressing through essential, proficient, strong and exemplary categories. Likert scale questions were designed to determine the extent to which participants believed ADEPT supported their development of strong and exemplary elements of the nine dimensions.

The third section explored career planning and progression with an emphasis on whether ADEPT experience influenced both decision making and achievement. Holding a formal leadership position or undertaking further training was particularly questioned. The final section concentrated on suggestions for improvement for the programme and ideas on how to incorporate leadership training into postgraduate education.

The questionnaire was emailed to all ADEPT alumni in November 2021**.** Two reminder emails were sent prior to closure of the questionnaire four weeks later. The project team divided the questionnaire into sections for review as per the above layout. Demographic data was collated. Quantitative data generated from responses to Likert scale and closed questions was analysed using descriptive statistics. Qualitative data generated by free text responses underwent thematic analysis.

Results

Section 1- Demographics and Project

A total of 46 trainees have undertaken ADEPT since 2015, with each year group varying in size from between 8 to 12 fellows. Demographic data for the entire alumni cohort was available through NIMDTA's database. 33 (72%) were female and 13 (28%) were male. All fellows were white. 38 (83%) of the fellows graduated from Queens University Belfast (QUB) medical school. Training grades were represented from ST3-ST7 with the predominance in ST5 or above (78%). Trainees came from a range of specialties with psychiatry (33%), paediatrics (17%) and obstetrics and gynaecology (15%) being the most predominant.

19 (46%) fellows responded to the survey. 4 (21%) respondents did not matriculate with QUB in keeping with the total cohort. Host organisations varied each year and from the respondents, 8 were based within an HSC Trust with a further 5 within NIMDTA. The remaining 6 were based in various organisations including the Department of Health, General Medical Council (GMC) and Regional Quality Improvement Agency (RQIA). Project themes included training quality, simulation-based education, human factors, digital health, patient safety and regional or local clinical quality improvement. At the end of their ADEPT year, 60% of respondents had the opportunity to continue with their project in some way. Many projects had natural succession planning with another ADEPT fellow taking over the following year. Some respondents had hoped to remain involved in their project but found this impractical due to returning to clinical work and training in a different Trust,

or the other demands on their time such as professional membership examinations. Others reported utilising special interest sessions to remain involved with their project, and one respondent reported that they still remained involved as a consultant. 75% of those who responded to the survey stated that their fellowship project had resulted in a publication, presentation or award, with two fellows having all three. Articles were published in the British Medical Journal (BMJ) Leader, the Ulster Medical Journal and the BMJ Simulation and Technology Enhanced Learning. The fellows' work was recognised nationally at conferences held by the FMLM, the Royal College of Paediatrics and Child Health and the Institute for Healthcare Improvement International Forum. Notable accolades included nominations for college trainee of the year and the development of guidance adopted by the Department of Health.

Section 2 – Leadership Development

63% of respondents did not perceive themselves as leaders before ADEPT. Those that did saw their leadership capabilities mostly in clinical contexts as part of 'service provision', but not within 'service development'. A minority had previously held roles such as Trainee Representative and were seeking to develop their leadership skills through the fellowship, but the majority had limited experience in leadership outside the clinical realm and admitted they did not understand leadership in healthcare before the fellowship. They learned that 'everyone within the team…can be a leader.'

The Likert scale assessment mapped to the nine domains of the NHS Healthcare Leadership Model is discussed below. Table 1 provides a summary of these findings.

Inspiring shared purpose

Valuing a service ethos and behaving to reflect principles and values of the healthcare service.

100% of participants felt the leadership fellowship enabled them to reach this to a strong level, developing their resilience in the face of opposition. 84% were challenged beyond their remit and took personal risk.

Leading with care

Demonstrating the essential personal qualities of a healthcare leader, understanding team needs and fostering safe and supportive environments.

79% agreed or strongly agreed the fellowship allowed them to develop their skills in creating a positive team atmosphere. Only 11% felt they had not learnt to hold other leaders responsible for the wellbeing of their teams.

Evaluating information

Information handling and planning improvement.

100% agreed or strongly agreed that the fellowship enabled them to learn how to initiate change and improve pathways or systems.

Connecting our service

Gaining knowledge and understanding of how people, teams and organisations work in an integrated and collaborative way.

84% of participants agreed the fellowship promoted skills of adaptability and flexibility. 95% felt they could build effective strategic relationships for interpersonal and systems working because of their participation in the fellowship.

Sharing the vision

Sharing the vision involves communicating an attainable, inspiring and common purpose.

32% neither agreed nor disagreed that they could develop a compelling framework for success after the fellowship, however, 79% felt they could describe future changes to inspire hope amongst those they were leading.

Engaging the team

Promoting the value of individual contributions in improving outcomes for services and their users.

100% agreed or strongly agreed that they improved in building a team to deliver a shared purpose. Only 5% disagreed that they would be able to encourage team working and ambition.

Holding to account

Ensuring that team members work to meet common goals, providing support and effective feedback, and enabling members to maintain ownership of their performance.

95% looked for opportunities to celebrate high standards in their team and 89% learned to advocate and promote an ambitious mindset.

Developing capability

Developing personal skills to meet future challenges and service needs, and to role model personal development to team members.

74% felt they could develop activities to build long term capability through mentoring or career aspirations and 68% agreed they would be able to take a strategic approach to developing people.

Influencing for results

Building relationships and understanding to foster positive networks and achieve desired outcomes.

84% felt the fellowship enhanced their ability to create shared agendas with stakeholders and agreed their skills to act as organisational ambassadors were improved.

Overall, following completion of the ADEPT Fellowship, most participants noted an improvement in all nine domains with some areas seeing more progression than others. Most development was seen in "Evaluating Information" and

"Engaging the Team", whereas skills in "Sharing the Vision" and "Developing Capability" were less improved.

Section 3 – Career choices and achievement

74% of respondents are currently working at consultant level with a mean time since their ADEPT fellowship of 4.7 years. Those who have not taken up a consultant post or remain in higher training completed ADEPT an average of 4 years ago. The overwhelming majority of respondents felt their participation in the ADEPT fellowship programme contributed positively to their overall career progression. A common theme was that the fellowship, "improved confidence and provided a great head-start for life as a consultant." Others felt that it, "offered something unique and broadened their horizons". When advancing through their training, former fellows indicated that they had been able to use their fellowship project to demonstrate personal skills in leadership, team-working and quality improvement (QI). They also indicated that the programme had provided them with a platform to gain insight into the inner workings of HSC Trust management systems. This offered them a unique talking point during their interviews to become consultants.

After completing their fellowship, most former fellows continued along their existing career path but each indicated that they felt better equipped with additional skills, new interests and further strengths. Some went on to adapt their job plans to include simulation-based education whilst others have actively promoted leadership, QI and innovative thinking within their team. A small number continued to develop their leadership skills by attending renowned courses such as the Scottish Quality and Safety Fellowship.

One respondent reported negative attitudes towards the fellowship on their return to training, with the specialty emphasising completion of training before the trainee would re-engage with their project interest.

Just under 50% of participants indicated that they undertook further leadership roles following completion of their fellowship. These included clinical leads, trust leads in both education and governance, societal and college representatives. However, most respondents went on to complete their training and hold active leadership roles as consultants and educational supervisors, suggesting that they were actively leading without appreciating their respective leadership skills and abilities.

Section 4 – Recommendations

All fellows agreed that they would recommend the ADEPT programme to a colleague. They felt it improved their leadership, management, QI, communication skills and enabled them to establish a wider network of contacts with a deeper understanding of systems and structures to drive change.

Respondents were generally very positive about the fellowship, but several themes emerged for potential ways to improve. Input from external organisations outside the healthcare sphere, such as Google, was recommended. It was suggested the programme would benefit from more emphasis on innovation, entrepreneurship, digital transformation, and collaboration with other leadership fellows from different regions. There was also interest in reconnect sessions to further build on learning from the year. There were several suggestions from participants who had undertaken ADEPT in its early years which have since been addressed, such as increasing the diversity of specialties of trainees involved and increasing group work.

Participants were asked how leadership lessons from ADEPT could be more effectively integrated into postgraduate medical education for all junior doctors. It was felt that all trainees should be able to develop leadership skills without taking a year out of training, such as protected time for higher trainees' special interests, which could be used for leadership development. It was felt there should be clear expectations laid out for all doctors in line with HSC Trust higher strategic planning, and more efforts should be made to integrate leadership experience into day-to-day clinical jobs. It was felt that all junior doctors would benefit from some of the teaching offered to ADEPT Fellows, and that it could be useful to hold regular webinars by inspirational leaders that could be attended by junior doctors across Northern Ireland.

Discussion

The overall impression from this review was of impactful gain on an individual and organisational level. Individuals used the year to add value to their curriculum vitae with the ascertainment of publications, presentations and awards. Furthermore, many respondents felt that they had a unique point of view for consultant interview which led to successful appointment. Leadership skills as defined by the nine domains of the NHS Healthcare Leadership Model saw improvement across the board. Host organisations gained through project development and increased engagement in formal leadership roles going forward. One respondent reported instigation of a new service within their first year as a consultant. These positive experiences are reflected in evaluations of other UK based leadership fellowships. [7, 8, 9]

A recurring theme in the healthcare sector is that doctors who have gone through years of formal training often fail to recognise the innate leadership skills they have acquired on their journey to becoming a consultant.[10] This was evident within the ADEPT group as the majority did not identify themselves as leaders prior to undertaking the fellowship. Distinguishing, nurturing and reframing these skills for use outside of the clinical area are important considerations when developing leadership training in healthcare. One of the main identified barriers to this was the lack of protected time to pursue personal leadership development during a clinical rotation. The increasing pressure being felt within the healthcare system and resultant pressure on senior clinicians' time is likely the foremost reason for the relatively low survey response rate of 46%. Furthermore, the COVID-19 pandemic has created a surge in research activity whilst simultaneously limiting data collection techniques. This has resulted in increased survey dissemination with many suffering a "survey fatigue" characterised by lower response rates. [11]

There also remains a stigma towards leadership fellowships with one respondent reporting negative attitudes towards what was seen as their "year off" by members of their specialty, perhaps reflecting a lack of appreciation for the fellows' new skill set which has been previously observed.[12] Fellows felt medical leadership training embedded in standard training would be more ideal to reach trainees and combat such sentiment especially with evidence showing benefit to both individual performance and patient outcomes.[13] The increased engagement of ADEPT alumni in leadership roles as a consultant is likely to affect attitudes going forward.

An interesting observation was the relatively lower improvement in the leadership skill of "Sharing the Vision". NI's political instability often leads to uncertainty in healthcare reform and policy. This national level leadership is crucially important for setting the culture within the HSC and may influence how the fellows perceive organisational vision.[12] The fellows' suggestions for improvement included connecting with external organisations for leadership inspiration. Notably examples came from the technology world, rather than safety critical areas such as airline or nuclear industries wherefrom many healthcare lessons have been drawn. Google has invested heavily in creating a corporate vision statement and culture, which are redefining how many people engage with their work.

Another recommendation from the ADEPT alumni was for increased networking with other leadership fellows across the UK. Without shared learning, Northern Ireland can become isolated from its counterparts across the water. The 2021 ADEPT scheme has paired with FMLM as its leadership training body and brings together fellows from Northern Ireland, England, Scotland and Wales. This new collaboration will provide those links and networking opportunities that will continue to grow with time.

Conclusion

The ADEPT Clinical Leadership Fellowship delivers effective leadership training as measured by the nine domains of the NHS Healthcare Leadership Model. It provides value for host organisations through the projects undertaken and by developing doctors who are more likely to engage in future formal leadership roles. ADEPT alumni saw the value in their leadership experience and felt it should be embedded in standard postgraduate schemes to reach a wider audience.

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Clinical Paper

The Long-Term and Late Effects of the Diagnosis and Treatment of Colorectal Cancer

Andrew Carlile, Tim McAdam

Background

Colorectal cancer is the 3rd most common cancer in the UK. Through early detection and improved treatments more people than ever are surviving this disease. Surgery, chemotherapy and radiotherapy are the cornerstones of management, but these invasive treatments can cause a number of long-term and late effects. Using qualitative methods this study aimed to; explore peoples experiences with long-term and late effects of colorectal cancer, how these effects impacted on their lives and how participants managed them.

Method

Semi-structured qualitative interviews were conducted with 15 participants who had completed curative treatment. Interviews were transcribed and analysed using the Framework approach to identify themes and categorise text data.

Results

Many long-term and late effects of colorectal cancer were explored including bowel dysfunction, sexual dysfunction, pain, metastatic disease and cognitive dysfunction. These effects caused distress for many and were linked to depression and social limitation. Previously unidentified long-term effects included decreased libido and joint pain which respondents attributed to chemotherapy. Anxiety and depression were found predominantly to be late effects. Management of long-term and late effects was varied with healthcare services often ineffective.

Conclusion

Insight gained into long-term and late effects and their treatment, indicated that many participants suffered because of their after-effects and had unmet health needs. It adds a qualitative insight into an area where quantitative research has already been conducted. Improvements in cancer follow-up could offer opportunities to effectively identify, manage and monitor these effects. Further interventional studies are required to develop effective care pathways to achieve optimal care.

Key words

Colorectal cancer, long-term effects, late effects, after effects, Survivorship

Study Title: The long-term and late effects of the diagnosis and treatment of colorectal cancer

Colorectal cancer is the fourth most commonly diagnosed Cancer in the United Kingdom (third in the world). With an incidence of over 41,000 it makes up 11% of all Cancer diagnosed each year[1]. The mainstay of curative management remains surgical resection, chemotherapy and/or radiotherapy[2]. These treatments can have long-term and late effects on a patient that can impact almost any aspect of their lives. Through improved screening and treatments, the 10-year survival for Colorectal Cancer has more than doubled with over 50% of patients alive 10 years after diagnosis[1]. Consequently, there is now an ever-increasing number of people who have survived and are living with the aftereffects of the disease and its treatment. Many now consider Cancer as a chronic illness however this doesn't universally fit as it tends to be an acute pathology that is curatively treated followed by a sequela of aftereffects[3].

These Aftereffects are usually divided into long-term and late effects.

- Long=term effects have been defined as those that develop during active treatment or immediately after the completion of treatment and persist longer than six months after the completion of treatment[4].
- Late effects are defined as those effects that are not present or identified during or after treatment but may develop months or years later due to the effects of the disease or treatment on organ systems or psychological processes[5].

It has been well documented that patients have many long-term and late effects due to colorectal cancer. These effects are greatly affected by cancer site, operative technique and the use of chemotherapy and/or radiotherapy. Fatigue, altered bowel habit, sexual dysfunction[6] are some of the physical effects and there is also a significant mental impact with regards to Anxiety and Depression[5]. These papers suggest that the is a need to identify and better understand the physical and psychological consequences of this disease and its treatment.

There is also evidence that patients are unaware of these after affects and this can impact on their management[7].

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Hence, using qualitative methods, this study aimed to identify long-term and late effects of colorectal cancer and explore in-depth participants experiences with them, how these aftereffects impacted on their lives, and how participants chose to manage these effects.

METHODS

Participants were recruited consecutively from oncology and general surgery clinics at Aberdeen Royal Infirmary from January 2013 to March 2013. Patients were eligible if they had a diagnosis of colorectal cancer Dukes A, B or C, had completed curative treatment at least 6 months previously and were over 18 years old. Patients were excluded if they were unable to give informed consent or unable to understand English.

With informed consent, one of the Authors interviewed patients in their own homes. They underwent semi-structured interviews based on a topic guide. This covered their journey from their initial management onwards, to illicit any effects from their treatment. The topic guide then prompted patients to discuss these symptoms further and how they managed them. Finally a checklist that was created following a literature review was used to explore any symptoms not realised while going through the topic guide. The digitally recorded interviews were then transcribed verbatim.

Data was analysed using the framework approach. Data collected was sorted, organised and classified using the software package NVivo 9. The data was organised to key themes and analysed for emergent categories, patterns, connections and comparisons.by the Author and two other researchers independently reviewed the data during analysis.

We aimed to recruit patients until data saturation was achieved and we felt we had a fully and comprehensive account of patients after affects.

RESULTS

Participant characteristics

Our varied sample of 15 participants consists of a range of ages, diagnoses and treatment modalities Tab1. No new themes were developed from the last three interviews so at this time we were satisfied that data saturation had been achieved.

Three overarching themes were developed with respect to the aims of the project. They were ‘long-term effects’, ‘late affects’ and ‘management’. These formed the basis for organising emerging themes and preconceived themes.

Long-term effects

Bowel dysfunction

Bowel dysfunction was the most frequently identified long-term effect of colorectal cancer described by 13 participants.

For those who had a stoma almost all described in detail their distaste for the stoma. The most common reason for disliking the stoma was the bag leaking and the anxiety around this.

Table 1

Age at Interview	**Number of people**
40-50	1
51-60	3
61-70	8
80+	3
Dukes Classification	
A	3
B	4
C	8
Operation	
Right Hemicolectomy	5
Transverse colectomy	1
Left Hemicolectomy	2
Anterior resection	7 (5 ileostomy)
Adjuvant Treatment	
Chemoradiotherapy	3
Chemotherapy alone	9
Radiotherapy alone	0

> *“I was scared to go out with it encase it burst or something you know. I had gone to (location) with a friend, and I had gone to (location) and it had burst… I was really terrified.” (Participant 1)*

A negative effect the stoma had on participants’ body image was also identified.

> *“…but you (consultant) can wear normal clothes, normal skirt how come I can’t (said to a consultant)? So as I said its one of those things that you get irritated by…” (Participant 15)*

As well as the social limitations that the stoma brought.

> *“…it did stop me, it was a sort of exercise class in the water which I used to quite enjoy, I had to stop that…” (Participant 1)*

Faecal incontinence

Several subjects described faecal incontinence as a long-term effect of colorectal cancer and associated their condition with surgery.

> *“I was frequently incontinent, sometimes when I was walking home from town when everything was bad.”*

> *“It is very difficult to have a good social life you know we had a really good social, and we love walking and we did socialise… at times unbearable.” (Participant 5)*

This highlighted a link between incontinence and decreased social functioning, as the fear of an incident inhibited them from enjoying activities.

Faecal frequency

All participants who reported faecal frequency associated it with surgery. For the majority this was manageable, however, for one participant faecal frequency had a debilitating affect.

> *"My frequency of bowel movement now was 10–20 times a day, I kept a journal. One particular 24-hour period it was 30 times but I was, it was always incomplete and hugely painful never passed and I had to twist my body, rock and all kinds of things to try and pass stools, not successfully." (Participant 5)*

Feacal urgency

The severity of feacal urgency varied between participant but if severe it resulted in the participant becoming house bound and depressed.

> *"I felt that every time I stood up I had the sensation that I needed to go to the toilet."*
> *"…I said this is really getting me down because I'm house bound…" (Participant 15)*

Pain

Participants were asked about their experiences with pain and two clear sub-themes appeared. Pain originating from the abdominal region and pain felt elsewhere in the body. In all, two thirds of participants identified pain as a long-term effect.

> *"I mean I have had pain, abdominal pain" (participant10)*

For some the pain was severe and debilitating, being described as like putting "*a sword up your rectum*", forcing some to retire from their job and lead to *"suicidal thoughts"*.

Two participants reported pain in other parts of the body, especially in or around joints. Chemotherapy was identified as the cause in all participants. One participant clearly linked her chemotherapy treatment as the cause for recurrent flares of her rheumatoid arthritis. Another described pain at joints where he had previous injuries.

> *"…but also I've noticed old injuries are sore. Like I snapped this thumb, I smashed it up in a motorcycle accident and its really painful here (pointing to his* metacarpophalangeal *joint). My knee, which I smashed in the same motorcycle accident, is painful as well… " (Participant 3)*

Sexual dysfunction

Several participants were concerned by a reduction sexual function. Some associated sexual effects with chemotherapy and others with surgery.

> *"Ooh yes, ooh yes your libido disappears" (Participant 15)*

Yeah less sex drive than I used to have, definitely that's for sure and less sensitivity (of the penis). (Participant 2)

Chemotherapy caused decreased sex drive and increased penile sensitivity while participants with a stoma revealed apprehension towards sex due to fear of the bag bursting and body image issues.

> *"(During sex) I had to be careful not to put weight on my stomach when I had the stoma bag, I was very conscious in case it burst" (Participant 15)*

LATE EFFECTS

Depression

Many participants described times of *"feeling down"*, in a *"black area"* or getting *"very down"*. Some attributed it to other aftereffects such as bowel dysfunction or the presence of a stoma as a cause.

> *"and I was getting very down because I couldn't leave the house" (Participant 15)*

This participant also emphasised that limitations in social interaction and activities of daily living as contributing factors for depression.

Complications resulting from surgery had a negative impact on a participant's mood. One participant had a liver resection resulting in the removal of her gallbladder and worsening Gastroesophageal Reflux.

> *"My bile, I'm always very acidic anyway but it became so bad it was actually interrupting my sleep and making me very depressed." (Participant 4)*

For another it was the return of their long-term and late effects that resulted in her becoming severely depressed.

> *"I did become clinically depressed and had to actually be admitted privately… I felt I was going downhill again physically and I'd come so far you know." (Participant 4)*

Anxiety

Although no participants stated they suffered from anxiety disorder many did reveal periods of anxiety. These periods were strongly correlated to follow-up clinic appointments, follow-up scans and receiving results of the scans. At all these moments it was the fear of recurrence or the fear that something was '*not right*' that caused anxiety.

> *"I got my scan and then a letter came in on the Thursday to go for one the following week and I just panicked, just totally panicked so ended up going to my GP in you know floods of tears…" (Participant 11)*

Management

The range of long-term and late effects, coupled with the breadth of severities, has resulted in aftereffects being managed in various ways.

Self Management

Numerous participants simply *"lived with"* their condition. This attitude of "*acceptance*" was particularly pertinent regarding bowel dysfunction.

> *"I have had problems with the bowels… you start to accept what you're left with and you start to appreciate that you can't be perfect again, you know, you'll never be just perfect again."(Participant 10)*

Lifestyle changes

Several participants altered their lifestyle by eating more healthily, increasing the amount of exercise they undertook or by using self-help book. Some made dietary changes either to combat bowel dysfunction while others altered their diet to include more fruit and vegetables to improve their health.

> *"(In response to constipation management) yes but I eat figs, figs are the answer honest to goodness… far better than Fybogel or any of these moggy things." (Participant 14)*

Participants used vitamin D and E to help manage depression and peripheral neuropathy to good effect.

> *"This lady had put herself onto vitamin E which she felt helped with the tingling so I thought right I'll give it a go as well and emm I've been taking it ever since just one tablet a day." (Participant 11)*

However there is always a risk associated with self-management as patients can develop potentially harmful habits and beliefs.

> *"I have one book that proposes you don't get chemotherapy, eat your way to fitness…" (Participant 3)*

General Practitioner

A third of participants consulted their GP to manage the aftereffects such as painful joints, abdominal pain, numbness, chilblains, constipation, anxiety and Insomnia

> *"My GP was excellent she gave me various pain killers and muscle relaxants… GP came into my house and he gave me a laxative and an Enema." (Participant 4)*

Some patients were reluctant to attend their GP as they believed they were unwilling or unable to manage the long-term and late effects.

> *"I've never been asked by my GP or by the consultant about any mental issues" (Participant 3)*

Some had difficulty communicating to their GP how they were feeling, and that this impacted on the care she received.

> *"I couldn't seem to get, my GP to understand how I felt, I just couldn't seem to get that across" (Participant 5)*

Consultants

Consultants treated many aftereffects of colorectal cancer and consequently didn't feel the need to go to the GP; however, when they went for routine follow-up appointments, they took the opportunity to reveal their aftereffects. Subsequently oncologists and general surgeons are accredited for managing many participants' aftereffects such as constipation and diarrhoea.

> *"(In response to a question asking who recommended Movicol) No it was recommended by the hospital actually… I think it was the Oncologist so it was, I'm sure yes." (Participant 1)*

Discussion

Current Literature has Identified that many patients suffer from Gastrointestinal side effects following treatment[8], Pain[9] and sexual dysfunction as has been highlighted in this study. Anxiety and Depression also affect many cancer survivors[5]. These late and long-term affects of colorectal cancer were not only numerous, affecting different parts of the body but also had far reaching consequences on patients mental health and social mobility. Due to qualitative[6] nature of the data we also began to see how surgery lead to more gastrointestinal issues whereas as chemotherapy lead to more problems with pain and sexual dysfunction. It was also clear that these physical aftereffects had a significant impact on the patients mental health with many reporting that they felt depressed and/or anxious following treatment.

The nature of the aftereffects suggest that primary care could have an important role in addressing many of these. Adams et al[10]. looked into views of cancer care reviews in primary care. They again showed there was unmet needs due to cancer aftereffects and suggested that some participants did not want to bother the GP with aftereffects (this was also identified in our study).

The NICE guideline on colorectal cancer[2] also emphasizes the importance of long-term and late effects of colorectal cancer. They encourage specific information on aftereffects to be provided to patients. Yet, in our study many participants were given little or no information on potential aftereffects. Subsequently they were unaware of some, and some turned to unreliable sources that gave potentially harmful advice such as "don't have chemotherapy, eat your way to fitness".

This growing body of evidence has led to a report by the The National Cancer Survivorship Initiative (NCSI)[11] looking at the management of cancer survivors. They stated "that failure to manage the consequences of treatment can have a significant impact on patients and on the National Health Service (NHS), so it makes sense to design and commission pathways and services that minimise the consequences of cancer treatment and address unmet needs among patients".

In light of our study and this report we propose that;

- All colorectal survivors should be monitored during and after treatment for long-term and late effects for as long as necessary.
- Long-term and late effects our study revealed such as bowel dysfunction, sexual dysfunction, pain and psychological issues are all conditions that are primarily managed in primary care and GPs would have a wealth of experience in dealing with many of them.
- Information should be provided on what to expect after treatment, what is considered normal and when patients should seek further medical advice. Clear and effective communication of information can improve wellbeing and quality of life.

Recently there has been increasing evidence for the use of patient reporting outcomes measures (PROM) and eHealth apps to support cancer patients' care during treatment[12] as well as online Holistic needs assessments[13,14]. They can help identify aftereffects and allow Doctors to provide effective and long-term follow up of patients.

Advances in colorectal cancer treatment more and more people are now surviving this disease. This has created a new cohort of patients with healthcare needs that this study has endeavoured to shed light on. The experiences of these patients ranged from a simple annoyance, to severely debilitating and even life threatening.

This study has also highlighted that many survivors had unmet health needs as a consequence of these aftereffects. The results indicated a need for improved management and healthcare structures to be implemented, to effectively identify, manage, and support colorectal cancer survivors who are left with the long-term and late effects of their disease.

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Medical Ethics

Eugenics

Michael Trimble

> "The wisest thing in the world is to cry out before you are hurt. It is no good to cry out after you are hurt; especially after you are mortally hurt. People talk about the impatience of the populace; but sound historians know that most tyrannies have been possible because men moved too late. It is often essential to resist a tyranny before it exists. It is no answer to say, with a distant optimism, that the scheme is only in the air. A blow from a hatchet can only be parried while it is in the air."

So G.K. Chesterton begins his book *Eugenics and Other Evils*.[1] This work was written in the early decades of the twentieth century and articulates Chesterton's concerns regarding the nascent science of eugenics. At this point in history all that is proposed is selective breeding. Chesterton offers the following definition.

> "Eugenics, as discussed, evidently means the control of some men over the marriage and unmarriage of others; and probably means the control of the few over the marriage and unmarriage of the many,"

Chesterton did not look further forward to imagine what possibilities scientific advances might bring to this endeavour and may not have anticipated how swiftly this particular axe might fall. Not many years later, Aldous Huxley would publish his *Brave New World*.[2] The story opens with a description of the workings of the Central London Hatchery and Conditioning Centre where the next generation of genetically determined embryos are incubating. Whilst Huxley had an impressive imagination, he did not foresee how rapidly things would change. He had set his story hundreds of years in the future but in his reflections on the tale in *Brave New World Revisited,*[3] he laments the speed at which his predictions were being fulfilled. However, even then, the scientific advances that would facilitate the Central London Hatchery were still the stuff of science fiction and science fiction has continued to riff on the themes afforded by genetic testing and genetic manipulation. For example, the film *Gattaca*[4] portrays a not too distant future where genetic testing of new-borns is routine and those who do not come up to expectations are deemed to be "invalid". This status blights the individual's future – why invest time and effort training someone who has less potential than their peers? Such discrimination is, of course, illegal, but laws can be worked around and the film follows one man's attempt to live beyond discrimination based on his perceived genetic potential. *Blade Runner*[5] and its sequel *Blade Runner 2049*[6]are set in a dystopian future where extreme genetic manipulation facilitates the creation of human replicants – biological beings like humans (and often with superior intelligence and strength) but significantly not humans– who serve as slaves. It may be easy to dismiss such films as pure fantasy but, like Huxley, we may be surprised at the pace of change.

Let us start with genetic screening. It is part of NHS England's Long Term Plan to be the first national health care system to offer whole genome sequencing as part of routine care. The target is to sequence 500,00 whole genomes by 2023/24. Initially this will be targeted but the debate has begun regarding the appropriateness of its use in untargeted screening of newborns or in the antenatal period.[7,8]

You may recall from years ago being told about the Wilson and Junger criteria for screening, as adopted by the World health Organisation.[9]

The second criteria states that there should be a treatment for the condition and the eighth there should be an agreed policy on whom to treat. One of the problems raised by such screening is the discovery of disease for which there are no current therapies and the identification of risk factors for poor health. With regard to serious conditions for which there is no cure, it is sobering to reflect on the current state of play with existing antenatal screening. For example, in the UK following a diagnosis of Down syndrome, 90% of pregnancies are terminated;[10] in Iceland the figure is closer to 100%. With regard to identification of risk factors, it is not hard to image the insurance industry wishing to utilise such data – perhaps initially with encouragement of lower premiums for those willing to provide evidence of a favourable genetic profile voluntarily.

What about gene manipulation? There are broadly two types of gene manipulation; somatic and germ-line. Somatic manipulation affects only the individual patient and is generally deemed to be less controversial. Recent news stories have covered treatments for rare genetic diseases such as leber congenital amaurosis,[11] and metachromatic leukodystrophy,[12] and trials are ongoing with treatments for other conditions.[13] Germline gene editing had previously been considered off limits as any changes would be passed down to succeeding generations but, with the development of CRISPR (clustered regularly interspaced short palindromic repeats) gene editing techniques, it has become technically feasible and, as might be expected, there is an ongoing push to move the boundaries. In 2015 news reports began to circulate that researchers at China's Sun Yat-sen University had used CRISPR technology to correct the genetic defect that causes beta-thalssaemia. These early stage embryos were not implanted but there was considerable unease that a line had been crossed.[14,15] However, in 2018 it emerged that the same researchers had edited the genome of embryos in the hope of making them immune to HIV and these embryos had been implanted and carried to term. It is interesting to note that the development of technology often occurs without substantive debate as to whether it should exist. And even if, as in the case of germline gene editing, the prevailing consensus has been that it should not, it only takes a rogue individual to bring the technique into being. One can trace the trajectory of opinion from the initial response that there should be a moratorium on such research to simply questions about safety and governance in the development and utilization of the procedure. The question rapidly changes from *is it moral to pursue this goal* to that of *how should we pursue it?* [16]

In *Playing God,*[17] John H Evans describes how the early "thick", substantively rational debates about issues in bioethics, where ends and means were both considered, became "thinner", formally rational deliberations, where the ends are assumed as a given, and the means only are debated. In this story, there is a power-play by the scientists who are uncomfortable with the challenge posed to their assumed jurisdiction over the ethics of experimentation by theologians and philosophers. To prevent direct public scrutiny of the issues, government advisory commissions were formed, and these required a formally rational framework to function. In turn this led to an assumption of an overlapping consensus about the ends of such research and formally rational debate, i.e., deliberation simply about the means. At an early stage the now ubiquitous Georgetown form of Principlism (autonomy, beneficence, non-maleficence, and justice) became the only game in town for the consideration of bioethical issues. Other broader ethical principles, such as the inviolability of human life, were discounted. Evans' structured history provides a helpful context for H Tristram Engelhardt's more personal reflection on these events in *After God* [18]. Initially part of the vanguard of bioethics, Engelhardt now sees the discipline as "demoralised and deflated". Another personal view from one inside the debates is that of Leon Kass [19] Whilst Kass, writes as a scientist, the spiritual aspects of the subject are not far from his mind as evidenced by his frequent reference to CS Lewis's *Abolition of Man*.[20] Kass also cites Jacques Ellul's *The Technological Society*. [21] Ellul believed that modern society is dominated by *technique*. Technique is more than simply the application of technology as to achieve an end. Technique is ultimately focused on the concept of efficiency, creating an artificial system which "eliminates or subordinates the natural world." It is easy to see how this fits with the culture of formal rationality adopted by the bioethicists. Whilst Ellul was prepared to some extent to give *technique* as applied to medicine the benefit of the doubt, Postman takes a more skeptical (and probably more realistic) view.[22] New techniques continue to be developed. Recent headlines have informed us of "man-made embryo[s] grown in a lab for the first time" using stem cells from mice. The researchers are quoted as saying that this "opens the door to similar studies with human cells, though there are many regulatory hoops to get through first."[23] In the UK these regulatory hoops come in the form of the Human Fertilisation and Embryology Act 1990. As I write, the Human Fertilisation and Embryology Authority are holding a consultation into the potential revision of the act which would see them granted increased powers; powers that include the licencing of experiments on embryos using germline editing. Much of such debate occurs away from public consciousness and we only hear of the outcomes once the deliberations have ended. To return to the beginning, the axe is in the air and has begun to fall. Should we cry out before it is too late?

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6. Villeneuve Denis. Blade Runner 2049. California: Warner Bros; 2017.
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Letters

Testing for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): the case of an accidentally swallowed Rapid Antigen swab

Editor

Oropharyngeal and nasopharyngeal specimens obtained by swabbing are pivotal in both rapid antigen tests and the PCR tests for the diagnosis of acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Self-performed tests are widely available and performed globally. This unique case highlights some unusual risks associated with self -performed testing kits and challenges that can be faced with managing these patients in the medical setting.

A 14 year old boy was referred to General Surgeons having accidently swallowed a self-performed Rapid antigen COVID-19 testing nasopharyngeal swab. He presented with no symptoms; denied any abdominal pain or difficulties breathing. His observations were within normal range.

Radiological options for determining position were limited due to the swallowed swab being made entirely of plastic and non-radio-opaque. Conservative watchful waiting was considered and discarded as an option due to risks of perforation. An urgent OGD was considered the most appropriate diagnostic and therapeutic option and consent was obtained.

An urgent OGD was performed with the intention to locate and retrieve the swab. The presence of the swab was confirmed in the third part of the duodenum and retrieved at the maximum reach of the endoscope (see figure 1). The patient had remained clinically stable following the procedure and was discharged home that same day. He required no further follow up but had to isolate having tested positive for SARS-CoV-2.

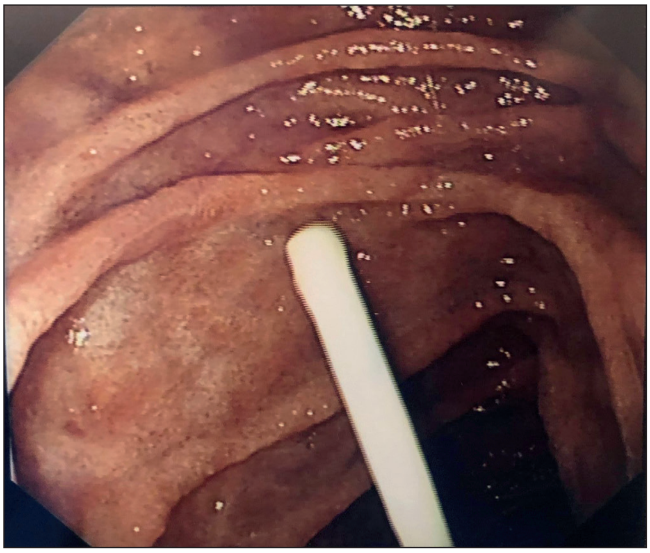

Figure 1: Endoscopic image showing the ingested swab in the 3rd part of the duodenum.

There is limited literature regarding the SARS-CoV-2 sampling complications [1]. A case study by Molnár et al. (2021) explored the management of a 45 year old male patient who had ingested a 15cm swab, similar to this case, with retrieval achieved via endoscopy in Budapest [2]. Other complications highlighted from previous cases studies involved breakage of the swab tip; leading to a foreign body in the nasal cavity, the oesophagus [3] and in the bronchus following sampling through a tracheostomy [4]. The length of Rapid antigen test swab in this case was approximately 8cm compared to the usual length of 15cm specimen samples mainly distributed for testing.

Through the pages of your Journal, we wish to emphasise:

- Correct sampling technique is crucial to avoid false negative test results and further spread of the SARS-CoV-2 virus [5].
- Education in correct technique for completing self-performed tests is one method to reduce complication rates. Knowledge regarding differences between nasopharyngeal and oropharyngeal swabs would also provide benefit.
- The significance of reading and following instructions enclosed in every test pack should be reinforced to the public. This education should also form part of the vaccination and self-testing media campaigns.

Challenges faced in this case included limited imaging methods that could identify the location of the swab prior to performing the OGD. If the swab was labelled with a radiopaque material, the location could have been identified sooner and an appropriate management plan targeted. This would be a useful consideration to the future design of swabs to reduce serious complications requiring further extensive surgery if left to advance beyond the duodenum.

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Curiositas

QUIZ 1

This Photo by Unknown Author is licensed under CC BY-ND

1. Name the song and recording artist that this photo represents.
2. What medical condition is it about?

Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).

QUIZ 2

Free to use under the 'Pixabay' license. No attribution required.

1. Name the song and recording artist that this photo represents.
2. What medical condition is it about?

Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).

QUIZ 3

Photograph by A. Vage, no copyright.

1. Name the song and recording artist that this photo represents.
2. What medical condition is it about?

Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).

QUIZ 4

This Photo by Unknown Author is licensed under CC BY-ND

1. Name the song and recording artist that this photo represents.
2. What medical condition is it about?

Aaron Vage (PhD Student, Centre for Medical Education, Queen's University Belfast).

CONSIDER CONTRIBUTING TO CURIOSITAS?
Please refer to *'Curiositas: Guidelines for contributors'* http://www.ums.ac.uk/curiositas.html and email EditorUMJ@qub.ac.uk with your ideas and submissions.

Curiositas: Answers

QUIZ 1

1 & 2. "Ballad of the Boy in the Red Shoes," appeared on Elton John's 2001 album, "Songs from the West Coast." It has been suggested that John used his musical platform to tell the lyrical story of a dancer dying from acquired immunodeficiency syndrome (AIDS)[1], whilst showing his contempt for the Regan administration's response to the human immunodeficiency virus (HIV)/AIDS endemic of the 1980s[2]. The vast number of outcomes associated with HIV/AIDS can be attributed to the radical immune system deficiency that occurs in those infected. Mononucleosis (otherwise known as glandular fever) is commonly seen in patients presenting with a primary HIV infection, and with the passing of time many will fall victim to opportunistic infections (candidiasis, cytomegalovirus) that can signify the onset of AIDS[3]. Whilst there is no cure for HIV/AIDS, modern medicine has made significant advances in terms of slowing the disease's progression; protease and integrase inhibitors, such as atazanavir and elvitegravir, block replication and disrupt genetic transfer of the virus, respectively. According to the U. S. National Library of Medicine, there are currently over 500 active HIV/AIDS-related clinical trials across the globe[4].

[1] Songfacts, LLC. 2022. *Ballad of the Boy in the Red Shoes by Elton John* [Internet]. (cited 2023 Mar 7). Available from: https://www.songfacts.com/facts/elton-john/ballad-of-the-boy-in-the-red-shoes

[2] Songmeanings. 2022. *Ballad of the Boy in the Red Shoes Elton John* [Internet]. (cited 2023 Mar 7). Available from: https://songmeanings.com/songs/view/3458764513820549663/

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QUIZ 2

1 & 2. "Afire Love," featured on Ed Sheeran's second studio album, "Multiply." In a 2014 interview with The Telegraph, Sheeran revealed that he wrote the song about his grandfather's twenty-year battle with Alzheimer disease, and the emotional turmoil experienced as his grandfather slowly succumbed to its effects[1]. Alzheimer disease is a neurodegenerative condition, characterised by an insidious foray of symptoms that ultimately impair cognitive functions such as attention, memory and reasoning. The most common symptom seen in patients presenting with Alzheimer's is episodic short-term memory loss. The degree to which executive functioning is impacted during the early stages of the disease can range from mild to severe[2] and, to date, there is no known cure for Alzheimer's. Nonetheless, there are currently two drug categories approved for the symptomatic treatment of the condition: cholinesterase inhibitors, which encourage interneuron communication by acting to elevate levels of the neurotransmitter, acetylcholine, and partial N-methyl D-aspartate (NDMA) antagonist memantine, which addresses memory deficits by antagonising NDMA glutamate receptors, thus normalising the glutaminergic system.

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QUIZ 3

1 & 2. The American jazz poet, Gil Scott-Heron, released "The Bottle" in 1974. Scott-Heron's profound lyrics act as a social commentary regarding alcoholism within the African American community of Northern Virginia in the 1970s[1,2]. Despite the global prevalence of alcohol use disorder, it's causes are incompletely understood. However, a number of factors such as cognitive function, environmental influence and social interaction are thought to play key roles in the progression of the condition[3]. The effects of alcohol misuse are wide reaching, impacting not only the drinker, but the healthcare system in which they inadvertently utilise. In their latest report, Public Health England released data showing that over 600,000 people within the country are dependent drinkers; further suggesting that up to 82% of these individuals still require treatment[4]. Whilst interventions like cognitive or dialectical behavioural therapy offer potential benefits in terms of management, there is much work to be done in the field of alcohol use disorder.

[1] Songfacts, LLC. 2023. *The bottle by Gil Scott-Heron* [Internet]. (cited 2023 Mar 7). Available: https://www.songfacts.com/facts/gil-scott-heron/the-bottle

[2] Romig. 2011. *Gil Scott-Heron's "The Bottle"* [Internet]. (cited 2023 Mar 7). Available: https://www.newyorker.com/news/news-desk/gil-scott-herons-the-bottle

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[4] Public Health England. 2021. *Alcohol dependence prevalence in England* [Internet]. (cited 2023 Mar 7). Available: https://www.gov.uk/government/publications/alcohol-dependence-prevalence-in-england

QUIZ 4

1 & 2. "Until it Sleeps" was released by Metallica in 1996. Frontman and lyricist, James Hetfield, penned the song as a means to come to terms with the death of his mother in 1979, from cancer[1]. In the book, "Justice for All: The Truth about Metallica," it is suggested that Hetfield was never told what type of cancer his mother had, due to his family's fervent belief in Christian Science[2]. With figures now showing that one in two people will encounter cancer at some point in their life[3], the disease really needs no introduction. Billions of pounds have been spent on cancer research over the years, and whilst much has been achieved in terms of treatment for specific cancers, the disease is the cause of death in 450 people per day in the United Kingdom alone[4].

[1] Nur Pervan M. 2021. The Message James Hetfield Hid In Metallica's Until It Sleeps [Internet]. (cited 2023 Mar 7). Available from: https://rockcelebrities.net/the-message-james-hetfield-hid-in-metallicas-until-it-sleeps/

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[3] NHS. 2022. *Cancer* [Internet]. (cited 2023 Mar 7). Available from: https://www.nhs.uk/conditions/cancer/ [Accessed: 07/03/2023].

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History

Thirty Nobel Prizes: Cavendish Crocodiles

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Running Title: Cambridge Physics
Key Words: Modus operandi

INTRODUCTION

On October 25, 1921 Peter Kapitsa[1,2,3] (Table 1) (Fig. 1) wrote to his mother referring to the future Lord Rutherford as a "Crocodile" (Fig. 2)[4,5,6]. Rutherford had advanced from his native New Zealand to Montreal, to Manchester, England, to head the Cavendish Laboratory at Cambridge University, succeeding Sir Joseph John Thomson[4,5,6,7,8,9,10,11] (Fig. 3). Rutherford was third in a series of thirty Nobel Prize winners from the Cavendish Laboratory (Table 1). Lord Rutherford died in 1937 of persistent abdominal ileus[12].

In 1952, as a Cambridge undergraduate reading Honours

Figure 1. Peter (Pyotr Leonidovich) Kapitsa, FRS (1894-1984), oil on canvas, 107.9 x 90.5 cm, 1926 by Boris Kostodiev (1878-1927). Gift of Anna Kapitsa, 1935, after their return to the Soviet Union. From the collections of the Fitzwilliam Museum, University of Cambridge, No. 1770, and reproduced with permission. Award of Kapitsa's Nobel Prize in Physics was postponed until 1978 (Table 1). Kapitsa returned to the Cavendish and Cambridge post World War II[2,3].

TABLE 1. NOBEL PRIZE RECIPIENTS FROM THE CAVENDISH LABORATORY, CAMBRIDGE[1]

RECIPIENT	YEAR	PRIZE
Lord Rayleigh	1904	Physics
Sir Joseph J. Thomson	1906	Physics
Lord Rutherford	1908	Chemistry
Sir Lawrence Bragg	1915	Physics
Charles Barkla	1917	Physics
Francis Aston	1922	Chemistry
Charles Wilson	1927	Physics
Arthur Compton	1927	Physics
Sir Owen Richardson	1928	Physics
Sir James Chadwick	1935	Physics
Sir George Thomson	1937	Physics
Sir Edward Appleton	1947	Physics
Lord Blackett	1948	Physics
Sir John Cockcroft	1951	Physics
Ernest Walton	1951	Physics
Francis Crick	1962	Physiology or Medicine
James Watson	1962	Physiology or Medicine
Max Perutz	1962	Chemistry
Sir John Kendrew	1962	Chemistry
Dorothy Hodgkin	1964	Chemistry
Brian Josephson	1973	Physics
Sir Martin Ryle	1974	Physics
Antony Hewish	1974	Physics
Sir Nevill Mott	1977	Physics
Phillip Anderson	1977	Physics
Pyotr Kapitsa	1978	Physics
Allan Cormack	1979	Physiology or Medicine
Sir Aaron Klug	1982	Chemistry
Norman Ramsey	1989	Physics
Didier Queloz	2019	Physics

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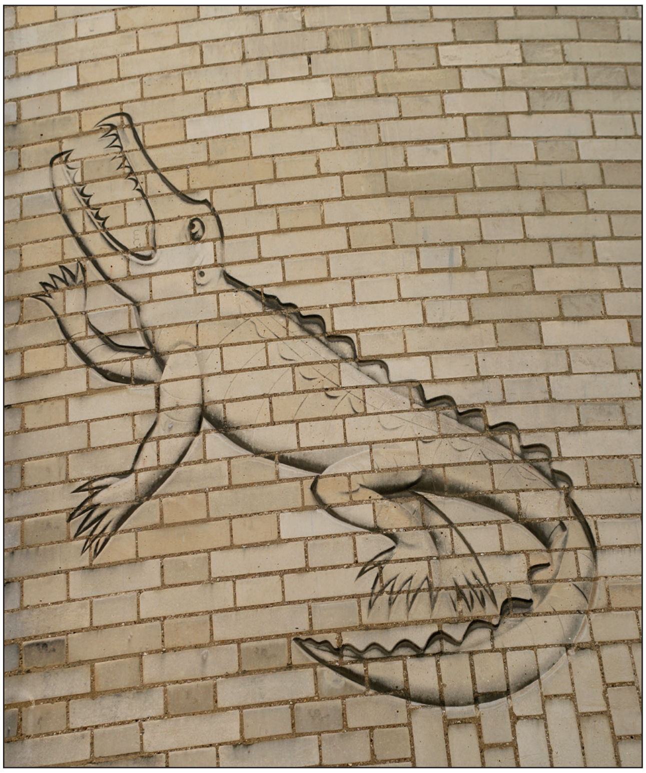

Figure 2. Crocodile on the outer wall of the Cavendish's Mond Laboratory, engraved by Eric Gill, 1933, courtesy of the Cavendish Laboratory, Cambridge. In 1933, the Cavendish's extension, the Mond Laboratory, was built for Kapitsa to continue his research into intense magnetic fields. Future Nobel Laureate Kapitsa commissioned the engraving of the crocodile—his nickname for Rutherford[4,5,6].

Natural Science Tripos Part 1, I[1] asked the future Sir Michael Stoker, my tutor, who or what was meant by "Crocodile" in this context[13,14,15,16]. Michael G.P. Stoker replied, "Choose a 'Crocodile' to approach donors and get funding. 'Crocodiles' when working should always test their equipment at different barometric pressures and temperatures. Electrical supply must be constant and gas supply stabile and of demonstrated purity. After acceptance of your first scientific papers, you should apply for new funding. If you were successful, then you were probably a 'Crocodile'."

SIR MICHAEL G.P. STOKER

Sir Michael Stoker became Professor of Virology, at University of Glasgow. Stoker served as Acting Director and then Director of the Imperial Cancer Research Fund (ICRF) Laboratories, London, for more than a decade[13,14,15,16,17]. My tutor visited Harvard on many occasions and advised on both Virology and treatment of cancer. Stoker arranged for my colleague Prof. Howard H. Hiatt, who headed the Department of Medicine at Harvard's Beth Israel Hospital from 1963 to 1972, to study advances in Oncology at the ICRF Laboratories[18,19]. After returning to Boston, Hiatt was a founding director of the Beth Israel's Cancer Treatment Division, and was appointed Dean of Harvard's School of Public Health[18,20].

Figure 3. Sir Joseph John Thomson (1856-1940), Cavendish Professor (1884-1919), later Master of Trinity College, Cambridge, President of the Royal Society (1915-1920), by Arthur Hacker (1858-1919). Oil on canvas, 90.2 x 68.6 cm. From the collections of the Cavendish Laboratory and reproduced with their permission.

While Master of Clare Hall (1980-1987), Sir Michael Stoker did much to expedite work at the Cavendish. Decades before, Prof. V.E. Cosslett and his Cambridge colleagues, including Stoker himself, had greatly advanced electron microscopy[21,22,23]. This technology enabled progress in Virology and the development of vaccines for infectious diseases.

HARVARD UNIVERSITY EXPERIENCE

On the second weekend in May 1943, twenty-year-old Lembit Hans Laasberg and his young wife Irene had escaped from Estonia, their country of origin, in a flat-bottomed wooden boat. The Laasbergs had obtained their boat from the Forest Brothers[24]. They rowed through the shallows by night along the Estonian coast to avoid the additional mines and net barriers placed in the Gulf of Finland by Germany and Finland to block Soviet Submarines[25,26]. They eventually made their way to Finland and traveled to Sweden. Laasberg, who had studied Agriculture and Biology at Tartu University for a year, continued his education in Chemistry at Hermods Institute and the University of Lund in Sweden[27,28]. He then relocated to Gothenburg, Sweden, where he received a Chemical Engineering degree[28]. Later he was employed by an oil company. He would sometimes compare the analytic process for petroleum to that of human plasma.

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[1] This and other first-person references are to the first author.

In the late 1950s the Laasbergs emigrated to Canada where Hans continued graduate studies in Immunochemistry and Immunology at McGill University, Montreal, where Lord Rutherford had once been Professor of Physics[8,9]. By the mid-1960s they had emigrated to the United States. In 1967, I recruited Hans Laasberg from Tufts University to Harvard.

As our research program expanded on the Harvard Medical School campus, Laasberg's wide-ranging knowledge and advice was a treasured resource. He ran the Harvard Medical School Blood Gas Laboratory for two decades[29,30,31,32,33,34]. Laasberg corresponded with Cavendish Nobel Laureate Max Perutz[35] (Table 1) about the role of halothane and its interaction with blood[36,37]. Once, in 1969 when I was chairing a Harvard Medical School Meeting, Laasberg whispered to me that I was acting as a "Crocodile". Recalling Stoker's explanation from my Cambridge days, I understood the significance of this appellation (Fig.2).

Laasberg also mentored then Harvard researcher Susan E. Lynch, later physician and First Lady of New Hampshire for her Governor husband's four terms (2005-2013)[38]. Susan Lynch co-authored papers with bacteriologist colleague Dr. Gary C. du Moulin[39,40] (Fig. 4). Dr. Lynch served on the Board of Overseers of Dartmouth University's Geisel School of Medicine, and as paediatrician-First-Lady of New Hampshire promoted public health and nutrition initiatives[41,42]. As we celebrate the centenary of Hans Laasberg's birth in Rakvere, Estonia, the Biotechnology Lecture series he founded at Worcester Polytechnic Institute in Massachusetts continues his legacy[27].

In Harvard's Longwood Medical Area, Prof. John Enders was a great friend and fellow "Crocodile"[43,44]. After winning the Nobel Prize in 1954 with his Harvard colleagues for "Discovery of the ability of poliomyelitis viruses to grow in cultures of various types of tissue"[45], he went on to successful development of a measles vaccine, with the support of government, industry and private philanthropy[44,46]. His legacy continues in the Enders Building at Harvard's Boston Children's Hospital that bears his name.

Figure 4. Lembit Hans Laasberg, Ch.E. (1922-2014), left, with Gary C. du Moulin, Ph.D., then Assistant Professor of Microbiology, Harvard Medical School, at Beth Israel Hospital, Boston, 1987.

For two decades, L.H. Laasberg directed the Blood Gas Laboratory, where he mentored young scientists and encouraged support from area politicians and philanthropists with his scientific integrity and personal charm. Dr. du Moulin continues his distinguished career in academic and applied research, and retired as a Full Colonel from the U.S. Army Medical Reserve.

JOHN WHARRY DUNDEE AT HARVARD

Prior to my arrival at the Beth Israel Hospital on the Harvard Medical School Campus, I had been mentored at the Massachusetts General by Henry Knowles Beecher[47,48,49,50] jointly with John Wharry Dundee[51,52,53] (Fig. 5). Dundee and Beecher were impressive lecturers on Medical Sciences. Both Professors John W. Dundee and Henry K. Beecher were interested in the overuse of thiopental especially in shock. They lectured together in the early 1960s at the Massachusetts General Hospital on thiopentone's misuse after the Japanese attack on Pearl Harbor, Hawaii, in December 1941[54,55,56,57,58,59]. Beecher and Dundee's mentoring of junior faculty included tutorials on selection of the most effective journals in which to publish the results of research.

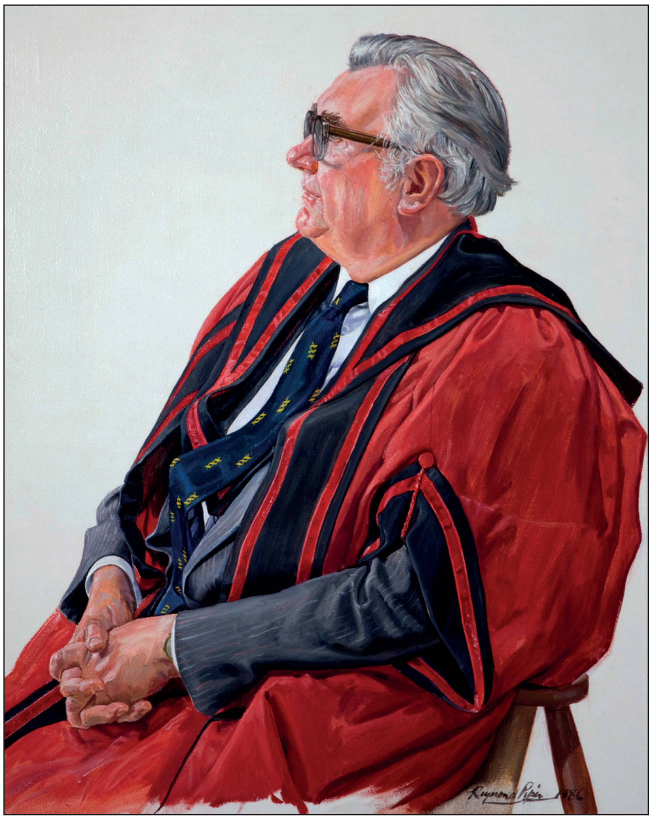

Figure 5. John Wharry Dundee, OBE, M.D., Ph.D., FFARCS, FFARCSI, FRCP, (1921-1991). Oil on canvas, 1986, 103 cm x 83 cm, by Raymond Piper (1923-2007). From the Portrait Collection of the Naughton Gallery, Queen's University Belfast, no. 174, and reproduced with permission. Photograph provided by Queen's University Belfast.

John Wharry Dundee claimed to have several close relatives living in the Boston area. Dundee was an excellent church organist who played at Christ Church, Cambridge, Massachusetts, where George Washington had sheltered while Boston was besieged during the American Revolution.

THE NATURE OF "CROCODILES"

One explanation of Kapitsa's designation of Lord Rutherford as "the Crocodile" was that he moved in one direction only—ahead-- and never looked back[10]. Tutor Stoker's 1952 explanation to me clarified some aspects of academic leadership that defined a "Crocodile" following the examples of Thomson[7] (Figure 2) and Rutherford[8,9,10,11] (Table 1). These included the ability to raise funds whether from industry, private philanthropy, or governmental funds; identification of exceptional scientists and other staff and their effective recruitment and training. Equally important are the interpersonal and managerial skills that promote both team-building and individual professional development. Optimization of grant-writing and in-depth knowledge of the world of academic publishing are key areas.

Figure 6. Dorothy Crowfoot Hodgkin, OM (1910-1994). Photograph by Walter Stoneman, half-plate glass negative, 29 June 1947. NPG x26009, © National Portrait Gallery, London and reproduced with permission. Nobel Prize Winner Hodgkin's formative contributions to X-ray crystallography revolutionized the manufacture of insulin and led to its wider availability. Quality control and therapeutics in the practice of Anaesthesia benefited from Hodgkin's discovery and implementation of x-ray crystallography.

A CAVENDISH ALUMNA AND "CROCODILE"

Dorothy Crowfoot Hodgkin (Fig. 6) (Table 1) was the sole awardee of the 1964 Nobel Prize in Chemistry for "her determinations by X-ray techniques of the structures of important biochemical substances"[60,61]. She attended Somerville College, Oxford 1928-1932, which assisted her with a research fellowship to be held for one year at Cambridge and one year at Oxford. Under the supervision of Professor J.D. Bernal, Cambridge, she was awarded a Ph.D. in 1934, after which she returned to Somerville College, Oxford, with First-Class Honours Degrees from both Oxford and Cambridge[60,62,63].

Figure 7. Dorothy C. Hodgkin, on May 20, 1971, the day of her installation, in Chancellor's robes of the University of Bristol, once worn by her predecessor Sir Winston Churchill. University of Bristol Photograph 1971, no. DM2705/Box6/L157E, reproduced with permission. The oil-on-canvas portrait of the Right Honourable Sir Winston Churchill, KG, OM, CH, MP, Chancellor of the University of Bristol 1929-1965, was painted in 1943 by Frank O. Salisbury (1874-1962), No. PCF 13 in the University of Bristol Portrait Collection.

Professor Crowfoot married historian Thomas Hodgkin in 1937. Her career as Official Fellow and Tutor in Natural Science advanced the teaching of Chemistry for the women's colleges at Oxford, including Somerville[60,62,63]. Her Oxford career advanced as she became University lecturer and demonstrator in 1946, Reader in X-Ray Crystallography in 1956 and Wolfson Research Professor of the Royal Society in 1960[62,63]. As "Dorothy, Mrs. Hodgkin" she received the Order of Merit in 1965[64].

Hodgkin raised funds for advanced X-ray apparatus from diverse sources such as the Rockefeller and Nuffield Foundations. The Rockefeller Foundation provided her Somerville College Laboratory with funding throughout World War II[62,63]. She and her trainees used x-ray crystallography to map organic molecules of increasing complexity[65,66,67,68], including insulin[69,70,71,72,73,74,75,76,77,78,79], penicillin and other antibiotics[80,81,82,83] and cobalamin, or vitamin B12[84,85,86]. Hodgkin's post-World-War II work on the analysis of the rhombohedral 47z insulin crystal with trainee Marjorie Harding resulted in improvements in the production of pharmaceutical insulin and its wider availability[70,71,72]. There were many notable visitors to her laboratory including the Braggs[11], J.D. Bernal[62,63], Dame Kathleen Lonsdale[62], and Cavendish Nobelist colleague Max Perutz[35] (Table 1).

Dorothy C. Hodgkin was elected Chancellor of Bristol University in 1970, where she actively served until 1988. This post had previously been held from 1929 to 1965 by Sir Winston Churchill (Fig 7), and from 1965 to 1970 by Henry Somerset, the 10th Duke of Beaufort[62,63]. Hodgkin promoted the peaceful uses of atomic energy by becoming president of Pugwash in 1975, at the request of Professor, later Sir Joseph Rotblat, KCMG[11,62,63,87]. Hodgkin's work demonstrates that greater advances in both Physiology and Pharmacology result from their close cooperation and complementary harmonization rather than scientific rivalry[88,89].

CONCLUSION

"Crocodiles" have contributed greatly to the success and stature of universities across the globe. Queen's University Belfast (QUB) "crocodiles" have included numerous distinguished individuals. For example, President and Chancellor Baron Ashby (1904-1992) recruited noted virologist George W.A. Dick to QUB, advancing the production and safety of polio vaccine[43]. Lady Ashby was also a distinguished scientist. Vice-Chancellor Sir David Lindsay Keir, L.L.D. (1895-1973) chaired the Northern Ireland Council for Orthopaedic Development during World War II [90]. Sir John Henry Biggart (1905-1979), Pathologist and Dean of QUB's Medical Faculty for 27 years, showed extraordinary leadership during World War II and later in assuring close cooperation between postgraduate medical education and the National Health Service[91,92]. Prof. Dame Ingrid V. Allen (1932-2020) was a pioneer in several areas of Neuropathology and established Northern Ireland's Regional Neuropathology Service[44]. All personified the requisite qualities for the highest standards of academic leadership in Science and Medicine. In the Humanities, Nobel Laureate Seamus Heaney contributed much through his poetry to our cultural standard of living on both sides of the Atlantic, and especially at Harvard[93,94]. In the century since Kapitsa's October 1921 letter to his mother[4], the "Crocodiles" of academia, at QUB and beyond, have improved technology, medical care and civilization worldwide.

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