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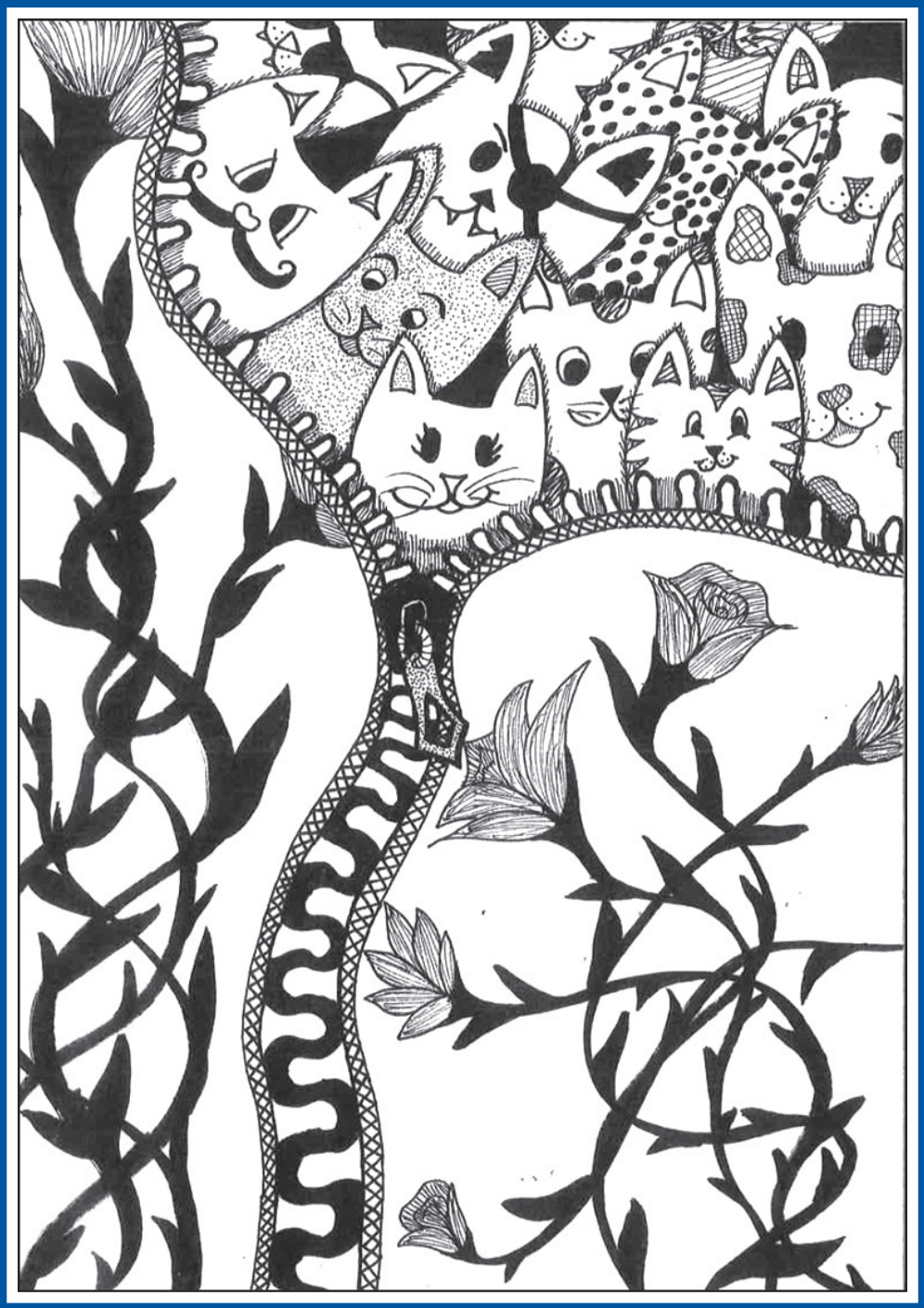

The Ulster Medical Journal

The journal of the Ulster Medical Society. First published in 1932.

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Editorial

Quaere verum

Michael Trimble

This year has seen the release of the latest film in the *Matrix* series.[1] Those familiar with the franchise will know that the pretext for the narrative is that what we know as reality is, in fact, a shared computer simulation which has been developed to keep humanity captive as a biological energy source. A different take on unreality can be found elsewhere: The animated film *Spider-Man: Into the Spider-Verse*[2] and its live action follow up, *Spider-Man: No Way Home* [3] depend on multiple parallel versions of reality to sustain their plotlines. You may think this is simply the stuff of stories rather than science, but it has supporters in unexpected places. In his book *The God Delusion,* biologist Richard Dawkins is happy to accept a theory of multiple universes [4] including one where he has a green moustache.[5] The idea that we are all living in a simulation *à la* the Matrix has also been postulated as a possibility [6]- one that is taken seriously by some influential individuals. [7]

However, most of us probably live our lives according to the tenets of realism and rely on a certain degree of common sense. We take it for granted that the chair we sat on yesterday will bear our weight today. Scottish Common Sense Realism was a school of philosophy that existed in the 18th and 19th centuries but which has not survived the test of time. It opposed Descartes' Theory of Ideas and the extreme scepticism of David Hume, instead promoting simple realist belief. Its best known proponent, Thomas Reid, articulated the theory as follows:

> "If there are certain principles, as I think there are, which the constitution of our nature leads us to believe, and which we are under a necessity to take for granted in the common concerns of life, without being able to give a reason for them — these are what we call the principles of common sense; and what is manifestly contrary to them, is what we call absurd."[8]

A more modern formulation of realism was proposed by Roy Bhaskar in his book *A Realist Theory of Science*.[9] He describes a hierarchy from empirically observed phenomena, through actual events, and on to the underlying reality. For Bhaskar, it is as important to focus on the nature of how things are (ontology) as it is to think about our knowledge of them (epistemology). The work of science takes theories regarding the nature of reality as its raw material, seeking to transform such theories and to improve them. These theories, and our knowledge of reality, are therefore *transitive*. Reality itself is not subject to such change and is therefore termed *intransitive*. To be a realist is not to believe that scientific knowledge is unassailable and immune to change or challenge. Thomas Kuhn describes the normal business of science as problem solving within an accepted system[10] but notes that from time to time the very system changes and undergoes a revolution or paradigm shift.[11] Our knowledge is at best a fair representation of the world but, in general, it is accepted that the world is real, is constant. Such realities may be termed *brute facts* or *true truth*. We need to take truth seriously and, for this reason, submissions to this journal are subject to peer review to ensure standards are maintained.

In the contemporary context, some truths have become emotionally and politically charged. Stating one's beliefs can have consequences. In the academic setting, fears about the loss of academic freedom and the potential for open debate have reached such levels that the UK government has thought to introduce a Bill to protect free speech in universities [12] but even such legislation may not be sufficient if there is a popular movement among students. This was evident in the case of analytic philosopher Kathleen Stock. In her book *Material Girls*,[13] she took a realist approach to biology, as might be found in current physiology texts.[14] Ultimately, the campaign against her lead to the end of her tenure at the University of Sussex.[15] This in turn became a topic on BBC's *Question Time*. Contributing on the panel was the eminent reproductive specialist Lord Robert Winston. Somewhat surprisingly, his statements regarding reproductive biology were rebuffed by the programme's host.[16] I suspect that most of us, whatever our area of practice, remember much of the basic science we were taught at medical school. Although, it should be noted that the validity of traditional texts has recently been challenged.[17]

Knowledge has been described as justified (or warranted), true belief. For data to become knowledge a knower is required[18] and to that extent all knowledge has a personal element.[19] Some, such as Thomas Kuhn[20] and the Ancient Greek philosopher Protagoras,[21] have argued against the concept of objective truth but their arguments do not hold water. Whether considering the astronomical models of Ptolemy and Copernicus[22,23] or the mechanics of Newton and Einstein[24] for one model to be "better" than another, it must be held to be a more accurate representation of the way things are, that is, of objective reality. In our quest for truth, we acknowledge that our theories are often imperfect and, as in a quote ascribed to Sir William Osler,

> In seeking absolute truth, we aim at the unattainable and must be content with broken portions.[25]

Not everyone loves the truth. We need to be mindful of those who propagate untruth – we live in a world with error,[26] lies,[27] conspiracy theory[28]and fraud.[29] Before becoming incorporated to Queen's College (now Queen's University) the Belfast Medical School was part of the Royal Belfast Academical Institution[30] (known locally as Belfast "Inst"). The school motto was, and still is, *Quaere verum* (Latin meaning "seek the truth"). Let me conclude by encouraging you, in whatever situation you find yourself, to seek the truth.

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UMS Website

The Society needs a Fellow or Member to take over the maintenance of its website (www.ums.ac.uk). This is not an onerous task and is one which can be done from home. The website has been written directly in html which is not difficult to learn and the site benefits by the pages being simpler and smaller and therefore faster to load. The structure is stable and unless the new website manager wishes to rewrite the site, only routine maintenance will be required. This will mostly be needed before each new lecture season, after the AGM, and after an issue of the Journal has been published.

A brief introduction to writing in html is available from our administrator (administrator@ums.ac.uk) to whom all enquiries and offers of assistance should be addressed.

HONORARY UMS FELLOWSHIPS

Professor Sir Michael McBride and Dr John Purvis have been enrolled as Honorary Fellows of the Ulster Medical Society. On 7th October 2021 UMS President, Dr Seamus McAleer, read out brief citations as follows:

Professor Sir Michael McBride: In recognition of his outstanding leadership as Chief Medical Officer in Northern Ireland during the COVID-19 pandemic. Michael graduated from QUB in 1986 and in 1994 he became a consultant in HIV at the Royal Victoria Hospital. In 2006 he was appointed CMO. In 2014, at the request of the Health Minister, he was appointed Chief Executive of the Belfast Health and Social Care Trust until 2017, while continuing his role of CMO. He was knighted in the 2021 Birthday Honours for services to public health in Northern Ireland, and was awarded a professorship in public health practice from QUB.

Dr John Purvis: In recognition of his sterling work as Honorary Editor of the Ulster Medical Journal from 2015 to 2020, during which time he raised the academic standing of the Journal including the style and standard of the Journal's images. John graduated from QUB in 1985 and in 1995 he became a consultant cardiologist at the Altnagelvin Area Hospital. He had a background in teaching and academic medicine which led him to a Postgraduate Diploma in Clinical Education, as well as honorary clinical lecturer at QUB. He retired from clinical practice in 2020.

LIST OF REFEREES FOR 2021

We pass on our sincere thanks to all our referees for 2021

Dr Allister Foy	Dr David Coyle	Prof Neil Kennedy
Dr Ian Bickle	Dr Lorraine Parks	Dr Janet Sinton
Mr Timothy McAdam	Dr Lysa Owen	Prof Mary Frances McMullin
Dr Raghu Sathyanarayana	Dr Stuart Ritchie	Ms Lauren Young
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Mr Scott McCain	Mr Stephen Kirk	Dr Pamela Magee
Dr Chris Kelly	Dr Mark Davies	Dr Hans Nagar
Prof Louise Dubras	Dr Charlotte Addy	

Erratum

Please note corrected authorship for:

Ulster Med J 2021;90(3):138-141
Guest Editorial C25 in QUB: a transformed curriculum for a transformed healthcare system
Neil Kennedy, Pascal McKeown, Mairead Boohan

Ulster Med J 2022;**91(1):**4-8

Clinical Paper

Outcomes After Laparoscopic Transabdominal Pre-Peritoneal Repair (TAPP) For Groin Hernia In A Single Consultant Series

Waleed Riaz, Kevin Birmingham, Richard Thompson

Accepted: 27th September 2021
Provenance: Externally peer reviewed

Aim: TAPP repair is an established minimally invasive approach for groin hernia repair. The objective of this study was to report post-operative outcomes after TAPP repair in a single surgeon series and benchmark these against reported outcomes in the literature.

Methods: All patients who had an elective or emergency TAPP repair of a groin hernia from September 2016 to March 2020 in a district general hospital were retrospectively analysed from the electronic care record (ECR) for post-operative morbidity, re-admission, recurrence and length of hospital stay. The primary outcome of interest, chronic post-operative pain, was assessed via telephone interviews using the European Registry for Abdominal Wall Hernias Quality of Life (EuraHS-QoL) questionnaire.

Results: 164 patients, incorporating 190 hernia repairs were included. 155 (94.5%) were men and 9 (5.5%) were women. The median age was 51 (range: 20-81). 160 (97.6%) patients had an elective repair and 4 (2.4%) had an emergency repair. 157 (95.7%) patients underwent a primary inguinal hernia repair, of which 26 (15.8%) had a bilateral inguinal hernia repair. 7 (4.3%) patients had a femoral hernia repair. All procedures were performed by a single consultant surgeon. One emergency patient required conversion to open to allow for resection of ischaemic small bowel, however, the hernia itself was repaired laparoscopically. 94 (57.3%) patients were successfully contacted to provide EuraHS-QoL scores. 13/94 patients (13.8%) complained of chronic pain at rest on an average follow-up of 32.7 months (range: 16-43m). 2/94 (2.1%) patients had mild pain, 9/94 (9.6%) had moderate pain and 2/94 (2.1%) patients had severe pain at rest. 131 (79.9%) TAPP repairs were performed as day case procedures. Median length of stay in those patients who were not day cases was 1 day (range=1-11 days). Post-op morbidity rate was 7.9% (n=13), however, these were minor complications (Clavien-Dindo I/II). Incidence of seroma and haematoma was 1.8% (n=3) each. Re- admission rate was 3% (n=5). Mean follow-up of patients was 21 months (SD 12.6m, range=1-43m). Two patients (1.2%) had a recurrent groin hernia during this time period and one patient (0.6%) had a port site hernia.

Conclusion: The outcomes of chronic post-operative pain and rate of recurrence were comparable to those reported in the literature. Re-admission rate was low and there were no major complications. The majority of patients were performed as a day case.

Keywords: Laparoscopic groin hernia repair, trans-abdominal pre-peritoneal repair, chronic pain, hernia recurrence, elective surgery, day case surgery.

Introduction

Minimally invasive techniques (TAPP and TEP (totally extra-peritoneal repair)) for groin hernia repair were first introduced in the early 1980s.[1] Since then, outcomes from these procedures have been extensively reported in the literature. Recurrence rate after laparoscopic repair is comparable to that of open conventional techniques and has been reported to be up to 5%.[2, 3] A multi-centre randomized controlled trial reported incidence of chronic pain following laparoscopic repair to be half that of open Lichtenstein repair at the end of 5 years, 9.4% compared to 18.8%.[4]

Both TAPP and TEP are equally popular as established laparoscopic techniques. A detailed review of outcomes following laparoscopic inguinal hernia repair by the HerniaSurge group in 2018 did not show any significant difference in operative times, recovery time, post-operative pain, total complication rates, hospital length of stay, recurrence rates or costs between TAPP and TEP repair. However, access-related complications can differ; there is increased risk of visceral injury during trans-abdominal entry with TAPP while there is increased risk of vascular injury during extra-peritoneal entry and dissection during TEP.[5]

The aim of our study was to review the post-operative outcomes in a single consultant surgeon series of TAPP procedures for both an elective and emergency presentation of a groin hernia and benchmark these against accepted published standards. The primary outcome of interest was incidence of chronic post-operative pain. Secondary outcomes were post-operative morbidity, readmission rates, hernia recurrence and length of hospital stay.

[1]Daisy Hill Hospital, Southern Health and Social Care Trust, Northern Ireland, UK

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Methods

All patients who had an elective or emergency TAPP repair of a groin hernia at our district general hospital from September 2016 to March 2020 by one consultant surgeon were retrospectively analysed for post-operative morbidity, re-admission, hernia recurrence and length of hospital stay. All information was retrieved from electronic care records (ECR) by assessing discharge summaries and any subsequent documents or relevant investigations that may report a recurrence.

All patients presenting with an elective or emergency groin hernia were offered a TAPP repair unless they had a large, irreducible inguinoscrotal hernia when an open repair was offered. A standard 3-port TAPP repair was performed using a flat 15x10cm lightweight, macroporous polyester mesh secured in a standard way with absorbable tacks and the peritoneal flap closed with an absorbable continuous suture.

Chronic post-operative pain was defined as pain occurring more than 3 months after surgery, as per the International Association of the Study of Pain,[6] and was analysed using the European Registry for Abdominal Wall Hernias Quality of Life (EuraHS-QoL) score via telephone interviews. The EuraHS-QoL score is a validated disease-specific, patient-reported outcome tool that can be used to quantify pain at the site of the hernia repair, restriction of daily activities and cosmetic discomfort.[7,8] We did not have any preoperative scores for this cohort of patients and cosmetic scores were not recorded as it was felt that this outcome is more relevant to major incisional hernia repairs. Reasonable efforts were made to contact initial non-responders on at least 2 further occasions in order to maximise the data obtained.

Descriptive statistics were used to analyse the data in Microsoft Excel (Version 16.16.22).

Results

164 patients, 94.5% (n=155) men and 5.5% (n=9) women, were included in the defined time period. The median age of the patients was 51 (range: 20-81). 160 (97.6%) patients had an elective repair and 4 (2.4%) had an emergency repair. 157 (95.7%) patients underwent a primary inguinal hernia repair, of which 26 (15.8%) patients had a bilateral inguinal hernia repair. 7 (4.3%) patients had a femoral hernia repair. Therefore, the total number of groin hernia repairs was 190. All procedures were done by a single consultant surgeon (RT). One patient required conversion to open to allow for resection of ischaemic bowel in a strangulated femoral hernia, however, the hernia itself was repaired laparoscopically.

131 (79.9%) patients were performed as a day case. Median length of stay in those patients who were not day cases was 1 day (range=1-11 days). Post-operative morbidity occurred in 13 (7.9%) patients. These were all minor complications (Clavien-Dindo I/II) as outlined in Table 1. 3 (1.8%) patients had a seroma and 3 (1.8%) had a haematoma. 5 (3%) patients needed a re-admission (Table 2). Mean follow-up of patients was 21 months (SD 12.6m, range=1-43m). 2 patients (1.2%) had a recurrent groin hernia during this time period. One (0.6%) patient had a port site hernia.

Table 1: Post-operative complications

Patient Age	Morbidity	Clavien-Dindo Grade	Day Post-op	Management
58	Vasovagal episode	I	0	Conservative
20	Urinary retention	I	0	Catheterized
75	Urinary retention	I	0	Catheterized
70	Haematoma	I	1	Conservative
50	Nausea & Vomiting	I	2	Non-specific, resolved with conservative management, discharged
76	Chest Sepsis, Paralytic Ileus, Haematoma	II	2	IV antibiotics TPN HDU Level 2 care
37	Haematoma	II	6	Conservative
70	Port site infection	II	7	Oral antibiotics
51	Pleuritic chest pain	I	8	Admitted under medics, negative CTPA, discharged
44	Testicular pain and bruising	I	16	Required admission, non-specific, conservative management
42	Seroma	I	24	Conservative
32	Seroma	I	51	Conservative
33	Seroma	I	75	Conservative

Table 2: Re-admissions

Reason for Admission	Day Post-op	Diagnosis and Treatment
Nausea & Vomiting	2	Non-specific, resolved with conservative management, discharged
Pyrexia & suprapubic tenderness	6	Infective collection, resolved with IV antibiotics
Pleuritic chest pain	8	Admitted under medics, CTPA negative, discharged
Testicular pain and bruising	16	Non-specific, conservative management
Groin swelling & pain	24	Conservative management

94 patients were available to provide EuraHS-QoL scores via telephone interviews. Mild pain was defined as score 1 to 3, moderate pain as score 4 to 7 and severe pain as score 8 to 10. Likewise, restriction to daily activities, both indoor and outdoor, and restriction to sports and heavy labour was also stratified as mild (score 1-3), moderate (score 4-7) and severe (score 8-10). Pain and restriction scores of contactable patients are described in detail in Tables 3-6.

Table 3: Post-operative pain scores

**Average follow-up*

Severity of pain	Pain at rest n (%) [Avg. f/u*=32.7m (range=16-43m)]	Pain during day-to-day activities n (%) [Avg. f/u=30.5m (range=16-43)]	Pain during last week n (%) [Avg. f/u=28.8m (range=16-43)]
Mild	2 (2.1%)	2 (2.1%)	1 (1.1%)
Moderate	9 (9.6%)	8 (8.5%)	10 (10.6%)
Severe	2 (2.1%)	5 (5.3%)	2 (2.1%)
Total	13 (13.8%)	15 (15.9%)	13 (13.8%)

Table 4: Post-operative restriction to activities

Severity of restriction to activities	Restriction to daily indoor activities n (%) [Avg. f/u=24.2m (range=16-42m)]	Restriction to daily outdoor activities n (%) [Avg. f/u=20.2m (range=16-34m)]
Mild	4 (4.3%)	2 (2.1%)
Moderate	None	3 (3.2%)
Severe	2 (2.1%)	1 (1.1%)
Total	6 (6.4%)	6 (6.4%)

Table 5: Post-operative restriction to sports

Severity of restriction	Restriction to sports Avg. f/u=23.6m (range=16-43m)
Mild	None
Moderate	5 (7.9%)
Severe	2 (3.2%)
Did not do sports	31 (33%)

Table 6: Post-operative restriction to heavy labour

Severity of restriction	Restriction to heavy labour [Avg f/u=26.2m]
Mild	4 (5.4%)
Moderate	3 (4%)
Severe	2 (2.7%)
Did not do heavy labour	20 (21%)

Discussion

This was a retrospective study which aimed at reporting important surgical outcomes after laparoscopic TAPP repair of groin hernia. The primary outcome of interest was the incidence of chronic post-operative pain. Prevalence of chronic post-operative pain ranges from 1 to 32% in the literature. The incidence of chronic pain in our cohort was 13-16%, of which approximately 5% was reported to be severe by patients. Table 7 shows our rate of chronic pain when compared to other studies.[4, 9-17]

Table 7: Prevalence of chronic pain

Study	Chronic pain in laparoscopic group	Chronic pain in open group
Butters 2007	13/81 (16%)	24/76 (31.5%)
Eker 2012	37/247 (15%)	66/235 (28.1%)
Eklund 2010	58/616 (9.4%)	124/659 (18.8%)
Gokalp 2003	1/61 (1.6%)	0/62 (0)
Heikkinen 2004	0/62 (0)	4/59 (6.8%)
Lau 2006	9/91 (9.9%)	18/83 (21.7%)
Pokorny 2008	6/119 (5%)	4/65 (6.1%)
Sevinc 2019	5/147 (3.4%)	39/155 (25.2%)
Wang 2013	0/168 (0)	2/84 (2.4%)
Westin 2016	39/188 (20.7%)	62/187 (33.1%)
Riaz et al. (our study)	13/94 (13.8%)	x

The lack of a standard definition is primarily responsible for the variable rates of chronic pain reported in the literature.[18-21] A recent systematic review identified 22 different definitions of chronic post-operative inguinal pain, of which the definition provided by the International Association for the Study of Pain was applied most often.[22] This is the definition we have used in our study.

Molegraaf et al. also noted that the Visual Analog Scale (VAS) and the Short Form-36 (SF-36) were the most commonly used assessment methods for pain intensity and quality of life (QoL) assessment after inguinal hernia repair.[22] Several hernia-specific scores have been validated for assessment of pain and QoL in hernia patients: Carolina Comfort Scale (CSS), Inguinal Pain Questionnaire (IPQ) and the recently validated EuraHS-QoL score.[7, 23, 24] The EuraHS-QoL score takes into account patient-reported outcome measures of pain and QoL, has been validated for use both pre- and post-operatively, uses fewer questions and is easier to use; hence why we opted to use it for pain and QoL assessment in our study.

There is good evidence in the literature supporting the superiority of laparoscopic groin hernia repair to open repair with regards to early post-operative pain, analgesia requirement, time to return to normal daily activities and chronic pain.[4,25-29] A recent updated network meta-analysis has reaffirmed these findings: apart from significantly reduced early postoperative pain, time to return to work/activities and chronic pain, minimally invasive TEP and TAPP were also associated with significantly reduced risk of hematoma and wound infection compared to the open Lichtenstein tension-free repair. However, risk of hernia recurrence and seroma were similar between both groups, so was the post-operative length of hospital stay.[30]

In our study, recurrence rate was low and well within rates reported in the literature (Table 8).[4, 9-17, 31, 32] Immediate post-operative morbidity was uncommon and of minor severity. None of the patients required any immediate operative re-intervention. The British Association of Day Surgery has suggested that 80% of inguinal hernia repairs should be carried out as day case procedures.[33] This figure was achieved in our cohort.

Table 8: Hernia recurrence rates

Study	Chronic pain in laparoscopic group	Chronic pain in open group
Anadol 2004	0/25 (0)	0/25 (0)
Butters 2007	1/81 (1.2%)	1/76 (1.3%)
Eker 2012	12/247 (4.9%)	19/235 (8.1%)
Eklund 2010	21/616 (3.4%)	7/659 (1.1%)
Gokalp 2003	0/61 (0)	0/62 (0)
Heikkinen 2004	5/62 (8.1%)	2/59 (3.4%)
Koju 2017	3/51(5.9%)	0/51 (0)
Lau 2006	0/100 (0)	0/100 (0)
Pokorny 2008	6/119 (5%)	0/65 (0)
Sevinc 2019	5/147 (3.4%)	8/155 (5.2%)
Wang 2013	0/168 (0)	4/84 (4.8%)
Westin 2016	2/188 (1.1%)	4/187 (2.1%)
Riaz et al. (our study)	1/190 (1.05%)	x

The 2009 European Hernia Society (EHS) guidelines recommend that bilateral hernia should preferably be treated by a laparoscopic method provided expertise is available.[34] The advantages of laparoscopic repair (faster recovery, lower risk of chronic pain and cost-effectiveness) are increased when performing two hernia repairs via the same approach. The European Association of Endoscopic Surgery (EAES) guidelines also recommend laparoscopic repair to be an excellent choice in bilateral groin hernias.[35] This view is also endorsed by the British Hernia Society groin hernia guidelines. These guidelines also recommend laparoscopic approach to be the preferred method of choice in women, in patients at risk of chronic pain (younger patients, other chronic pain problems, pre-operative presentation of severe groin pain with only a small hernia on palpation) and in patients with a recurrent hernia if the index operation was an open repair.[36]

The Department of Health (DoH) Northern Ireland published a policy statement in July 2020 for the proposed establishment of a regional service for day case elective care procedures in Northern Ireland.[37] Elective procedures could therefore be carried out without any competition from emergency procedures, thus reducing the likelihood of last-minute cancellations. Furthermore, at COVID-light or COVID-free facilities, this could also minimise risk to

elective patients and allow more effective use of resources. A regional elective service could potentially reduce waiting times for elective procedures that have seen an all-time high as a result of the COVID-19 pandemic.[38]

One of the general surgical procedures proposed in the DoH policy statement is primary repair of an inguinal hernia. In view of the arguments put forward in our paper in favour of laparoscopic repair, we propose that the regional elective surgical services in Northern Ireland should consider offering laparoscopic repair at least to the patient groups that are highly likely to benefit from it: young men, women, and bilateral or recurrent hernias. Our data show acceptable levels of chronic pain and hernia recurrence following laparoscopic hernia repair in all patients deemed suitable for a laparoscopic repair and also reaffirm that the figure of 80% day cases is achievable with the laparoscopic approach.

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Clinical Paper

Does social deprivation correlate with meningococcal MenACWY, Hib/MenC and 4CMenB/Meningococcal Group B vaccine uptake in Northern Ireland?

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ABSTRACT

Background

Several meningococcal vaccines have been recently introduced into the infant and adolescent vaccination schedules in Northern Ireland to promote immunity to *Neisseria meningitidis*, protecting against meningococcal septicaemia and meningococcal meningitis. Maintained vaccination uptake is vital in securing individual protection as well as herd immunity. Several social factors have been described in influencing vaccine uptake and therefore it was the aim of this study to examine possible correlations between meningococcal vaccine uptake rates and indicators of social deprivation in Northern Ireland.

Methods

Vaccination data was retrieved from the Cover of Vaccination Evaluated Rapidly (COVER) database, for meningococcal vaccines (MenACWY, HiB/MenC & 4CMenB, as well as for MMR vaccine as a non-meningococcal control). Vaccine coverage data assessed included (i). Two doses of MenB by 12 months, (ii). All 3 doses of MenB by 24 months, (iii). HiB/MenC coverage, (iv). MenACWY (Year 12s, for NI) (v). First dose of MMR. Northern Ireland Multiple Deprivation Measures 2017 (NIMDM2017) were examined against 38 indicators in 7 domains. NI HSCT vaccine uptake dataset for each vaccine was correlated with each indicator in the HSCT NIMDM2017 dataset. Regression analysis was performed to determine the relationship between vaccine uptake and deprivation indicators and coefficient of variation (R^2) was calculated for each of the indicators. R^2 values >0.7 were considered significant.

Results

For 4CMenB (all 3 doses by 24 Months), HiB/MenC, MenACWY and for MMR, correlation of variation (R^2) values > 0.7, were obtained for 17, 16, 0 and 17 social deprivation indicators, respectively. Significant deprivation indicators were (i) the proportion of 18-21 year olds, who have not enrolled in higher education courses at higher or further education establishments, (ii) the proportion of domestic dwellings that are unfit, (iii) the proportion of domestic dwellings with Local Area Problem Scores, (iv) rate of burglary, (v) rate of vehicle crime, (vi) rate of antisocial behaviour incidents (per 1,000 population), (vii) absenteeism at primary schools and (viii) the proportion of the population aged 65 and over living in households whose equivalised income is below 60% of the NI median.

Conclusions

Within the last two decades, incidence of meningococcal disease has been on the decline. The introduction of meningococcal vaccines has contributed to this decrease and uptake of such vaccines should remain a public health priority to maintain the decline in meningococcal disease. Identifying contributing factors to low vaccine uptake, such as, the association between local deprivation and uptake of meningococcal vaccines, should be of public health importance and acknowledged by local governments and policy makers in their efforts to enhance vaccine uptake, both infant and teenage vaccination. There is a clear correlation with educational deprivation measures such as absenteeism and poor educational attainment and reduced vaccine uptake, perhaps through lack of understanding and willingness to vaccinate. This is where the importance of a clear and coherent public health message surrounding meningococcal vaccination should be prioritised, particularly to establish innovative modalities in a multidisciplinary team approach, to reach out to and increase vaccine uptake rates in socially deprived communities in Northern Ireland.

Keywords: education; meningitis; meningococcal; vaccine uptake; vaccination; social deprivation

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Introduction

The large progressive decline in child mortality globally has largely been due to the introduction of vaccines coupled with improved sanitation and nutrition. Since 1960, the introduction of vaccines has accompanied a 61% decline in infant mortality due to infectious diseases[1]. Scientific and pharmaceutical companies have produced countless vaccines that protect against a variety of diseases and governments and health services have sustained the delivery of immunisation programmes to ensure effective distribution[2]. Despite the success of vaccines, in 2019, an estimated 5.2 million children under the age of 5 years died globally, generally from preventable and treatable diseases[1]. The value and worthwhile introduction of vaccines needs consistent appreciation by the public to ensure a sustained uptake of such vaccines to maintain health and wellbeing.

Invasive meningococcal disease (IMD) is an infectious disease caused by the widespread human Gram-negative pathogen *Neisseria meningitidis* and is a main cause of life threatening diseases, meningitis and sepsis[3]. The diverse clinical spectrum of *N. meningitidis* presents varying severity of infection, ranging from mild non-specific flu like symptoms to a sudden onset of sepsis/meningitis. In the most serious incidents, multiorgan failure and death contribute to 10-15% of cases[4]. In addition to mortality, long term sequelae can often be life limiting as hearing loss, neurodevelopmental disabilities and amputations are seen in 11-19% of survivors[5]. This is a serious condition and is viewed as a major public health concern due to the widespread distribution of *N. meningitidis* and associated disease burden in the young population, which has recently reviewed and described in Northern Ireland[6].

The meningococcus is categorized into twelve serogroups and the most common causative agents of IMD global disease burden is caused by serogroups A, B, C, W-135, and Y[3-6]. IMD affects those of all ages however highest incidence is seen in infants, young children, and older adults. Case fatalities are often higher in older adults, often due to underlying comorbidities[7]. The introduction of meningococcal vaccines has led to variations in serogroup incidence and has seen a shift in the age distribution of those at higher risk of IMD.

Societal factors are often influential in vaccine uptake and evidence from a study examining infant vaccine uptake found that most deprived communities were at a significantly greater risk of not receiving the infant measles-mumps-rubella (MMR) vaccine[8]. Other previous studies have shown evidence of the effect of deprivation on vaccine uptake, highlighting an inverse association between deprivation and the uptake of routine vaccines (e.g. HPV, influenza)[8-10]. Social factors such as educational attainment, income and employment can contribute to healthcare outcomes through patient education and understanding. These socioeconomic factors can act as barriers to healthcare however, the effect of socioeconomic deprivation on vaccine uptake is poorly understood and very little attention has been paid to the role of deprivation in effecting uptake of meningococcal vaccines. Therefore, it was the aim of this study to examine the correlation between meningococcal vaccine (MenACWY, Hib/MenC & 4CMenB) uptake and social deprivation in Northern Ireland.

Methods

Database analysis of meningococcal vaccination uptake rates

The Cover of Vaccination Evaluated Rapidly (COVER) programme provides immunisation data for children within the UK on their first, second and fifth birthday[11]. For NI, immunisation data was retrieved from the above database. Meningococcal vaccines examined included MenACWY, Hib/MenC and 4CMenB, as well as a non-meningococcal control, namely mumps, measles and rubella vaccine (MMR), was also examined. Vaccine coverage included (i). Two doses of MenB by 12 months, (ii). All 3 doses of MenB by 24 months, (iii). HiB/MenC coverage, (iv). MenACWY (Year 12s, for NI) (v). First dose of MMR.

Vaccine Uptake versus Deprivation Measures

Northern Ireland Multiple Deprivation Measures 2017 (NIMDM2017) provides deprivation measures for NI and utilises 38 indicators in 7 domains (https://www.nisra.gov.uk/statistics/deprivation/northern-ireland-multiple-deprivation-measure-2017-nimdm2017). NIMDM2017 provides an aggregated dataset using these domains for Northern Irelands Health and Social Care Trusts (HSCT), therefore, data displays 6 domains with 37 indicators. The NI HSCT vaccine uptake dataset for each vaccine was correlated with each indicator in the HSCT NIMDM2017 dataset.

Statistics

A regression analysis was performed through Microsoft Excel for Microsoft Office 365 Version 2102 to determine the relationship between vaccine uptake and deprivation indicators and coefficient of variation (R). R squared values (R^2) where calculated for each of the indicators. If R^2 value was $0.5 < R^2 < 0.7$, it was considered a moderate effect size and if the R^2 value > 0.7 the value was considered a strong effect size. In consideration of that, in this regression analysis, any values which fell within these bounds, particularly > 0.7, were considered significant.

3. Results

Table 1 details the correlation R^2 between vaccine uptake and social deprivation metric. In relation to the 4CMenB (2 doses by 12 months), 9 indicators produced R^2 values $0.5 < R^2 < 0.7$ and 18 indicators produced R^2 values of > 0.7. For 4CMenB (all 3 doses by 24 Months) 9 indicators produced R^2 values $0.5 < R^2 < 0.7$ and 17 indicators produced R^2 values of > 0.7. For HiB/MenC, 10 indicators produced R^2 values $0.5 < R^2 < 0.7$ and 16 indicators produced R^2 values of > 0.7. For MenACWY, no indicators produced R^2 values $0.5 < R^2 < 0.7$ or values > 0.7. For MMR, 10 indicators produced R^2 values $0.5 < R^2 < 0.7$ and 17 indicators produced R^2 values of > 0.7. Most correlations were seen in the 'Education, Skills and Training' domain and 'Crime and Disorder' domain.

Discussion

Meningococcal disease has an everchanging epidemiology with incidence and serogroups varying widely over time. Over the past two decades, the incidence of meningococcal disease has been declining due to the successful introduction of meningococcal vaccines. The first introduction of meningococcal C vaccine has accompanied rapid declines in IMD incidence however other emerging serogroups such as Men B and W have been increasing in regions of the UK and ROI. Associated with this is the shift in age distribution with those aged over 24 subjected to the highest incidence of IMD. This is not surprising given, the poor uptake of the adolescent MenACWY vaccine in NI and the late introduction of the vaccine in the ROI, perhaps being a contributing factor to the increase among this age-group.

Within NI, the percentage of infants receiving the first two doses of 4CMenB by their first birthday in 2018/19 was 94.3% and 94.5% in 2019/20. In the same years, those receiving their booster dose in NI was 92.4% and 92% respectively[11,12]. Considering a non-meningococcal comparator, MMR uptake has similar rates, as in 2019/20, 92.2% of infants in NI received their first dose of MMR by their 2nd birthday[13]. MenACWY uptake is much lower compared to infant vaccines. Uptake was initially quite low in 2015/16 as in Northern Ireland only 78% of year 12s received the vaccine. However, there has been an increase in the number receiving this vaccine since then with 84.9% of year 12s receiving their MenACWY vaccine in 2018/19. In comparison to uptake of a similar vaccine, targeted at teenagers, HPV vaccine coverage shows similar uptake rates in Northern Ireland. In 2018-19 only 76.6% of year 9s completed their full course of HPV vaccines and 82.8% of year 10s completed theirs[13]. Uptake of infant meningococcal vaccines has been consistently high since their introduction, however it is apparent that MenACWY uptake is considerably lower when compared with other meningococcal vaccines. In a study of MenACWY uptake and barriers and motivation towards vaccination in Northern Ireland undergraduate students, it was found that amongst 1210 students, 868 first-time freshers and 342 non-freshers, from healthcare-related, non-healthcare-related and engineering/computing faculties, vaccine uptake amongst 18-year-old students was 90.7% and 87.3% in female and male cohorts, respectively, falling to 72.1% and 67.7% (19-year cohort) and 32.7% and 39.6% (20- to 25-year cohort) in males and females, respectively. Students reported that posters, clinics and talks were the preferred methods of communication and not social media. There was general lack of awareness of the signs/symptoms of meningitis and approximately 30% of students falsely believed that administration of the MenACWY vaccine excluded the risk of contracting meningitis[14].

The MenACWY vaccine is aimed at adolescents and those entering university and so motivation to seek information on the seriousness of meningococcal disease and, if not offered in school, the willingness to seek the vaccine themselves may be a barrier to uptake within this age group. In addition, a study analysing school characteristics in uptake of MenACWY found that poorer schools, with high deprivation, had lower uptake[15] of the vaccine. This finding signifies the importance of socioeconomic factors on vaccine uptake, particularly within the school setting.

Findings in this study regarding meningococcal vaccine uptake and deprivation demonstrated that infant meningococcal vaccines (4CMenB and HiB/MenC) are considerably impacted by local deprivation particularly within Northern Ireland. MenACWY is not affected by deprivation as no correlation was evident in these results. 'Education, Skills and Training' and 'Crime and Disorder' parameters comprised most notable strong effect size correlations, producing R^2 values > 0.7 (Table 1).

The proportion of pupils attending special schools or attending primary schools with special education needs stages 3-5 produced high R^2 values of 0.8816, 0.8361, 0.8721 and 0.9159 in this domain for each analysed infant vaccine. It is of interest that poorer vaccine uptake is seen in this subdomain, as the perception of adverse effects from vaccination is a common occurrence amongst parents with children of special needs[16], particularly the notion that childhood vaccines are the cause of Autistic Spectrum Disorder (ASD), in early infancy. The uptake of MMR was significantly impacted by the publication of report (1998), now discredited, linking autism to MMR vaccination[17] leading to an 80% decline of MMR in the following years[8]. Unfortunately, many media platforms can prolong these vaccine 'myths' and information provided through social media can often lead to misrepresentations of vaccine side effects. These assumptions would indeed follow a decline in uptake of any infant vaccine.

Absenteeism in both primary and secondary schools and associated low educational attainment show considerable correlation with poor vaccine uptake (Figures 1a, 1b). The Department of Education published research in 2016 finding that the higher overall absence rate across Key Stage (KS) and KS4, the more likely a lower level of attainment was achieved by the end of KS2 and KS4[18]. It is known that level of education is impactful within the vaccination process, as a study evidenced that more educated parents more likely to visit GPs to seek advice about vaccinations[19] than those with a lower educational attainment. Additionally, Forshaw and colleagues identified that maternal education is correlated with increased childhood vaccination and found a significant difference between literate and illiterate women, presenting that increased literacy has a positive impact on vaccine uptake[20]. In consideration of this, it is evident that education has a critical role in the decision-making process regarding vaccination. Those with higher educational attainment will be more knowledgeable, grasp an easier understanding of health-related information and can make conscious and informed decisions regarding their own healthcare or the healthcare of their children. In addition to educational parameters, many 'Crime and Disorder' parameters highlighted a correlation with poorer vaccine uptake, with four of the most notable indicators seen, including (i) rate of burglary, (ii) rate of theft, (iii) rate of vehicle crime and (iv). rate of anti-social behaviour. These parameters reinforce the deprivation associated with a particular area and within the

Belfast Trust Region these are elevated, compared to other regions of Northern Ireland. There is little research on the impact of crime and disorder on vaccination uptake, however high levels or crime can be associated with lower educational attainment, and reduced social benefits[21]. Crime is a mirror of the quality of the social environment within an area and as an indicator of deprivation, needs to be closely considered in terms of public health so policy makers can be assisted in developing vaccine interventions to target deprived regions to maximise uptake.

Conclusion

Within the last two decades, incidence of meningococcal disease has been on the decline. The introduction of meningococcal vaccines has contributed to this decrease and uptake of such vaccines should remain a public health priority to maintain the decline in meningococcal disease. Identifying contributing factors to low vaccine uptake, such as, the association between local deprivation and uptake of meningococcal vaccines, should be of public health importance and acknowledged by local governments and policy makers in their efforts to enhance vaccine uptake, both infant and teenage vaccination. There is a clear correlation with educational deprivation measures such as absenteeism and poor educational attainment and reduced vaccine uptake, perhaps through lack of understanding and willingness to vaccinate. This is where the importance of a clear and coherent public health message surrounding meningococcal vaccination should be prioritised, particularly to establish innovative modalities in a multidisciplinary team approach, to reach out to and increase vaccine uptake rates in socially deprived communities in Northern Ireland.

CONFLICT OF INTEREST:

Author OCB declares that she has no conflict of interest. Author BCM declares that she has no conflict of interest. Author JEM declares that he has no conflict of interest.

AVAILABILITY OF DATA AND MATERIAL

None available

COMPETING INTEREST

None

Credit authorship contribution statement

Orlaith C. Brennan: Formal Analysis**;** Investigation; Methodology; Visualization; Roles/Writing - original draft; Writing - review & editing

John E. Moore: Conceptualization; Formal analysis; Investigation; Methodology; Writing - review & editing

Beverley C. Millar: Conceptualization; Formal analysis; Investigation; Methodology; Writing - review & editing

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Figure 1: (a) Effect of absenteeism in primary and
(b) post-primary schools on vaccine uptake of three meningococcal vaccines and MMR vaccine.

Table 1:
Summary of correlation (R^2 value) between meningococcal vaccine uptake vs deprivation for all deprivation indicators of Northern Ireland

			Income & Employment			
Vaccine	**Health & Social Care Trust**	**Uptake (%)**	**Proportion of the population living in households whose equivalised income is below 60 per cent of the NI median (%)**	**Proportion of the population aged 15 and under living in households whose equivalised income is below 60 per cent of the NI median (%)**	**Proportion of the population aged 65 and over living in households whose equivalised income is below 60 per cent of the NI median (%)**	**Proportion of the working age population who are employment deprived (%)**
4CMenB 12 months 2018	Belfast	89.5	11.8%	17.5%	4.3%	23.1%
	Northern	96.0	12.3%	18.1%	6.5%	18.1%
	South Eastern	95.5	12.1%	17.9%	6.1%	17.9%
	Southern	96.5	14.5%	20.5%	7.2%	19.8%
	Western	96.2	15.3%	20.7%	6.8%	25.8%
	R^2 Value		**0.3261**	**0.3695**	**0.9414**	**0.0904**
4CMenB 24 months 2018	Belfast	88.6	11.8%	17.5%	4.3%	23.1%
	Northern	95.2	12.3%	18.1%	6.5%	18.1%
	South Eastern	94.0	12.1%	17.9%	6.1%	17.9%
	Southern HSCT	94.0	14.5%	20.5%	7.2%	19.8%
	Western	95.1	15.3%	20.7%	6.8%	25.8%
	R^2 Value		**0.2664**	**0.2799**	**0.8369**	**0.063**
HiB/MenC 2018	Belfast	88.9	11.8%	17.5%	4.3%	23.1%
	Northern	95.5	12.3%	18.1%	6.5%	18.1%
	South Eastern	94.0	12.1%	17.9%	6.1%	17.9%
	Southern	94.7	14.5%	20.5%	7.2%	19.8%
	Western	95.4	15.3%	20.7%	6.8%	25.8%
	R^2 Value		**0.3072**	**0.3297**	**0.8871**	**0.0602**
MenACWY 2018-2019 Year 12s	Belfast	84.5	11.8%	17.5%	4.3%	23.1%
	Northern	86.2	12.3%	18.1%	6.5%	18.1%
	South Eastern	81.7	12.1%	17.9%	6.1%	17.9%
	Southern	87.5	14.5%	20.5%	7.2%	19.8%
	Western	83.3	15.3%	20.7%	6.8%	25.8%
	R^2 Value		**0.0404**	**0.083**	**0.0891**	**0.0314**
MMR 2018	Belfast	89.1	11.8%	17.5%	4.3%	23.1%
	Northern	94.9	12.3%	18.1%	6.5%	18.1%
	South Eastern	93.9	12.1%	17.9%	6.1%	17.9%
	Southern	94.6	14.5%	20.5%	7.2%	19.8%
	Western	94.5	15.3%	20.7%	6.8%	25.8%
	R^2 Value		**0.2704**	**0.307**	**0.9096**	**0.1098**

Table 1 continued

					Health & Disability					
Vaccine	**Health & Social Care Trust**	**Uptake (%)**	**Standardised preventable death ratio (excluding Suicides)**	**Standardised physical health-related benefit ratio**	**Standardised ratio of people registered as having cancer (excluding non-melanoma skin cancers) (NI = 100)**	**Standardised emergency admission ratio (NI = 100)**	**Proportion of Singleton Births with Low Birth Weight (%)**	**Standardised ratio of Children's Dental Extractions (NI = 100)**	**Standardised ratio of people on multiple prescriptions on a regular basis (NI = 100)**	**Standardised ratio of people with a long-term health problem or disability (Excluding Mental Health problems) (NI = 100)**
4CMenB 12 months 2018	Belfast	89.5	128.3	114.7	107.7	116.2	5.1%	100.3	108.9	107.2
	Northern	96.0	91.8	89.3	97.8	93.7	4.2%	84.0	97.0	96.8
	South Eastern	95.5	86.9	83.9	95.0	101.7	4.2%	113.1	89.9	97.6
	Southern	96.5	95.3	101.7	100.7	92.5	4.0%	111.7	100.1	96.7
	Western	96.2	104.7	118.7	100.3	97.2	4.4%	93.9	108.0	103.5
	R^2 Value		**0.7718**	**0.1626**	**0.6575**	**0.9231**	**0.899**	**0.00001**	**0.2438**	**0.6238**
4CMenB 24 months 2018	Belfast	88.6	128.3	114.7	107.7	116.2	5.1%	100.3	108.9	107.2
	Northern	95.2	91.8	89.3	97.8	93.7	4.2%	84.0	97.0	96.8
	South Eastern	94.0	86.9	83.9	95.0	101.7	4.2%	113.1	89.9	97.6
	Southern HSCT	94.0	95.3	101.7	100.7	92.5	4.0%	111.7	100.1	96.7
	Western	95.1	104.7	118.7	100.3	97.2	4.4%	93.9	108.0	103.5
	R^2 Value		**0.7223**	**0.1515**	**0.6812**	**0.8631**	**0.7643**	**0.0374**	**0.2091**	**0.5219**
HiB/MenC 2018	Belfast	88.9	128.3	114.7	107.7	116.2	5.1%	100.3	108.9	107.2
	Northern	95.5	91.8	89.3	97.8	93.7	4.2%	84.0	97.0	96.8
	South Eastern	94.0	86.9	83.9	95.0	101.7	4.2%	113.1	89.9	97.6
	Southern	94.7	95.3	101.7	100.7	92.5	4.0%	111.7	100.1	96.7
	Western	95.4	104.7	118.7	100.3	97.2	4.4%	93.9	108.0	103.5
	R^2 Value		**0.7071**	**0.1334**	**0.633**	**0.9097**	**0.7962**	**0.0312**	**0.1869**	**0.5395**
MenACWY 2018-2019 Year 12s	Belfast	84.5	128.3	114.7	107.7	116.2	5.1%	100.3	108.9	107.2
	Northern	86.2	91.8	89.3	97.8	93.7	4.2%	84.0	97.0	96.8
	South Eastern	81.7	86.9	83.9	95.0	101.7	4.2%	113.1	89.9	97.6
	Southern	87.5	95.3	101.7	100.7	92.5	4.0%	111.7	100.1	96.7
	Western	83.3	104.7	118.7	100.3	97.2	4.4%	93.9	108.0	103.5
	R^2 Value		**0.0002**	**0.0036**	**0.0739**	**0.1558**	**0.0608**	**0.0379**	**0.0336**	**0.0898**
MMR 2018	Belfast	89.1	128.3	114.7	107.7	116.2	5.1%	100.3	108.9	107.2
	Northern	94.9	91.8	89.3	97.8	93.7	4.2%	84.0	97.0	96.8
	South Eastern	93.9	86.9	83.9	95.0	101.7	4.2%	113.1	89.9	97.6
	Southern	94.6	95.3	101.7	100.7	92.5	4.0%	111.7	100.1	96.7
	Western	94.5	104.7	118.7	100.3	97.2	4.4%	93.9	108.0	103.5
	R^2 Value		**0.7825**	**0.1893**	**0.6744**	**0.936**	**0.8799**	**0.0086**	**0.2541**	**0.6424**

Table 1 continued

			Education, Skills & Training							
Vaccine	**Health & Social Care Trust**	**Uptake (%)**	**Proportion of pupils attending Special Schools or attending primary school with Special Education Needs Stages 3-5 (%)**	**Absenteeism at Primary Schools (% of possible attendance)**	**Proportion of school leavers not achieving five or more GCSEs at A*-C (and equivalent) incl. English and maths (%)**	**Proportion of those leaving school aged 16, 17 and 18 not entering Education, Employment or Training (%)**	**Proportion of 18-21 year olds who have not enrolled in Higher Education Courses at Higher or Further Education establishments (%)**	**Proportion of pupils attending Special Schools or who are attending post-primary schools with Special Education Needs Stages 3-5 (%)**	**Absenteeism at post-primary schools (% of possible attendance)**	**Proportions of working age adults (25-64) with no or low levels of qualification (%)**
4CMenB 12 months 2018	Belfast	89.5	11.5%	5.3%	39.4%	4.5%	68.5%	10.8%	7.2%	36.1%
	Northern	96.0	8.1%	4.1%	36.4%	3.3%	64.3%	7.2%	6.1%	35.2%
	South Eastern	95.5	9.3%	4.3%	32.9%	2.1%	62.6%	9.2%	6.5%	30.3%
	Southern	96.5	8.3%	4.5%	35.2%	2.1%	62.8%	7.8%	6.3%	36.6%
	Western	96.2	9.2%	4.7%	34.9%	2.3%	61.4%	9.5%	6.8%	41.0%
	R^2 Value		**0.8816**	**0.704**	**0.6417**	**0.7618**	**0.8551**	**0.591**	**0.6429**	**0.0031**
4CMenB 24 months 2018	Belfast	88.6	11.5%	5.3%	39.4%	4.5%	68.5%	10.8%	7.2%	36.1%
	Northern	95.2	8.1%	4.1%	36.4%	3.3%	64.3%	7.2%	6.1%	35.2%
	South Eastern	94.0	9.3%	4.3%	32.9%	2.1%	62.6%	9.2%	6.5%	30.3%
	Southern HSCT	94.0	8.3%	4.5%	35.2%	2.1%	62.8%	7.8%	6.3%	36.6%
	Western	95.1	9.2%	4.7%	34.9%	2.3%	61.4%	9.5%	6.8%	41.0%
	R^2 Value		**0.8361**	**0.7317**	**0.5696**	**0.6158**	**0.8059**	**0.5546**	**0.602**	**0.009**
HiB/MenC 2018	Belfast	88.9	11.5%	5.3%	39.4%	4.5%	68.5%	10.8%	7.2%	36.1%
	Northern	95.5	8.1%	4.1%	36.4%	3.3%	64.3%	7.2%	6.1%	35.2%
	South Eastern	94.0	9.3%	4.3%	32.9%	2.1%	62.6%	9.2%	6.5%	30.3%
	Southern	94.7	8.3%	4.5%	35.2%	2.1%	62.8%	7.8%	6.3%	36.6%
	Western	95.4	9.2%	4.7%	34.9%	2.3%	61.4%	9.5%	6.8%	41.0%
	R^2 Value		**0.8721**	**0.7124**	**0.5416**	**0.6275**	**0.8043**	**0.5939**	**0.6242**	**0.0162**
MenACWY 2018-2019 Year 12s	Belfast	84.5	11.5%	5.3%	39.4%	4.5%	68.5%	10.8%	7.2%	36.1%
	Northern	86.2	8.1%	4.1%	36.4%	3.3%	64.3%	7.2%	6.1%	35.2%
	South Eastern	81.7	9.3%	4.3%	32.9%	2.1%	62.6%	9.2%	6.5%	30.3%
	Southern	87.5	8.3%	4.5%	35.2%	2.1%	62.8%	7.8%	6.3%	36.6%
	Western	83.3	9.2%	4.7%	34.9%	2.3%	61.4%	9.5%	6.8%	41.0%
	R^2 Value		**0.1567**	**0.0097**	**0.148**	**0.0175**	**0.025**	**0.3493**	**0.1825**	**0.0898**
MMR 2018	Belfast	89.1	11.5%	5.3%	39.4%	4.5%	68.5%	10.8%	7.2%	36.1%
	Northern	94.9	8.1%	4.1%	36.4%	3.3%	64.3%	7.2%	6.1%	35.2%
	South Eastern	93.9	9.3%	4.3%	32.9%	2.1%	62.6%	9.2%	6.5%	30.3%
	Southern	94.6	8.3%	4.5%	35.2%	2.1%	62.8%	7.8%	6.3%	36.6%
	Western	94.5	9.2%	4.7%	34.9%	2.3%	61.4%	9.5%	6.8%	41.0%
	R^2 Value		**0.9159**	**0.7642**	**0.5838**	**0.673**	**0.7958**	**0.6513**	**0.6983**	**0.0023**

Table 1 continued

Vaccine	Health & Social Care Trust	Uptake (%)	Proportion of domestic dwellings that are unfit (%)	Proportion of domestic dwellings in a state of disrepair (%)	Proportion of domestic dwellings without (1) modern boiler, or (2) loft insulation and double glazing (%)	Rate of Household overcrowding (%)	Proportion of population with disability without adaptations to dwelling (%)	Proportion of domestic dwellings with Local Area Problem Scores (%)	Standardised ratio of road defects (NI = 100)	Rate of Road Traffic Collisions (per 1,000 population)	Proportion of properties in flood risk area (%)
4CMenB 12 months 2018	Belfast	89.5	1.4%	15.9%	25.0%	4.7%	82.0%	4.7%	180.9	4.6	3.9%
	Northern	96.0	2.5%	15.6%	28.1%	3.1%	84.4%	1.9%	80.8	3.8	2.6%
	South Eastern	95.5	2.3%	15.6%	27.8%	3.0%	84.6%	2.1%	94.6	4.4	1.8%
	Southern	96.5	3.0%	16.1%	27.6%	4.3%	84.0%	1.7%	131.6	4.0	2.4%
	Western	96.2	3.0%	16.2%	25.7%	4.9%	84.1%	1.9%	75.7	4.4	1.4%
	R^2 Value		**0.8637**	**0.003**	**0.5007**	**0.1247**	**0.8815**	**0.9991**	**0.6941**	**0.4211**	**0.7109**
4CMenB 24 months 2018	Belfast	88.6	1.4%	15.9%	25.0%	4.7%	82.0%	4.7%	180.9	4.6	3.9%
	Northern	95.2	2.5%	15.6%	28.1%	3.1%	84.4%	1.9%	80.8	3.8	2.6%
	South Eastern	94.0	2.3%	15.6%	27.8%	3.0%	84.6%	2.1%	94.6	4.4	1.8%
	Southern HSCT	94.0	3.0%	16.1%	27.6%	4.3%	84.0%	1.7%	131.6	4.0	2.4%
	Western	95.1	3.0%	16.2%	25.7%	4.9%	84.1%	1.9%	75.7	4.4	1.4%
	R^2 Value		**0.7765**	**0.0004**	**0.4396**	**0.1484**	**0.8923**	**0.9443**	**0.8628**	**0.4084**	**0.7266**
HiB/MenC 2018	Belfast	88.9	1.4%	15.9%	25.0%	4.7%	82.0%	4.7%	180.9	4.6	3.9%
	Northern	95.5	2.5%	15.6%	28.1%	3.1%	84.4%	1.9%	80.8	3.8	2.6%
	South Eastern	94.0	2.3%	15.6%	27.8%	3.0%	84.6%	2.1%	94.6	4.4	1.8%
	Southern	94.7	3.0%	16.1%	27.6%	4.3%	84.0%	1.7%	131.6	4.0	2.4%
	Western	95.4	3.0%	16.2%	25.7%	4.9%	84.1%	1.9%	75.7	4.4	1.4%
	R^2 Value		**0.8264**	**0.0008**	**0.4427**	**0.1224**	**0.8649**	**0.9622**	**0.8068**	**0.448**	**0.6968**
MenACWY 2018-2019 Year 12s	Belfast	84.5	1.4%	15.9%	25.0%	4.7%	82.0%	4.7%	180.9	4.6	3.9%
	Northern	86.2	2.5%	15.6%	28.1%	3.1%	84.4%	1.9%	80.8	3.8	2.6%
	South Eastern	81.7	2.3%	15.6%	27.8%	3.0%	84.6%	2.1%	94.6	4.4	1.8%
	Southern	87.5	3.0%	16.1%	27.6%	4.3%	84.0%	1.7%	131.6	4.0	2.4%
	Western	83.3	3.0%	16.2%	25.7%	4.9%	84.1%	1.9%	75.7	4.4	1.4%
	R^2 Value		**0.0618**	**0.0525**	**0.0588**	**0.0176**	**0.0107**	**0.018**	**0.0585**	**0.4881**	**0.1337**
MMR 2018	Belfast	89.1	1.4%	15.9%	25.0%	4.7%	82.0%	4.7%	180.9	4.6	3.9%
	Northern	94.9	2.5%	15.6%	28.1%	3.1%	84.4%	1.9%	80.8	3.8	2.6%
	South Eastern	93.9	2.3%	15.6%	27.8%	3.0%	84.6%	2.1%	94.6	4.4	1.8%
	Southern	94.6	3.0%	16.1%	27.6%	4.3%	84.0%	1.7%	131.6	4.0	2.4%
	Western	94.5	3.0%	16.2%	25.7%	4.9%	84.1%	1.9%	75.7	4.4	1.4%
	R^2 Value		**0.8182**	**0.00007**	**0.536**	**0.1611**	**0.8942**	**0.9887**	**0.7415**	**0.4886**	**0.6634**

Table 1 continued

			Crime & Disorder						Access to Services	
Vaccine	**Health & Social Care Trust**	**Uptake (%)**	**Rate of Violence (including sexual offences), robbery and public order (per 1,000 population)**	**Rate of Burglary (per 1,000 population)**	**Rate of Theft (per 1,000 population)**	**Rate of Vehicle Crime (per 1,000 population)**	**Rate of Criminal Damage and Arson (per 1,000 population)**	**Rate of Deliberate Primary and Secondary Fires (per 1,000 population)**	**Rate of Anti-Social Behaviour Incidents (per 1,000 population)**	**Proportion of properties with broadband speed below 10Mb/s (%)**
4CMenB 12 months 2018	Belfast	89.5	21.2	5.8	11.8	4.0	12.3	4.2	36.6	1.2%
	Northern	96.0	12.2	3.0	5.4	1.3	7.3	2.4	24.1	11.8%
	South Eastern	95.5	13.3	3.3	5.2	1.6	7.5	2.7	27.3	7.7%
	Southern	96.5	13.8	3.8	4.7	1.9	7.4	2.8	22.6	14.2%
	Western	96.2	18.2	3.5	5.9	2.3	9.7	3.7	28.3	18.1%
	R^2 Value		**0.5975**	**0.879**	**0.9707**	**0.8289**	**0.7582**	**0.5472**	**0.8596**	**0.7433**
4CMenB 24 months 2018	Belfast	88.6	21.2	5.8	11.8	4.0	12.3	4.2	36.6	1.2%
	Northern	95.2	12.2	3.0	5.4	1.3	7.3	2.4	24.1	11.8%
	South Eastern	94.0	13.3	3.3	5.2	1.6	7.5	2.7	27.3	7.7%
	Southern HSCT	94.0	13.8	3.8	4.7	1.9	7.4	2.8	22.6	14.2%
	Western	95.1	18.2	3.5	5.9	2.3	9.7	3.7	28.3	18.1%
	R^2 Value		**0.5464**	**0.9428**	**0.8871**	**0.8313**	**0.6711**	**0.5061**	**0.7474**	**0.7408**
HiB/MenC 2018	Belfast	88.9	21.2	5.8	11.8	4.0	12.3	4.2	36.6	1.2%
	Northern	95.5	12.2	3.0	5.4	1.3	7.3	2.4	24.1	11.8%
	South Eastern	94.0	13.3	3.3	5.2	1.6	7.5	2.7	27.3	7.7%
	Southern	94.7	13.8	3.8	4.7	1.9	7.4	2.8	22.6	14.2%
	Western	95.4	18.2	3.5	5.9	2.3	9.7	3.7	28.3	18.1%
	R^2 Value		**0.5483**	**0.9148**	**0.9015**	**0.8191**	**0.6821**	**0.5073**	**0.7935**	**0.778**
MenACWY 2018-2019 Year 12s	Belfast	84.5	21.2	5.8	11.8	4.0	12.3	4.2	36.6	1.2%
	Northern	86.2	12.2	3.0	5.4	1.3	7.3	2.4	24.1	11.8%
	South Eastern	81.7	13.3	3.3	5.2	1.6	7.5	2.7	27.3	7.7%
	Southern	87.5	13.8	3.8	4.7	1.9	7.4	2.8	22.6	14.2%
	Western	83.3	18.2	3.5	5.9	2.3	9.7	3.7	28.3	18.1%
	R^2 Value		**0.0517**	**0.0011**	**0.0122**	**0.0082**	**0.0446**	**0.0621**	**0.1776**	**0.0405**
MMR 2018	Belfast	89.1	21.2	5.8	11.8	4.0	12.3	4.2	36.6	1.2%
	Northern	94.9	12.2	3.0	5.4	1.3	7.3	2.4	24.1	11.8%
	South Eastern	93.9	13.3	3.3	5.2	1.6	7.5	2.7	27.3	7.7%
	Southern	94.6	13.8	3.8	4.7	1.9	7.4	2.8	22.6	14.2%
	Western	94.5	18.2	3.5	5.9	2.3	9.7	3.7	28.3	18.1%
	R^2 Value		**0.6372**	**0.92**	**0.9548**	**0.8705**	**0.7746**	**0.5933**	**0.8671**	**0.7205**

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Clinical Paper

Surgical planning during a pandemic: Identifying patients at high risk of severe disease or death due to COVID-19 in a cohort of patients on a cataract surgery waiting list.

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ABSTRACT

Background

The delivery of cataract surgery during the COVID-19 pandemic is challenging because of the risk of nosocomial SARS-CoV-2 infection when patients attend hospital for elective care. In order to ascertain the risk to patients awaiting cataract surgery, this study aimed to identify the presence of systemic comorbidities that are associated with a high risk of severe disease or death due to COVID-19.

Methods

A prospective study of 315 patients (630 eyes) was conducted from 3rd June to 31st July 2020. An electronic health record was used to identify any systemic comorbidities that would render a patient 'clinically extremely vulnerable' to COVID-19, as outlined by the Department of Health for Northern Ireland. Patient demographics, best-corrected visual acuity (VA) and risk of postoperative anisometropia were also recorded.

Results

The median age of patients awaiting cataract surgery was 76 years (range 22-97). Of the 315 patients, 72% were aged over 70 and 16% were aged over 85. A systemic comorbidity that would confer high risk status was identified in 21% of patients. This high risk status was attributable to severe respiratory disease, cancer, and immunosuppression therapies in the majority of cases. The high risk group were younger than those deemed non-high risk, but there were no significant differences with respect to gender, anticipated degree of surgical difficulty, VA, or whether the patient was undergoing first or second eye surgery. Of those patients awaiting first eye cataract surgery, the mean VA in the listed eye was 0.84 logMAR and 39% (70/179) had a VA <0.3 logMAR (6/12 Snellen acuity) in their fellow eye. 57% of patients were awaiting first eye surgery, and 32% of those patients would be at risk of symptomatic anisometropia postoperatively.

Conclusion

One-fifth of patients awaiting cataract surgery were found to be at high risk of severe disease or death from COVID-19 and these patients may experience delays in their surgical care. Additional planning is required in order to minimise the morbidity associated with delayed cataract surgery.

Keywords

Cataract, COVID-19

INTRODUCTION

The COVID-19 pandemic has presented a significant challenge to the delivery of surgical care globally, as elective operations and outpatient appointments have been postponed, and resources reallocated to manage the burden of disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.[1] As these disrupted services resume, additional precautions are required to avoid hospital-acquired infection, particularly in patients who are vulnerable to worse outcomes and a higher mortality rate if they develop COVID-19. The Royal College of Ophthalmologists (RCOphth) issued guidance on resuming cataract surgery, with recommendations to prioritise care based on clinical need and balancing this against the risk of developing COVID-19.[2]

Cataract is the second most common cause of reversible visual impairment worldwide.[3] Cataract surgery is the most frequently performed elective operation in the United Kingdom and is a cost-effective intervention that improves quality of life significantly.[4,5] The demand on cataract surgery services in the UK is expected to increase by 50% between 2015 and 2035.[6] This increase in demand is related to a greater prevalence of cataract in an ageing population, but can also be attributed to a lower threshold for surgical

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intervention as the safety and visual outcomes of modern phacoemulsification surgery have improved.[6] The disruption of cataract services during the COVID-19 pandemic means that, in addition to the background increase in demand, there will be a significant backlog of patients requiring surgery.[7]

Patients undergoing cataract surgery are often elderly and have systemic comorbidities.[8] COVID-19 has a significantly higher mortality rate in older patients and those with certain comorbidities.[9] The Department of Health for Northern Ireland outlined specific diseases that would pose a greater risk of severe illness from COVID-19 (Table 1).[10] Patients meeting any of these criteria were described as 'clinically extremely vulnerable' to COVID-19.[10] This is distinguished from those who are 'clinically vulnerable' on the basis of age or other lower risk comorbidities.

Table 1: Conditions considered to make a patient clinically extremely vulnerable to a severe COVID-19 infection[10]

- Solid organ transplant recipients.
- People with specific cancers:
  - people with cancer who are undergoing active chemotherapy
  - people with lung cancer who are undergoing radical radiotherapy
  - people with cancers of the blood or bone marrow such as leukaemia, lymphoma or myeloma who are at any stage of treatment
  - people having immunotherapy or other continuing antibody treatments for cancer
  - people having other targeted cancer treatments which can affect the immune system, such as protein kinase inhibitors or PARP inhibitors
  - people who have had bone marrow or stem cell transplants in the last 6 months, or who are still taking immunosuppression drugs
- People with severe respiratory conditions including all cystic fibrosis, severe asthma and severe chronic obstructive pulmonary (COPD).
- People with Motor Neurone Disease
- People with rare diseases and inborn errors of metabolism that significantly increase the risk of infections (such as Severe combined immunodeficiency (SCID), homozygous sickle cell).
- People on immunosuppression therapies sufficient to significantly increase risk of infection.
- Women who are pregnant with significant heart disease, congenital or acquired.
- People who have had a splenectomy
- Those undergoing renal dialysis

In order to ascertain the risk to patients awaiting cataract surgery, we sought to investigate which of these patients would be considered to be 'clinically extremely vulnerable', or at high risk of severe illness or death due to COVID-19. Surgery was typically deferred for these high risk patients until transmission rates of COVID-19 had fallen, in order to mitigate the risk of infection.

METHODS

A prospective study was conducted between 3rd June and 31st July 2020 with the aim of identifying patients on the waiting list for cataract surgery in the Belfast Health and Social Care Trust who were deemed to be at high risk of severe illness or death from COVID-19. A standardised pro forma was used when reviewing the patients' clinical information via the Northern Ireland Electronic Care Record (NIECR). The following information was recorded: patient demographics (age, gender, laterality of listed eye); best-corrected visual acuity; whether the listed eye was the first or second eye to undergo cataract surgery; risk of anisometropia; comorbidities that would make a patient extremely vulnerable to severe disease or death from COVID-19.

If any of the conditions listed in Table 1 were present, a patient was graded as high risk. In the absence of these

Table 2: Description of Degree of Surgical Difficulty (DSD) Grading[14]

DSD Grade	Description
1	A very straightforward case, suitable for a novice cataract surgeon
2	A straightforward case which should cause an experienced surgeon no difficulties. May have one or two factors that increase surgical complexity e.g. sub-optimal dilation, difficulty lying flat, dense or mature cataract, high myopia or hypermetropia, age >85
3	A more challenging case for an experienced surgeon, likely to carry a higher risk of complication. Will have three or more factors that increase surgical complexity e.g. pseudoexfoliation syndrome, poor dilation requiring pupil expansion device, severe positional issues, shallow anterior chamber, any of those factors listed for Grade 2
4	A very challenging case with a very high risk of major complication. High risk factors include phacodonesis/ iridodonesis, previous significant blunt trauma, nanophthalmos

Table 3: Demographics and ocular characteristics of study population

Parameter	Results (n = 630)
Median age (Range)	76 years (22-97)
Male (%)	47
Right (%)	53
1st eye (%)	57
Mean VA in listed eye ± SD (Range)	0.84 logMAR + 0.87 (0.00 – PL)
Mean VA in fellow eye ± SD (Range)	0.45 logMAR ± 0.69 (-0.10 – NPL)
DSD grading of listed eye (%)	
DSD1	36
DSD2	48
DSD3	15
DSD4	1

DSD, Degree of Surgical Difficulty; PL, Perception of Light; NPL, No Perception of Light.

conditions, a patient was considered non-high risk. Patients who were non-high risk may still be considered 'clinically vulnerable' to COVID-19 because of their age or other systemic comorbidities but did not meet the specific criteria outlined for the 'clinically extremely vulnerable' group.[10]

The preoperative visual acuity was recorded using Snellen notation as the best-corrected distance visual acuity using the patient's habitual spectacle prescription at the time of listing for surgery. If visual acuity was documented following first eye cataract surgery but before patients had updated their spectacle prescription, best-corrected distance visual acuity was recorded with pinhole. Snellen visual acuity was converted to logMAR values prior to analysis.[11] Patients were defined as being sight impaired (SI) if binocular best-corrected visual acuity (BCVA) was between 3/60 and 6/60, and severely sight impaired (SSI) if binocular BCVA was less than 3/60.

Anisometropia exists when an individual's two eyes have different refractive powers. For patients with preoperative refraction data available, they were deemed to be at risk of significant anisometropia if an aimed postoperative emmetropic spherical equivalent in the first eye would leave ≥3 dioptres of residual myopia or hyperopia in the fellow eye. An interocular difference of 3 dioptres was considered to pose a significant risk of causing impaired postoperative binocular visual function, such as reduced stereopsis or diplopia.[12,13]

Additionally, all cases were graded according to the anticipated degree of surgical difficulty (DSD).[14] This preoperative grading is undertaken routinely at the time of listing in order to risk-stratify for intraoperative complications and plan operating lists appropriately. In cases where the DSD grade was not specified by the listing surgeon, the clinical notes were reviewed and a DSD grade assigned accordingly. A summary of the DSD grading system used is outlined in Table 2.

Patients were excluded from the final analysis if the pro forma was incomplete. Statistical analysis was conducted using Microsoft Office Excel (Microsoft, USA). In order to compare characteristics of the high risk and non-high risk groups, Chi-square and two-tail t-tests were used, with significance set at 0.05.

RESULTS

Demographics

The clinical information pro formas of 315 patients (630 eyes) were analysed. The median age was 76 (range 22-97) years (Table 3). The majority (72%) of patients were aged over 70, and 16% were aged over 85. Of those eyes included in the study, 57% were listed as the first eye to undergo cataract surgery in a bilaterally phakic patient. Eight incomplete pro formas were excluded from the analysis.

Risk factors for severe disease or death due to COVID-19

21% (66/315) of patients met the criteria as being at high risk of severe illness or death due to COVID-19 (Table 4). The majority of these patients had severe respiratory conditions (37/66), cancer (15/66) or were on immunosuppression therapies (9/66). Severe COPD accounted for the majority of patients (32/37) identified as having a severe respiratory condition.

The mean age of the high risk patients was significantly less than that of the non-high risk patients (Table 5). There were no statistically significant differences between the high risk group and non-high risk groups with regards to gender, first or second eye status, proportion that were DSD grade 3 or 4, or mean VA.

Table 4: Clinical reasons for being at high risk of severe disease or death due to COVID-19

Reason	% (n = 66)	Underlying diagnosis	(n)
Solid organ transplant recipients	5 (3)	Organ not specified	3
Specific cancers	23 (15)	Undergoing chemotherapy	7
		Undergoing immunotherapy	1
		Haematological malignancy	3
		Lung cancer	4
Severe respiratory conditions	56 (37)	Severe COPD	32
		Severe asthma	1
		OSA on CPAP	2
		Severe bronchiectasis	1
		Pneumonia requiring hospitalisation	1
Motor Neurone Disease	0 (0)	-	
Rare disease and inborn errors of metabolism	0 (0)	-	
Immunosuppression therapies	14 (9)	Systemic immunosuppression for autoimmune disease	9
Pregnant with significant heart disease	0 (0)	-	
Splenectomy	2 (1)	Previous splenectomy	1
Undergoing renal dialysis	2 (1)	Renal dialysis for end-stage renal failure	1

COPD, Chronic Obstructive Pulmonary Disease; OSA, Obstructive Sleep Apnoea; CPAP, Continuous Positive Airway Pressure.

Visual acuity

The mean visual acuity in all eyes listed for surgery was 0.81 logMAR (6/38 Snellen acuity) and 0.45 logMAR (6/18 Snellen acuity) in the fellow eye (Table 3). Of those undergoing first eye cataract surgery, the mean VA in the listed eye was 0.84 logMAR and 39% (70/179) had a VA less than 0.3 logMAR (6/12 Snellen acuity) in the fellow eye. For bilaterally phakic patients, 3% (5/179) had a binocular visual acuity that would be registrable as Sight Impaired and 1% (2/179) would be registrable as Severely Sight Impaired.

Risk of anisometropia

Of those patients undergoing first eye surgery with preoperative refraction data recorded, 32% (37/115) would be expected to have ≥ dioptres of anisometropia if emmetropia was the aimed refractive outcome in the first eye. Of those awaiting second eye surgery, 35% (41/118) had ≥ dioptres of anisometropia.

Table 5: Comparison of high risk and non-high risk patients

Variable	High risk group (n=66)	Non-high risk group (n = 249)	p value**
Age (years)*	71.7 ± 8.9	75.6 ± 11.3	0.003
Male (%)	45	48	0.55
1st eye (%)	52	58	0.22
DSD: Grade 3 or 4 (%)	14	16	0.59
VA in listed eye*	0.83 logMAR ± 0.90	0.81 logMAR ± 0.83	0.83

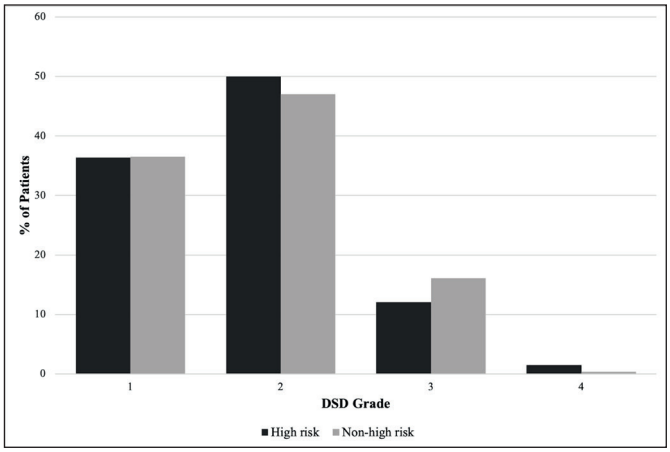
*Mean ± standard deviation **Chi-square test for frequency values and *t*-test for mean values

Degree of surgical difficulty

The majority of patients (48%, 150/315) were listed as DSD grade 2 (Table 3). There were no statistically significant differences in the proportion of patients in each DSD grade between high risk and non-high risk patients (Figure 1).

DISCUSSION

Figure 1: Proportion of high risk and non-high risk patients assigned DSD Grades 1-4



This study found that 21% of patients awaiting cataract surgery were deemed clinically extremely vulnerable to severe disease or death due to COVID-19. The coexistence of cataract and these high risk comorbidities poses the challenge of delivering cataract surgery safely to this vulnerable group of patients.

This cohort of patients had a mean age of 74.8 years and this is similar to the mean age of 76.0 years for the RCOphth National Ophthalmology Database Audit, which analysed a UK-wide population of patients undergoing cataract surgery.[15] The high risk group had a lower mean age than the non-high risk group. This may be related to the increased mortality rate associated with the conditions present in the high risk group. It is important to note that 72% of the patients in this study were aged over 70 and would therefore be considered 'clinically vulnerable' to COVID-19 even in the absence of high risk features.

A proportion of these patients would be expected to have senile cataract, but high risk comorbidities may increase the likelihood of developing visually-significant cataract. Severe COPD was the most common comorbidity that conferred high risk status. Smoking, the primary cause of COPD, and the use of inhaled steroid in its treatment both increase the likelihood of cataract formation.[16,17] 23% of patients deemed high risk had one of the specific cancers listed by the Department of Health for Northern Ireland. Several chemotherapy agents can cause cataract, and systemic corticosteroid may also be used during cancer therapy.[18] Patients who are systemically immunosuppressed to treat autoimmune disease or for solid organ transplant are typically maintained on steroid-sparing agents, but may receive short courses of corticosteroid and this would increase the likelihood of posterior subcapsular cataract formation.

This study highlights that a significant proportion of patients awaiting cataract surgery are at risk of delays in their care because of their systemic risk profile. For patients identified as being at high risk of severe illness or death due to COVID-19, surgery was typically deferred until after 31st July 2020, when the incidence of COVID-19 had decreased and public health guidance was adjusted accordingly.[19] This was done with the aim of mitigating the risk of developing COVID-19. However, delays in cataract surgery are also associated with significant morbidity. Visually significant cataract is associated with depression, impaired cognitive function, reduced quality of life, limitation of physical activity and impaired driving ability.[20-23] In addition to the negative impact on overall health and social wellbeing, there are ocular sequelae of delayed cataract extraction such as phacomorphic and phacolytic glaucoma.[24,25] Dense cataract can also mask retinal disease that cannot be visualised through the opacified lens.[26]

Visual acuity in the listed eye was similar in the high risk and non-high risk groups. The mean preoperative VA of 0.81 logMAR (6/38 Snellen acuity) for all eyes listed for surgery in this study was worse than the mean preoperative VA of 0.63 logMAR (6/24 Snellen equivalent) reported by the RCOphth's National Ophthalmology Database audit, which includes data from multiple health trusts across the UK.[27] There were seven patients in total who would be eligible for registration as being Sight Impaired or Severely Sight Impaired; three in the high risk group and four in the non-high risk group. This study did not record ocular comorbidities, but these patients had been listed for surgery because of vision loss secondary to cataract and so would be expected to have an improvement in vision post-operatively.

Approximately half of the patients included in the study were awaiting first eye cataract surgery. Of those, 32% were at risk of anisometropia following first eye cataract surgery. While the relationship between anisometropia and symptoms of reduced binocular visual function is complex, 40% of both hyperopes and myopes will have reduced stereopsis when anisometropia is ≥3 dioptres.[12] As such, 3 dioptres of anisometropia is generally considered to be clinically relevant, with an increased risk of headaches, aesthenopia, double vision and photophobia.[13] One study demonstrated an increased rate of falls requiring hospitalisation between first- and second-eye surgery, attributing this to surgically-induced anisometropia and loss of stereopsis.[22] Second-eye surgery presents an opportunity to correct anisometropia and improve stereopsis, stereoacuity, VA, contrast sensitivity and self-reported visual functioning.[28,29] It also offers a significant gain in quality of life.[30] It should be delivered in a timely fashion to avoid a possible increase in falls risk due to refractive imbalance between first- and second-eye surgeries.

Patients with more severe vision loss due to cataract may need to be prioritised if surgical capacity is reduced during the COVID-19 pandemic. While second-eye surgery is important, the greatest improvement in visual function is gained from first eye surgery and so prioritising those awaiting first eye surgery may be a reasonable approach during a period of limited capacity.[31] For patients with visually-significant cataract in both eyes, immediately sequential bilateral cataract surgery (ISBCS) has been suggested as an alternative method of delivering cataract surgery to vulnerable patients during the COVID-19 pandemic.[7,32] ISBCS involves operating on both eyes during a single visit to the operating theatre, therefore reducing the probability of nosocomial infection while addressing binocular visual function.

The increased use of telemedicine for tasks such as explaining the diagnosis and surgery, discussing aimed refractive outcomes and gaining consent, can be used to reduce the amount of time patients need to spend in clinical settings for face-to-face encounters.[7] The introduction of mandatory reverse transcriptase-polymerase chain reaction (RT-PCR) testing for SARS-CoV-2 in patients attending hospital for cataract surgery has reduced the likelihood of individuals with COVID-19 transmitting this to other patients and staff in hospital. Ensuring social distancing and reducing time spent in hospital, by streamlining patient flow through the day case surgical unit, have further mitigated this risk.

This study demonstrates the utility of an electronic health record in efficiently screening patients for risk factors associated with worse outcomes from COVID-19. It was not practical to access the paper-based case notes for this number of patients in a short period of time, but the relevant medical information was readily accessible through NIECR which allowed rapid screening of a large patient cohort. Some patients deemed to be 'clinically extremely vulnerable' chose to attend for cataract surgery during the period of this study. However, this decision was taken after a detailed discussion regarding the additional risks of SARS-CoV-2 infection and what steps were being taken to limit potential exposure. As such, individual patients could make an informed decision regarding the timing of their cataract surgery.

CONCLUSION

This is the first study to quantify the proportion of patients undergoing cataract surgery who are at high risk of severe disease or death from COVID-19. This high risk is attributable to severe respiratory disease, cancer and immunosuppression therapy in the majority of these vulnerable patients. This study also highlights the challenge of delivering cataract surgery safely to a high risk population with sight loss secondary to cataract. Screening for significant comorbidities can be performed efficiently using an electronic health record. Patients with severe vision loss can also be identified in this way. It is therefore important that relevant clinical information is recorded accurately on the electronic health record at the time of listing for surgery. Changes to how surgical care is delivered may also help to reduce visual morbidity and minimise the risk of nosocomial SARS-CoV-2 infection during the pandemic.

This study has not previously been submitted for publication or presentation.

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Ulster Med J 2022;**91(1):**26-29

Clinical Paper

Diagnostic accuracy of ultrasound in the paediatric population with acute right iliac fossa pain, our District General Hospital experience.

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Provenance: Externally peer reviewed

Keywords –
Paediatrics, appendicitis, ultrasound, general surgery

Abstract

Aim

This project aimed to evaluate the role of ultrasound scan (USS) in children presenting with acute onset right iliac fossa (RIF) pain and suspected appendicitis

Methods

We retrospectively studied 100 consecutive children undergoing USS for RIF pain. Children with low to moderate clinical probability of appendicitis were seen by the surgical team and subsequently underwent USS by a radiologist or a sonographer with a special interest in paediatric USS. The clinical findings, blood tests, and radiological diagnosis led to a decision to operate, observe or discharge. USS findings were subsequently verified with the final histology. The six-month follow-up data of these patients were also analysed.

Results

35 males, median age of 11 years (range 4-17), and 65 females, median age of 14 years (range 6-18) were included. A total of 23 appendicectomies were performed. On histology appendicitis was confirmed in 20, including 16 pre-operatively diagnosed on USS. 6 of these appendicectomies were performed on clinical suspicion with normal USS. 1 patient was diagnosed with neuroendocrine tumour of the appendix. Only 2 negative appendicectomies were performed. 62 patients were discharged without intervention. USS sensitivity was 74%, and specificity was 92% for appendicitis. An additional 16 patients were identified with alternate pathology including 5 ovarian cysts.

Conclusion

Appendicitis was more common in male patients; however, there was no difference in overall disease prevalence in male or female paediatric patients. Thus, USS is a valuable tool to exclude appendicitis in children with low to moderate probability.

Introduction

The lifetime prevalence of appendicitis is around 7%. In the UK, 12,000 appendicectomies are performed every year for children under the age of 18 years, and 80% of these cases are managed in district general hospitals[1,2] Acute right iliac fossa pain is a common presentation in children attending the emergency department. Diagnosis of acute appendicitis in children remains a challenge as there may be symptom overlap mimicking other differentials such as mesenteric adenitis, gastroenteritis, ovarian cyst, and urinary tract infections. Effective clinical assessment and ultrasound scan (USS) help identify patients who require surgical intervention. The classic symptoms of abdominal pain, nausea, vomiting, anorexia, and shifting of pain occur in less than 50% of cases[3]. Similarly, typical signs of tenderness, rebound tenderness, and peritonitis may not be present until there is a severe infection, perforation, or the presence of an abscess. USS is a widely available and preferred method to help diagnose appendicitis in children. Computed tomography (CT) scanning is, however, thought to be more sensitive[4]. The use of CT scans in children is limited because of the risk of radiation. With this, we looked into the diagnostic practice of our department in a medium-sized district general hospital.

Methods

In this retrospective study, a total of 100 children who presented to the emergency department with right iliac fossa pain between January and December 2019 were included. Histology and 6-month follow-up data were also assessed. All children included were seen by a senior member of the on-call team (a registrar or a consultant), underwent routine blood tests, and USS by a radiologist or a sonographer with a special interest in paediatric USS. Children with a high index of suspicion of appendicitis who did not require USS and directly underwent surgery were excluded from this study. Data was collated into an Excel spreadsheet and analysed for frequencies, sensitivity, and specificity.

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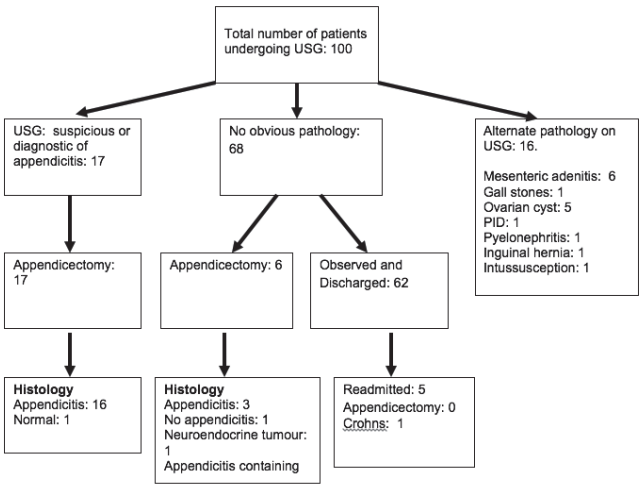
Results

Table 1: Age ranges for this cohort of patients

Pathology	Male (total 35)	Female (total 65)
Appendicitis	9(28%)	12(18%)
Mesenteric adenitis	3	3
Ovarian cyst	NA	5
Gall stones	1	0
Urinary Tract Infection	0	1
Pelvic Inflammatory disease	0	1
Possible Intussusception	1	0
Small groin hernia	1	0
Crohn's disease	0	1
Neuroendocrine tumour	0	1
Total	**15 (42%)**	**24 (37%)**

Table 2: Frequencies of pathology identified and treated in our cohort of patients on USS and final histology.



This study included 35 males, 65 females, and their median age was 14 years (range 4-18, table 1 shows age ranges). A total of 20 patients had a final diagnosis of appendicitis on histology, including 8 males and 12 females. Disease prevalence in these symptomatic children with right iliac fossa pain was similar (male 40%: female 37%). 16 of 20 histology proven appendicitis were diagnosed pre-operatively on USS with corresponding sensitivity of 74%. 62 patients with normal USS did not require intervention and were discharged, and the related specificity of USS was 92%. 6 additional appendectomies were performed based on clinical concerns, 4 of which were positive for appendicitis including one containing worms. 1 patient was diagnosed with neuroendocrine tumour on histology. In addition, 16 alternate pathologies were recognised, including 5 patients with ovarian cysts. Only 2 negative appendicectomies were performed in this cohort. (For details see Table 1, 2 below and Figure 1 in the appendix).

Discussion

Appendicitis is the commonest presentation with right iliac fossa pain in children and adolescents[5]. Prevalence of appendicitis in children referred for imaging investigations is reported between 31-50%[6]. Complexities in examination and communication issues in children could limit the clinical diagnostic accuracy and result in incorrect diagnosis in 28-57%[6] cases. Delayed diagnosis could result in perforated appendicitis, which could be as high as 51% amongst patients younger than 5 years. This may be secondary to limitations of communication and expression in the history and description of symptoms. However, the rate of perforated appendicitis improves in adolescents.[5] Adolescents present earlier and elicit more typical signs and symptoms.[6] Perforated appendicitis can lead to complications, extended length of stay in the hospital, and increased risk of mortality; therefore, early diagnosis and management is emphasised.[5,7] It is recorded that a treatment delay of 36 hours could result in perforated appendicitis in 65% of children.[6] In females, it is difficult to distinguish between appendicitis and gynaecological disorders therefore; they are more likely to have a negative appendicectomy[6,8].The prevalence of appendicitis in our cohort was slightly low compared to the published data. The prevalence of appendicitis was high in males, whereas teenage girls were found to have alternate pathology such as an ovarian cyst. The overall prevalence of pathology was similar in both groups 40% vs. 37%.

In addition to the clinical assessment, blood tests such as white cell count, neutrophil count, C reactive protein are commonly used to help diagnose. The predictability of the diagnosis can be improved by combining clinical assessment and blood tests. This is also the basis of commonly used scoring systems such as the Alvarado score for appendicitis. There is variable data for its sensitivity (75-90%) though it has been widely used since 1986.[9-10] The emphasis is on early recognition and treatment of appendicitis; this will reduce complications such as perforation and maintain a low negative appendicectomy rate. In the UK, Paediatric Emergency Appendicectomy guidelines recommend that the majority of operations should be performed within 12 hours of decision making and to aim for a negative appendicectomy rate below 15%.[1] Trends of management of appendicitis have slowly changed, however, most cases in the UK continue to be managed in district general hospitals.[1,2]

In some cases, clinicians may opt out of any imaging, and decisions in such cases are direct to surgery based on the clinical signs of frank peritonitis secondary to appendix perforation. We identified 30 additional children during this period, who were clinically diagnosed with appendicitis

and underwent surgery without USS and therefore excluded from this study. Their histology subsequently confirmed the clinical diagnosis. Most of the children presenting with low to moderate probability require imaging for early diagnosis. An early and accurate diagnosis is required in such cases to plan timely treatment and prevent high negative appendicectomy rates.[8] The average waiting time for USS in our cohort was 18 hours in the 'hot clinic' setting and in admitted patients, USS waiting time was 14 hours. In the Netherlands, the negative appendicectomy rate has reduced from 15% to 3.3% after implementation of imaging guidelines before surgery, and similarly, in the United States of America, the Surgical Care and Outcomes Assessment Program (SCOAP) has reduced the negative appendicectomy rate to 5.4%.[11] In accordance with the guidelines and recommendations, in our district general hospital, we have the facility to investigate and treat such children on a regular basis.[1,2] Early assessment, timely and accurate investigations, and treatment resulted in only 2 (10%) negative appendicectomies in our centre. Our 6-month follow-up data did not reveal any additional appendicectomies in this cohort of patients. This data showed 2 patients with post-operative infection, and they were treated conservatively with antibiotics. We referred 3 of our patients to a tertiary centre for further assessment and management, and this included a suspected Crohn's disease, a suspected intussusception, and a patient with post-operative histology suggestive of a neuroendocrine tumour.

USS is a widely used imaging modality in children presenting with RIF pain. The selection of imaging modality may vary in different centres across the world as in some places, CT scan is used as first-line imaging modality; however, in the UK, USS is still considered the first-line imaging modality in children. The sensitivity and specificity of USS in acute paediatric appendicitis are variable; previous studies reported sensitivity and specificity as low as 58-77% and 61-68% respectively.[3,12]. USS however, is an operator-dependent tool, and the results may improve in more experienced hands, in previous literature it was found that a carefully performed USS has a sensitivity of 75-90% and specificity of 90-99%.[12,13] We have a dedicated specialist consultant sonographer with an interest in paediatric USS and a team of sonographers who work closely with the radiologists. Although the sensitivity in our USS department was on the lower end of published data, high specificity helped with the discharge of patients with low to moderate probability.

CT scan is not widely used in the paediatric population because of the perceived risks of radiation and paediatric organ sensitivity to radiation and the cost of CT scans.[12,15] Its reported sensitivity is 90-100% and specificity 91-99%, evidently higher than USS.[13,14] The American College of Radiology (ACR) suggests considering the risk of radiation and suspicion of clinical complexity when making such decisions to expose children to radiation.[15] Reduced dose CT is a better alternate modality and as effective as conventional CT with a sensitivity of 95% and specificity of 94% as described in a recent systematic review and meta analysis. The dose of radiation used is 78% less than a conventional CT in such scans. Magnetic resonance imaging (MRI) is the third choice of imaging in appendicitis. MRI is particularly beneficial in the paediatric population in which CT scanning would be used reluctantly, given the fact that MRI produces no radiation.[15] Its reported sensitivity and specificity are 94-97% and 94-98% respectively.[15] Its use however, is limited because of its unavailability in acute settings and the length of time required (40-45 minutes), although this may significantly be reduced in new generation scans.[12] Similarly, a reduced number of sequences can be applied to reduce the scan time to around 15 minutes.[12] Young children may not tolerate the noise and tunnel effect. Other contraindications include metal implants and loose bodies. Reporting of MRI requires a subspecialist gastrointestinal radiologists, and all these factors limit its use in emergencies. [15] A typical cost comparison reveals that USS is the cheapest modality amongst the 3 available options; however, taking into account the number of days spent in hospital, the negative appendicectomy rate, and potential complications.[12]

Overall, USS is a beneficial and relatively cheap modality of imaging for acute appendicitis in children. In our experience, it has been a helpful aid in diagnosis and, more importantly, in excluding pathology in low to moderate clinical suspicion. Furthermore, dedicated and experienced USS specialists are useful in this regard as in our unit. We, however, appreciate that a stepwise approach including USS as a first-line modality (accepting possible lower sensitivity), followed by low dose CT or MRI if USS is inconclusive, should be considered. However, this depends on the ongoing clinical concern as many clinicians may or may not opt for CT or MRI. Therefore, these decisions are individualised and made based on a risk versus clinical complexity basis.

Conclusion

In children presenting with right iliac fossa pain, clinicians continue to rely on USS because of the diagnostic uncertainty of the presenting complaint. CT and MRI are alternative imaging options. We acknowledge the support of our radiology and surgical department in the management of all these patients.

No conflict of interest or financial support to declare.

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Case Report

Caecal Diverticulum Causing Catastrophic Gastrointestinal Bleeding in a Child: A Case Report

Mary Patrice Eastwood[1], Irene Milliken[1]

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Provenance: Externally peer reviewed

Abstract

Solitary caecal diverticulae are rare in children and presentation with massive gastrointestinal (GI) bleeding is seldom reported. We present the case of a 13-year-old boy with a two-year history of abdominal pain and multiple inconclusive investigations presenting with a life threating lower GI bleed. We also review the literature surrounding solitary caecal diverticulae and caecal duplication cysts (CDCs).

Introduction

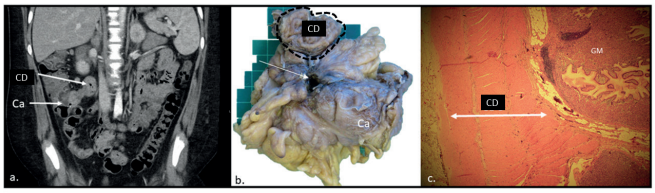
Profuse gastrointestional (GI) bleeding in children, leading to haemodynamic instability is most commonly associated with a Meckel's diverticulum. Herein, we report a rare cause of profuse gastrointestinal bleeding in an older child.

Case Report

A 13-year-old boy (90kg) presented to a referring hospital with a three-day history of bloody diarrhoea, right iliac fossa pain and shortness of breath. On presentation, he was hemodynamically unstable (BP 80 systolic, HR 140 bpm) with a haemoglobin of 34g/L (130-180g/L). His coagulation screen was normal. He was commenced on tranexamic acid, transferred to the paediatric surgical centre and received a massive blood transfusion (6 units). There, a computed tomography angiogram was undertaken which did not demonstrate active bleeding but demonstrated an abnormal tubular structure arising from the ileocaecal valve (Figure 1a).

He reported a two-year history of intermittent abdominal pain with episodes of bloody stool and constipation. In the preceding year, he had had a normal colonoscopy and oesophago-gastro-duodenoscopy. Oesophageal, gastric, duodenal, colonic and terminal ileal biopsies showed no histological abnormalities. His faecal calprotectin was mildly elevated at 90 ug/g and his haemoglobin was 103 g/L at that time. Magnetic resonance enterography had demonstrated terminal ileal thickening with no other areas of inflammation. There had been no concerns on antenatal scans.

Figure 1: a. CT angio showing the relation of the caecum (Ca) to the solitary caecal diverticulum b. Resected specimen demonstrating the caecum (Ca), CD (dashed line) and area of perforation (arrow) were adherent to gonadal vessels c. Histology showing all three layers of diverticulum wall (CD) and hypertrophic gastric mucosa (GM)



In the paediatric surgical centre he underwent a laparotomy which demonstrated an outpouching at his caecum. This outpouching was adherent to his gonadal vessels (Figure 1b). No typical appendix was visualised. The rest of his small bowel and liver were unremarkable. He had a limited right hemicolectomy and primary anastomosis.

Histopathology demonstrated a perforated solitary caecal diverticulum with heterotopic gastric mucosa (HGM) (Figure 1c). No appendix was definitively identified.

At two-month follow-up, he reported to be completely pain-free with no further episodes of GI bleeding.

Discussion

We report a rare case of caecal diverticulum with HGM resulting in life threating GI bleeding in an older child. HGM in a rectal diverticulum causing hematochezia in a 14 year old girl has been reported(1). We identified a single case report of CDC as a cause of rectal bleeding and haemoglobin drop in a 9-month old male (2). This was diagnosed on colonoscopy and ultimately resected(2). Interestingly, they reported benign glandular lining within the cyst wall(2); we were able to confirm HGM in our specimen. Heterotopic gastric mucosa can be found anywhere in the GI tract from mouth to anus. It is typically seen in the oesophagus, duodenum, Meckel's diverticulum or duplication cysts(3).

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Profuse GI bleeding resulting in haemodynamic instability does present in children. It is most often described in Meckel's diverticulum which is typically in the absence of abdominal pain, has a quoted incidence of between 1 and 4% and the majority are resected in those under the age of 4 years (4). Vascular malformations arising from the GI tract have been reported to cause rectal bleeding in children occasionally(5). In our patient, GI bleeding from longstanding inflammatory bowel disease had been ruled out on previous investigations. Colorectal carcinoma is seldom seen in children and may cause GI bleeding. It is associated with genetic syndromes such as familial adenomatous polyposis (FAP) and can present with a range of symptoms, unfortunately often late(6). Carcinoid tumours have also been reported to cause massive lower GI bleeding in adults although there are few reports in children(7).

A tubular CDC was also considered but they typically do not communicate with the colonic lumen although it is likely their underlying pathogenesis is shared. Several theories exist as to the origin of enteric duplication cyst. It is suggested that could be secondary to failure in regression of embryonic diverticula, errors of splitting of the notochord or failure in recanalization of the primitive intestine(8).

Enteric duplication cysts are rare in children having an estimated incidence from neonatal autopsies of 1/4500 (8). Colonic duplication cysts account for only 13% of enteric duplication cyst. The majority (80%) of these are cystic, located on the mesenteric side of the bowel and occur in the caecum (8). They contain all layers of colonic wall including muscularis propria(9). They rarely contain gastric mucosa therefore GI bleeding is infrequent, a more common presentation being that of appendicitis(8,9). Similarly, solitary congenital caecal diverticulum are rare, include all layers of the caecal wall and tend to present with pain rather than life-threatening haemorrhage(10).

Conclusion

We report a rare cause of life threating GI bleeding in an older child due to a perforated caecal diverticulum with HGM . Patients with ongoing symptoms and negative investigations may benefit from diagnostic laparoscopy.

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Medical History

The Belfast Branch of the Socialist Medical Association

Alun Evans

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Provenance: Internally reviewed

Introduction

The Belfast Branch (BB) of the Socialist Medical Association (SMA) was founded[1] in the autumn of 1942, one of 29 branches[2] of its parent, the SMA of Great Britain [sic]. It consisted of a broad church of doctors, dentists, students, and other health professionals, including nurses. Its monthly meetings attracted 25-40 individuals, but doctors never constituted more than a third of the audience.[3] From what had this interest in Socialism arisen in wartime Belfast? It stemmed from a push for a comprehensive State Medical Service which Stewart claimed[4] was, "…a sign of contemporary optimism about social reconstruction." As we shall see, there were also local circumstances which fuelled the ambitions of the BB.

The Origins of State Medicine

According to Murray,[5] two utopian novels paved the way for State Medicine. The first was Samuel Butler's 'Erewhon', published anonymously in 1872.[6] Its name derived from the rough spelling of 'Nowhere' backwards. It posed the question whether health was a right or a duty; if illness was a departure from duty or an act of God; and if medical care was a privilege or something to be denied to those wicked enough to become ill.

The other was Edward Bellamy's 'Looking Backward', published[7] in 1888. In it, the main character falls asleep in 1887, to wake up in Boston, Massachusetts, in 2000 when illness and disease are still rife. Bellamy rails against social injustice and concedes that those who cannot work should live on the produce of those who can, seeing the principle of universality of services with astonishing clarity. Goods and services were to be paid for with credit cards.[8] The book contains this remarkably prescient sentence:[9]

> No man any more has any care for the morrow, either for himself or his children, for the nation guarantees the nurture, the education and comfortable maintenance of every citizen from the cradle to the grave.

The phrase, 'from the cradle to the grave' will recur throughout this account, yet, in some form, it is far from new: Richard Steele, in 1709, wrote,[10] "…a modest fellow never has a doubt from his cradle to his grave."

One enterprising Belfast man, Frank M'Gibben, followed Bellamy's lead and in 1897, published[11] *Belfast in the Year 2000 AD*. Frank had been a member of the Bakers Loyal Orange Lodge 245, the only Lodge permitted to meet on Saturday nights because bread was not sold on the Sabbath.[12] After going blind in 1890, Frank took up writing. In his book, reprinted in 2000, Frank predicted the demise of horse traffic and the Orange Order, but one of these predictions proved incorrect.

Another book which influenced the future NHS was AJ Cronin's *The Citadel*, published[13] in 1937. Cronin was a Scottish Doctor, who, while working in Wales, became interested in miners' silicosis, and spent three years in Tredegar, which in the novel he disguised as *Aberalaw*.[14] Aneurin Bevan, a one-time miner in Tredegar, benefitted from the *The Tredegar Medical Aid Society* which served as a template for the NHS.

The State Medical Service Association

In 1911, Benjamin Moore, a Biochemistry professor, suggested[15] that a *National Health Service* would both 'strengthen the physique of the race' and save national resources. The State Medical Service Association (SMSA) was founded in 1912.

The Socialist Medical Association

The SMA replaced the SMSA in September 1930 when Somerville Hastings became its first President.[16] Hastings and a colleague visited the USSR in 1931 and were impressed with the Semashko System,[17] which included 'Prophylactoria' or health centres, and by the state medical education which ensured that doctors were drawn from all strata of society.[18]

The SMA gained affiliation with the Labour Party, and at a Labour Conference in 1932, Hastings successfully introduced this motion:[19]

> The country's health needs can only be effectively provided by the establishment of a complete State Medical Service, giving everything necessary for the prevention and treatment of disease, free and open to all.

Further success came two years later when the Labour Party established a Medical Services Committee on which the SMA

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was heavily represented,[19] and its report, *A State Medical Service*, was discussed at the Labour Party conference in 1934. Nevertheless, the SMA's admission of members of the Communist Party in the mid-1930s dismayed the Labour Party Executive.[4]

The Belfast Branch of the Socialist Medical Association

I learned about the BB from the Labour Historian, Andrew Boyd, the author of *Holy War in Belfast*[20] and other books. He put me in touch with several ex-members of the BB, and I spoke with them initially by telephone. In some, I detected a certain reticence to rake over old ground, as if Socialism was viewed as a youthful indiscretion.

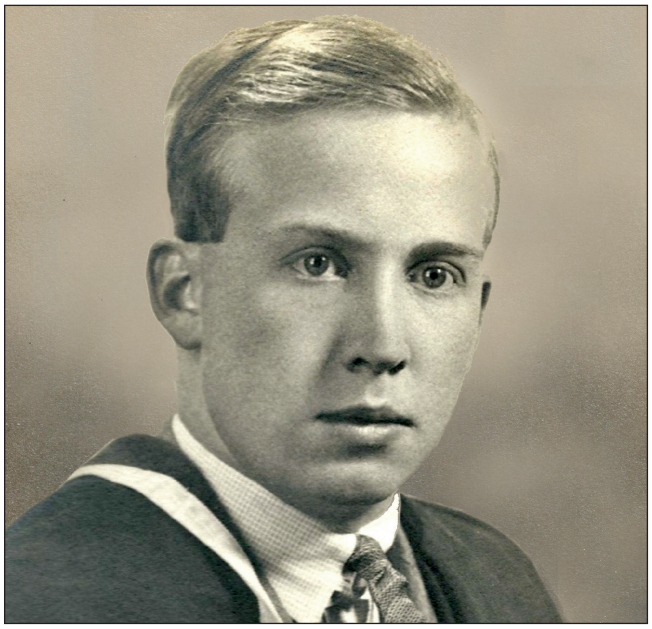

Figure 1: William Calwell (1915-2000)

Others were more forthcoming, particularly Drs William Calwell (see Figure 1) and Arnold Elliott (see Figure 2). Dr Calwell had been the BB's Vice-Chairman, and I visited him in the two years before he died. He had qualified in 1937 and afterwards did a DPH, when he was nicknamed 'The Bloodhound' thanks to his constant pursuit of fresh material for his haematological slides.[21] He attained an MD in 1941,[22] spending most of his life in General Practice in Whitehead, Co Antrim.

Dr Calwell itemised the concerns that gave rise to the BB: the poverty of the 1930s was central. Arnold Elliott, who dropped his original surname of Epstein, for obvious reasons, when he joined the British Army towards the end of the war, wrote me a wonderful letter in 2007:

> The poverty at that time was appalling and unemployment rife. There were inadequately clothed 'shawly' women and children walking barefoot. It was this background which motivated me to study Medicine and thus 'help starving humanity'.

The links between poverty and ill health are overwhelming and were originally categorised[23] by THC Stevenson of

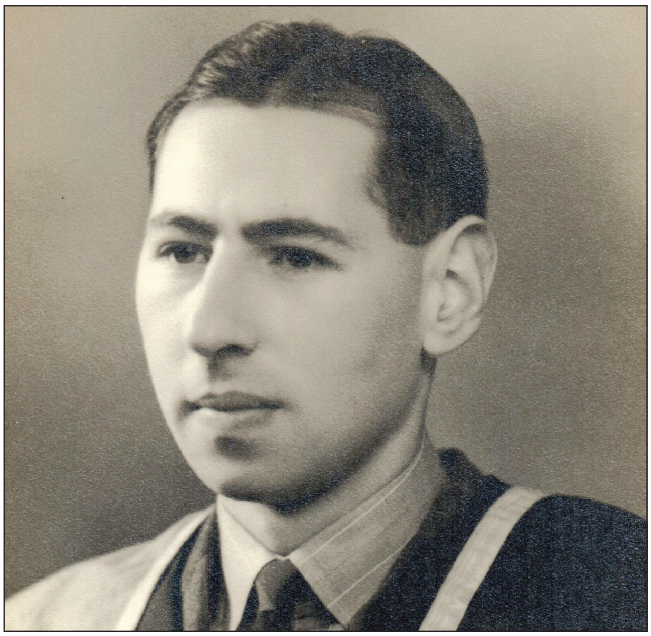

Figure 2: Arnold Elliott (1921-2009)

Strabane who devised the Social Classification system. Given the poverty of the time, it was little wonder that the health profiles in Belfast were poor. A full exploration of this lies beyond this paper's scope, so readers should refer to Privilege and Jones' masterful analysis.[24] In any case, the fathers of the fledgling Northern Ireland state bore some responsibility, as Health was evidently lowly ranked among their priorities.

The condition of the poorest in Belfast was dramatically exposed by the Belfast Blitz in the spring of 1941. The Moderator of the Presbyterian Church informed his flock that he was inexpressibly shocked:[25]

> …by the sight of the people I saw walking in the streets …I never saw the like of them before – wretched people, very undersized and underfed…Is it creditable to us that there should be such people in a Christian country… and yet there is evidence of wealth everywhere.

There followed the Carnwath Report[26] on the *Municipal Health Services of the City* in 1941. Thomas Carnwath, also born in Strabane, had been England's Deputy Chief Medical Officer.[24] While the prevention, control and treatment of epidemic disease was generally well catered for, pollution in Belfast Lough was a particular problem. The decline in Tuberculosis was slower than elsewhere and the Council was criticised for not pasteurising all milk; housing, although comparable to other UK cities, was in shorter supply. There were deficiencies in school medical services, children's nutrition, and the same obtained for Maternity Services: an obstetric flying squad was lacking. The city did particularly badly in comparison to other cities for indicators such as Infant and Maternal Mortality and Life Expectancy.

Tuberculosis was a huge problem in the 1930s, accounting for half of deaths in the 15-24-year age group.[26] Elliott recalled:

> When I was a student, Tuberculosis was rife and whole wards were filled with respiratory TB cases. Other wards were filled with bony TB. Measles and Diphtheria were endemic and included myself among their victims. I lost a younger brother with TB peritonitis.

There were also problems at Belfast's Municipal Sanatorium at Whiteabbey Hospital, with accusations of bribery,[27] and the Matron and the Medical Superintendent were suspected of having an affair. A letter, signed by the Gynaecologist, Thomas S Holmes, stating that, "…she is in my definite opinion *virgo intacta*"[28] was read out and Holmes confirmed that he had written and signed it. The whistle blower was Henrietta Helen Scott, who had qualified in Medicine two years before. When she attended a wedding in England, she asked for permission to lock her door, but on her return,

Figure 3: Queen's University Swimming Club (1940-41) Henry McClatchey, seated, 1st from left (one of four Medical students in the photograph), Dr William McClatchey, seated, 5th from left. (Courtesy of Special Collections, QUB Library)

her door had been forcibly opened.[29] To compound this, the Tuberculosis Committee had purchased large quantities of faulty blackout material and was involved in a dodgy land deal. The Inquiry Report, which ran to over 2,000 pages, was published in June 1942 but the recriminations rumbled on for some time, and the full story may never be told.

It was against this backdrop that the BB was established on 22nd September 1942.[1] Arnold Elliott recalled that it, "… consisted mainly of half a dozen left wing students, half of whom were swimming blues" (see Figure 3). This is interesting given Socialism's then obsession with physical fitness.[30]

Elliott continued:

> The Queen's debating society was dominated by the left against the right. The leader of the right had a brother who was the Irish university heavy weight boxing champion. He threatened to bash us when we said his brother was 'nailed to the crooked cross,' so we had to flee for our lives….We brought Stark Murray over from London.

Murray was an SMA veteran, and the visit probably took place when the BB was being established because, subsequently, all lectures were advertised in the local papers. Indeed, the BB recognised[3] its, "…cordial relations with the local press," and this is confirmed by 42 mentions in the 16 months of the BB's existence.

At the first meeting it was asserted that medical services in the province were, "…ripe for reorganisation," … "should be both preventative and curative," and "…the same for all and free for all."[1] There was a call for Clinics, such as those which, "were foreshadowed in *The Citadel* by A. J. Cronin". In such clinics, different specialists would co-operate, with:[1]

> …a direct chain connecting the man who makes the first general examination of the patient with the specialist or surgeon who finally undertakes the treatment of a difficult case.

Two days later the paper printed[31] a letter from, "…a true follower of A. J. Cronin", wishing them every success. Some of the book's following may have stemmed from the fact that when it appeared, its publisher, Gollancz, sent 200 free copies to the British Medical Association which was meeting in Belfast.[14] In October the BB sought affiliation with the Northern Ireland Labour Party,[32] and by the end of October this was granted,[33] but not in time for the BB to contest a by-election for a vacant QUB seat,[34] which was won by the Unionist, Dr William Lyle.

In November, a BB member gave a talk at the newly created *Women's War Effort Association*, stressing the importance of a proper balanced diet, rest and good factory conditions.[35] A fortnight later, Dr W McClatchey, the BB's Honorary-Secretary, was promoting better conditions for nurses, who were invited to attend SMA meetings.[36] In mid-December, the BB's first Chairman, Dr O G Edholm (a Physiologist, soon to take up a Chair in London[37]), passed a resolution welcoming a motion by Dr Lyle calling for the establishment of a Ministry of Health.[38] Lyle described the conditions of public health in rural areas as, "…a sordid tragedy." In December the BB passed a resolution in support of Lyle:[39]

> The people of Ulster have been shocked by the disclosures of Dr. Carnwath in his recent report and demand that the Government take immediate steps to bring the health services at least up to the level of those in England.

The BB stressed the importance of *The Beveridge Report* which could only be realised through the inauguration of a complete, national medical scheme. Health Centres would be linked to hospitals, with dentists, x-ray units and laboratories. Childcare, Antenatal and Maternity services would be provided with periodic screening of all patients, and lectures, research and 'health propaganda' would all be provided.[40] In fact, their concept of Health Centres was truly wide-ranging.

In January 1943, the BB called for city nursery centres to assist the *Women's War Effort Association*,[41] and Dr M Abrahamson lectured on *The Beveridge Report*.[3] In February the lecturer asked, *Why Socialism?*[42] In March, a meeting of 150 nurses was held in the Grand Central Hotel[43] (see Figure 4) when pay and conditions, seeking parity with the rest of the UK,[44] were discussed and another address, *Medicine and Socialism*, was delivered at the same venue as the membership had swollen to 70. The choice of venue[45] must have attracted taunts of 'Champagne Socialism' and, even worse, 'Bollinger Bolshevism'.

In April the BB published[3] its first and only *Bulletin*,

Figure 4: The Grand Central Hotel (first spire from the right). It was originally intended as a 'Grand Central Station' with underground platforms,[45] but the City Council opted for a new City Hall instead

in a format based on that of the SMA of Great Britain. It announced that Dr W McClatchey would talk on *Health Services in the Soviet Union* and gave details of a "…real social success" in the shape of a dance, possibly a fund raiser, held at Miss Foster's Dance Studio on the Lisburn Road that March with three prizes:[3]

> …presented for novelty dances by non-medical S.M.A. sympathisers.

In June the BB was represented at the Labour Party Conference on Policy,[46] and pleas for a Health Ministry were repeated. The BB's Honorary-Secretary, Dr W McClatchey, and his brother H McClatchey, both spoke.[47]

That September the BB called for improved factory conditions and was collecting questionnaire data before a conference in the autumn.[48] In October it reviewed causes of work absenteeism[49] and the need for an Industrial Health Service.[50] October also saw[51] a BB publication, as Murray breezily recalled:[2]

> The Belfast branch produced its own pamphlet *Health in Belfast* which set the ball rolling on the form of an organised service for Northern Ireland.

The pamphlet of 14 pages,[51] (see Figure 5) marshalled the BB's major preoccupations, chief among which was the lack

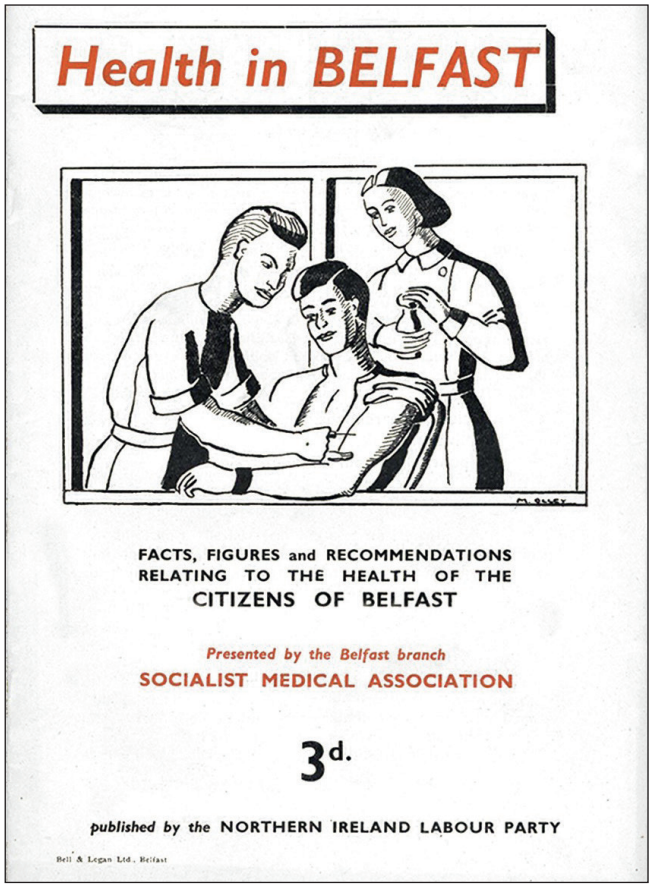

Figure 5. 'Health in Belfast,' cover design by Marjorie Olley, Belfast College of Art. (Courtesy of Belfast Central Library)

of a Ministry of Health. It summarised hospital facilities and the need for Area and Regional Councils. Maternity Services and the Thomson report of the 1930s concerning Maternal Health were referred to,[24] and Child Welfare and Housing received attention. It was particularly hard hitting on Tuberculosis and a 'scheme' was strongly recommended. The NI Tuberculosis Authority was established in 1946.[24] Venereal Disease was highlighted as a particular wartime problem. The pamphlet concluded with the maxim: "THE HEALTH OF THE PEOPLE IS THE CONCERN OF THE PEOPLE THEMSELVES."

The BB's Standing Joint Conference (of the Trades Union Council) took place in Clarence Place Hall that November.[52] The Chairman was Wilfred Brennen, who qualified in 1935 (IInd Class Honours), subsequently attaining an FRCSI in 1938.[53] Dr Marc Daniels presented the questionnaire results while Dr W McClatchey accepted that the results were not as conclusive as desirable owing to poor response rates.[54]

In December 1943 Dr William Lyle again called for the establishment of a Ministry of Health.[55] In rejecting the call, Sir Dawson Bates piled the blame for poor health on Local Authorities, thereby undermining his own case, as the Ministry of Home Affairs had clearly failed to cope with the problem. By late January 1944, the establishment of a Ministry of Health was being recommended,[56] and by late March it was accepted that a Ministry of Health and Local

Government should be established in place of the Ministry of Security.[57]

WHATEVER HAPPENED TO THE BELFAST BRANCH?

After November 1943, there were no further mentions of the BB in the local press. What had transpired? It was unlikely that the 'cordial relations' had soured badly, so it must have been that the chief aim of the BB, the establishment of a Ministry of Health, had been satisfied. Paradoxically, this was realised thanks to actions of the winner of the seat that the BB wished to contest, and a Unionist to boot! Also, Wilfred Brennen, the Chairman, was soon to be appointed Consultant Surgeon to the District Hospital, Magherafelt.[58] William McClatchey had qualified in 1940, and taken a DPH in 1941.[59] His brother, Henry McClatchey, qualified in 1946.[59] Arnold Elliott qualified in Medicine in 1944, and then served as a doctor on the troop ships.[60] He went into General Practice in the home counties, remained a lifelong Socialist, and a passionate champion of the NHS. It is likely that other student members may have gone off to serve in the forces. At this distance it is difficult to be sure that other factors weren't involved too.

The Carrick By-Elections

The only member of the SMA to enter mainstream politics was William Calwell. He fought the Carrick by-election in August 1943. Calwell was beaten by 2,496 votes by John Campbell, the Unionist. It was a bruising contest for Dr Calwell who told me that graffiti appeared accusing him of being "De Valera's Secret Agent". Dr Calwell left a hand-written account of the by-election:

> The Unionists began the election campaign with 19th century cat-cries – certainly in harmony with the sanitation and living conditions of the people. When Labour did not 'bite' they borrowed the progressive programme outlined by Labour and repeated parrot like all the things that Labour had said the previous night…. Not to be side-tracked Labour stuck to its programme, Infantile and Maternal Mortality which in NI are the highest in the United Kingdom and nearly twice as high as in England. The tuberculosis death rate again the highest in the UK, chaotic medical services and the Housing, 'In Sale' and 'Rent Rackets' so prevalent in Northern Ireland with their consequent effect of overcrowding, the ally of Tuberculosis.

Dr Calwell fought another Carrick by-election in April 1945. This time the Unionist majority was 4,164.[61]

The Advent of the National Health Service

Winston Churchill is generally credited with having first used the phrase, "from the cradle to the grave" in relation to National Insurance:[62]

> National compulsory insurance for all classes for all purposes from the cradle to the grave.

According to Fraser, however, The Daily Mirror had used the phrase in a headline on the 2nd December 1942:[63]

> Beveridge tells how to Banish Want, Cradle to Grave Plan, All pay, all benefit…one weekly payment for all citizens – from duke to dustman.

In fact, this was by no means the first citation in the newspapers.

Delivering the National Health Service was far from plain sailing, with the majority of the Medical Profession set against it.[64] Aneurin Bevan played one side off against another, and by introducing Distinction Awards, "Stuffed consultants' mouths with gold", to achieve it.[65] This subterfuge may have exacerbated any previously existing gulf between Hospital Medicine and General Practice, a far cry from the SMA's "sunlit uplands"[66] of a 'Health-centred panacea'.

Conclusion

There is no doubt that the SMA informed the health policy of the Labour Party, but in terms of the entire Medical Profession, they represented a tiny minority.[67] It seems that once the BB saw that its main objective, the establishment of a Ministry of Health, had been met, it quietly dissolved. We can only guess at the forces that were operating, with the younger members of the profession gaining free rein in the absence of their slightly older colleagues who were away fighting the war, who may have expressed their disapproval of what was being transacted in their absence. It is a fact that many western intellectuals were taken in by *Stalinism* in the 1930s.[68] To Unionists, 'Socialist' may have seemed all too redolent of the political philosophy which shaped Irish Nationalism.

In any case, a State Medical Service was established although it fell short of the SMA's expectations. The SMA continued its activities but changed its name to Socialist Health Association in 1981.[69] Perhaps the last words should be left to Aneurin Bevan: in promoting the concept of the NHS he employed the mantra, "We are going to Tredegarise you,"[70] and his epitaph, rich in political cynicism, for the SMA was, "Pure but impotent."[71]

ACKNOWLEDGEMENTS

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Medical History

Planning of the UK's National Health Service

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Key Words: Education, Nightingales, Training, Transportation

INTRODUCTION

William, Lord Beveridge (1879-1963) is widely recognized for his multi-faceted efforts to improve the health, education and social well-being of society. His career led to the establishment of the National Health Service (NHS) in 1948. His career began with his education at Charterhouse under House Master Frederick K. Girdlestone, cousin of renowned Orthopaedic Surgeon Gathorne Robert Girdlestone, first Nuffield Professor of Orthopaedic Surgery[1,2,3].

In 1894 Beveridge was promoted from Junior to Senior Scholarship, becoming Head of Charterhouse[1]. At Beveridge's Mother's insistence he went up to Balliol, where he subsequently won a Minor Exhibition in Mathematics[1]. His original plan was to become an astronomer, and continue his study of Mathematics, but he also returned to the study of Classics during his five years (1897-1902) at Balliol. After working in the East End of London and lobbying for social reform, in 1908 he became a Civil Servant at the Board of Trade[4]. Winston Churchill appointed and supported Beveridge's work in forming the Board of Trade, including the establishment of Labour Exchanges. By 1910 there were 214 such Labour Exchange branches to assist with employment[5]. His work in the British Ministry of Munitions and Ministry of Food during World War I enabled his food rationing system credited with ameliorating wartime food shortages[4]. In 1919 he was elected Director of the London School of Economics[4,6] and appointed Vice Chancellor of the University of London in 1926[4,6,7]. In 1937 he was elected Master of University College, Oxford (Fig. 1).

Figure 1
William Henry Beveridge (1879-1963), Oil on canvas, 90.2 cm x 69.9 cm, accession no. 50, painted 1959 by Allan Gwynne-Jones, DSO, CBE, R.A. (1892-1982). First Baron Beveridge of Tuggal, Head of the London School of Economics, 1919-1937, Vice-Chancellor, University of London, 1926-1937, Master, University College, Oxford, 1937-1944. Mathematical Scholar of Balliol, Progenitor of the National Health Service. User of the Library, later the Waller Library, at Murray House, Newcastle-upon-Tyne.

WORLD WAR II

In 1940, Ernest Bevin, Minister of Labour, recruited Beveridge to assist, as a temporary Civil Servant, with the Wartime Organization of British manpower. Beveridge chaired a Committee on Skilled Men in the Services which submitted reports to the War Cabinet in August and October1941, which were discussed at a meeting on 29 January 1942[8].

In November 1942, Beveridge published the *Report to Parliament on Social and Allied Services* known as *The Beveridge Report*[9]. In response, a Ministry of National Insurance was established at Newcastle-upon-Tyne in 1944[4,10,11]. Beveridge's legal offices were downtown.

The future Tessa Hedley-Whyte and her mother 'Peg' Waller went to Newcastle in 1948[12] (fig.2). Peg started at Murray

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Figure 2
Portrait of Elizabeth Margery (Peg) Waller, J.P. (1916-2008). Oil-on-canvas, painted 1938 by Cecil Stuart Jameson (1884-1973). Waller (née Hacking) played competitively at Wimbledon as a Junior. Chair of Trustees, Murray House Foundation and Waller Library, Newcastle-upon-Tyne. "Creating opportunities for young people to learn and reach their potential"[13].

House, where she was later to chair the Board of Trustees and manage the Library, later the Waller Library.

ANGUS HEDLEY-WHYTE, POST MUSGRAVE PARK

After our departure from Musgrave Park, where my* father had served as Commanding Officer[14,15], Father served from 1942 with the rank of Brigadier, as Consultant Surgeon to Northern Command[16]. Father was acquainted with William Beveridge and his ongoing campaign toward establishment of the National Health Service[16].

WAR CABINET 1944 AND 1945

At 3:00 p.m. on January 26th 1945 the War Cabinet chaired by Churchill met with the Chiefs of the British Armed Forces[17]. The Chief Agenda Item was the Allied Response to the serious threats of new revolutionary U-boats with efficient snorkels and hydrogen peroxide propulsion systems[18,19,20] that allowed fast and multi-day submerged cruising and sinking of Allied shipping. War Cabinet Meetings during the period October-December 1944 had endorsed Sholto Douglas's and FDR's proposed course of mitigation[21,22]. On 27 January 1945, German submarine U-1172 was sunk in St. George's Channel by depth charges from British Frigates HMS Tyler, HMS Keats and HMS Bligh[23]. The War Cabinet Minutes of Monday 29 January 1945 reported the incident: "U-boat activity continued in the Irish Sea. One U-boat had been sunk and another possibly sunk"[24]. Before VE Day due to the Allied In-Shore Response, another 14 were sunk chiefly by collision[25].

ALLIED LEADERS

Both Sholto Douglas and FDR had Scottish Grandmothers who were friendly with one another and with their grandsons. Sholto Douglas and FDR met alone in Cairo, Tehran and Washington, DC, with British and American guards outside the meeting room[21,26]. FDR by force of experience and US Governance controlled the placement and roles of "My Bombers", including the long-range US manufactured Liberators[21,27]. After U.S. entry into the war FDR mandated increased U.S. production of these aircraft to one every hour; 18,482 Liberators were built between 1941 and 1945[21,27].

FDR and Sholto Douglas, in 1944, proposed that all Anglo-American training flights should include passages over bays and harbours on both sides of the Atlantic. Sholto Douglas has described meeting alone with FDR; FDR's charm and competence and follow-up were impressive [21,26].

STALIN AND TEDDER

The British Cabinet with FDR's endorsement sent Eisenhower's deputy and Commander of the Western Alliance Tactical Air Force, Arthur W. Tedder (Fig. 3), to Moscow to approach Stalin about Allied aircraft landing arrangements. In Cairo, Tedder's plane started leaking aviation fuel onto the tarmac. This recognition of presumed sabotage before takeoff for Russia probably saved the lives of Tedder and his crew. Bad weather in Russia caused Tedder to complete his trip to Moscow by train[28,29]. Stalin asked Tedder for advice about air evacuation of wounded both in Russia and potentially in the Far East.[28]

The meeting alone with Stalin in the Kremlin was successful. British and American Bombers would be based on Soviet territory and be focused against German U-boats, their fuels, their transportation by German roads, rails and canals, their manufacture and their German ports. Medical and surgical cooperation between the Western Allies and the Soviets was intensified. Air transportation of the seriously wounded was emphasized[16].

At the celebratory Kremlin Dinner Tedder's speech was in fluent Russian: a language he later occasionally used to make a point as Chancellor of the University of Cambridge: "*Nyet*—end of debate!" [28].

*This and other first person references are to the first author.

Figure 3
Arthur William Tedder, GCB, 1st Baron Tedder, 1890-1967. Deputy Supreme Commander to Dwight D. Eisenhower at Headquarters of Allied Expeditionary Force 1943-45. Chief of RAF 1946-50, Chancellor of Cambridge University, 1950-67. Prince Philip subsequently served as Chancellor, 1976-2011. Oil-on-canvas by Henry Carr, R.A. (1894-1970), painted 1949, 74.5 x 61.5 cm, College Portrait 120. Reproduced by permission of the University and of the Master and Fellows of Magdalene College, Cambridge, solely for this Medical History.

1945: SUPERVISION AND IMPLEMENTATION

Diversion of RAF Coastal Command and US Navy flights and training and combat flights to maximize time over Northern Ireland and the rest of Great Britain were coordinated by UK and US radar and sonar chains[30].

ATTEMPTED SIEGE OF UK

George Stanley Waller (Fig. 4) was charged with implementation of this change in venue of air training to bays, harbours and coasts[31,32]. The sonar screening of the North Sea was of inestimable value to the Allies. The system of sound-wave detection, later known as "sonar", developed in secret during World War I by Lord Rutherford at Victoria University of Manchester was replicated and deployed[33]. U.S. Admirals questioned the British control of the Allied flight paths. The White House reminded them of "My Navy". FDR had been de facto Commander of the U.S. Navy and its Flying Boats in WWI[21].

George Stanley Waller, reading for an Honours Law degree at Cambridge University in 1932, joined the Cambridge RAF Air Squadron. Soon after being called to the Bar, Waller as a Junior accused a senior British Judge of Judicial Misconduct. Waller won his case after addressing the House

Figure 4
George Stanley Waller (1911-1999). Photographic portrait of the Rt Hon Sir George Stanley Waller, QC, OBE(M), 1964. Whitley Pilot and Captain for RAF 502 (Ulster) Squadron. Lord Justice of Appeal, Treasurer of Gray's Inn, 1978-1979. Recipient of Dagger Money for "Successful Conduct of Assize in Newcastle-upon-Tyne and Carlisle and safe journeys to and fro."

of Lords. The Senior Judge had suggested in open court that the wife who tried to enter her own house "should be horse-whipped". In Waller's opinion, and later that of the House of Lords, the Senior Judge's opinion was entirely unjustified[32].

Having played as a Wing-Forward, sometimes, Second Row, for Blackheath and the Barbarians, World All-Stars, Waller was on the winning team for the English Sevens for the RAF in the spring of 1941.

Waller was assigned to Pilot and Captain Whitley Bombers from Aldergrove and Limavady for RAF Ulster 502 Squadron. Two years and the sinking of the *Bismarck* later, and the loss of fifty percent of their Whitleys, Waller was transferred to Plymouth to assure close cooperation between the RAF and the US Navy Air Arm. After the *Bismarck* sinking Waller from his Whitley warned the Captain of the Royal Navy's Battleship *King George Vth*, "German bombers are about to counter-attack." The bombers retreated[32].

Waller crashed his boss and himself into a Plymouth oak tree. The pair of them then descended the oak, scratched but otherwise unharmed. On return to their original air base Peg Waller (Fig. 2) was not told of their return. She and her co-workers thought the crash must have killed their boss Air Vice-Marshal Geoffrey Rhodes Bromet, later Lt. Governor of the Isle of Man (1945-1952)[34] and Peg's husband Waller.

RESPONSIBILITY FOR TRAINING: RAF COASTAL COMMAND AND US NAVY AIR ARM

Waller was thereafter transferred to RAF Coastal Command Headquarters near both Northholt, and Northwood Park. There he was joined by wife Peg and daughter Tessa[12,32].

From there organization of air transportation of sick and wounded was aided and supplemented.

AMELIORATION OF SNORKELING

For his inspection tours of UK air bases and defenses, Waller determined to always pilot his own plane; he preferred not to carry bombs or depth charges on the training inspection flights. The British War Cabinet had wished to know from Sholto Douglas how many Anglo-American training flights carried bombs or depth charges.

ULSTER SEQUELAE

On August 7, 1945, my father awakened me in my room at Bamburgh, Northumberland, with news of Hiroshima[35]. Father said, "Smedal at Musgrave Park, in 1942, was pretty accurate[15]. W. R. ' Ronnie' Watts is operating on your sister and will stay for lunch[36]. I will assist with the anaesthetic for drainage and excision of your sister's neck glands. This is from the Belfast Blitz's tubercular bovine milk….[37,38,39] . You are to dine for lunch at Tughall Hall with Uncle Frank[16,40] who is flying his Spitfire there to meet Beveridge (Fig. 1) who is staying with the Hoults." Lord Beveridge leased Tugall Hall from 1944[41].

Because of weather the lunch with the Beveridges was postponed for a few days. Waller's boss, now Sholto Douglas[26], ordered Nettleton to continue his stay with his sister, my mother—"the meeting with Beveridge is very important. The chief topic will be the transport of sick patients." And so it came to pass.

WILLIAM BEVERIDGE AND HIS NATIONAL HEALTH SERVICE

"The UK NHS is being crafted", my father explained to me. For Ulster the sophisticated assessment of transport of patients was to prove valuable.

Tughall Hall changed names to Tuggall after having the name Tughall since the late 17th Century[41]. Beveridge, about to become a first peer, chose as his title Lord Beveridge of Tuggal[42].

LUNCHEON AT TUGHALL

Beveridge knew that as a combat Spitfire pilot since May 1940, my Uncle Frank Nettleton had a one-in-twenty-five chance of survival[16,40]. Beveridge wanted to know every detail of Allied Air Evacuation worldwide. The leading role of Dr. Bertie Trevor-Roper in Alnwick Medical Affairs was most helpful to Beveridge's Healthcare plans. Much improvement was due to advances in transportation. Northern Ireland connections with Glasgow, Edinburgh, Oxford and Newcastle-upon-Tyne were markedly improved[43]. Beveridge wanted even further improvement in air, rail and road transportation for safe and efficient patient transfer. Beveridge, furthermore, wanted to know all about the training and responsibilities of Nightingales in the RAF, the US Army Air Force, the U.S. Navy and the Russian forces[44,45,46].

After the Tughall Beveridge luncheon, Uncle Frank Nettleton and I arrived at our house on The Wynding, Bamburgh. My sister, pointing to her right neck bandage, said to Uncle Frank, "Ulster cows did this to me." The telephone then rang. It was Dr. Bertie Trevor-Roper. His son Hugh was going to Berlin to investigate the reported death of Hitler[47]. It is now known that Hugh Trevor-Roper lunched at i Tatti[1] with Bernard Berenson on the 30th of July 1945 before proceeding to Berlin[47,48]. The Russians, especially Commissar for Foreign Relations, Andrei Vyshinsky[47], claimed that Hitler might still be alive, hiding in the Charité. Dr. Bertie "T-R" knew that my father had worked in the Charité during my parents' honeymoon[49].

Son, Hugh Trevor-Roper, in 1979, became the first Lord Dacre of Glanton, in the County of Northumberland. Dacre had been a distinguished counter-intelligence officer for the Allies in World War II before achieving literary fame, and fortune from book sales and film rights. He became a close friend of Bernard Berenson[41,47,50].

THE NATIONAL HEALTH SERVICE AND MEDICAL EDUCATION IN NORTHERN IRELAND

Toward the close of his long career, Pathologist and QUB Medical School Dean Sir John Henry Biggart spoke of the "Interdependence between postgraduate medical education and training and the National Health Service commitment to the Public"[51]. Sir John Henry has been credited with the concept of the Joint Appointment System between the Health Department and the University from the outset of the NHS in 1948[52]. As a QUB graduate, he was awarded a Commonwealth Scholarship to Johns Hopkins which he held from 1931-1933, when he accepted a Lectureship in Neuropathology at Edinburgh. He held this post until his return to Belfast in 1937, after being pathologist to the Scottish Asylums Board, neuropathologist to the Edinburgh Royal Infirmary and a close associate of Prof. Norman Dott[16]. Before his departure from Edinburgh, he published a textbook on Neuropathology based on his lectures[52,53]. During World War II he ran the Emergency Blood Transfusion Service in Northern Ireland[54].

With knowledge and experience from both sides of St. George's Channel, Biggart chaired the Standing Medical Advisory Committee of the Ministry of Health for Northern Ireland from 1967-73, and represented QUB on Northern Ireland's General Medical Council from 1951 until his death in 1979[52,55]. Building on this legacy, Northern Ireland's NHS through a series of reorganizations, continues progress toward the quality and equity of care envisioned by Lord Beveridge.

Lord Beveridge was a regular patron of the (Peg) Waller Library during his stays in Tughall and his work in the Newcastle-upon-Tyne area.

1. The Villa i Tatti, known as i Tatti, was bequeathed to Harvard University by Bernard Berenson (Class of 1887) upon his death in 1959. Harvard later acquired its Archives and Library. This estate in the Settignano Foothills east of Florence currently houses the Harvard University Center for Italian Renaissance Studies[48].

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James Logan Prize Essay

The Holistic Approach to Cancer Pain Management

Zobia Hussain

James Alexander Logan, a second-year medical student at the Barts and The London School of Medicine and Dentistry, died in February 2001 after a distressing illness of three months duration. His family, friends and interested professionals subsequently set up the James Logan Trust to encourage doctors and others to have the confidence to recognise and treat cancer pain. The James Logan Trust has provided funds for an annual prize for the best essay on "The challenges of cancer pain assessment and management" to be submitted by a Queen's University of Belfast undergraduate medical student after the completion of their fourth-year palliative medicine teaching.

Introduction

Pain is one of the most significant symptoms amongst cancer patients – nearly 40% of all patients in the oncological population experience moderate to severe pain.[1] Responding to the urgent need for an international standard of care, the World Health Organisation published guidelines on cancer pain management in 1986.[2] Despite this there is evidence to suggest that pain is under-managed. A 2008 review of studies reporting negative Pain Management Index (PMI) scores concluded that 43.4% of patients were being undertreated[3] which decreased to 31.8% in a 2014 update.[4] While the temporal trend is encouraging, approximately 30% of patients with cancer pain are still being under-treated. The causes are wide ranging, from inadequate pain assessment by healthcare professionals, to patients' reluctance to report pain.[5] The multitude of barriers in pain management reflect the complex nature of the symptom, which Cicely Saunders noted in her concept of "total pain." Multiple dimensions beyond the physical contribute to pain[6] and awareness of this is integral to the holistic approach. This essay will discuss oncological, pharmacological, psychological, social, and spiritual strategies to manage cancer pain.

Defining and assessing pain

Holistic management of pain must begin with a comprehensive assessment – this requires understanding the nature of the symptom. The International Association for the Study of Pain defines the symptom as 'an unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage',[7] with additional points expanding upon the definition noted in *figure 1*. The subjective nature of pain makes addressing it challenging, its presence cannot be verified with diagnostic tools such as imaging or blood tests, so patients' self-reports of symptom improvement is the benchmark of treatment success.

Cancer pain is primarily either nociceptive or neuropathic.[9] The former is caused by injury to skin and organs which stimulates local nociceptors, the latter by damage to the central or peripheral nervous system. The quality of the pain is important to elicit in a pain history – sharp, localised pain is more often somatic while aching, dull pain may be visceral, neuropathic pain may be described as burning or shooting. This guides the clinician to the cause: somatic pain may be caused by tumour metastasis to bone, visceral pain by abdominal infiltration and neuropathic pain is due to compression or disruption of nerves, by tumour or surgical intervention.[10]

A key aspect of the pain management plan is setting expectations, which increases patients' satisfaction regardless

Figure 1 - notes on pain definition [Figure][8]

- Pain is always a personal experience that is influenced to varying degrees by biological, psychological, and social factors.
- Pain and nociception are different phenomena. Pain cannot be inferred solely from activity in sensory neurons.
- Through their life experiences, individuals learn the concept of pain.
- A person's report of an experience as pain should be respected.
- Although pain usually serve an adaptive role, it may have adverse effects on function and social and psychological well-being.
- Verbal description is only one of several behaviours to express pain; inability to communicate does not negate the possibility that a person experiences pain.

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of the intensity of their pain.[11] The WHO 1986 guidelines lay out the following goals: to decrease pain when a patient is carrying out activities as well as at rest, and to decrease pain at night to maximise pain-free sleep. To this end, a multi-pronged approach consisting of various modalities is recommended with multi-disciplinary input.

Oncological pain management

Oncological methods such as radiotherapy and chemotherapy reduce the source of pain and hence are ideal for symptom control.

Nearly 50% of cancer patients require some degree of radiotherapy, with around 40% of these patients receiving radiotherapy for symptom control.[12] It is important to note that radiotherapy may take up to 6 weeks to relieve pain depending on the neoplastic cells' stage in the cell cycle. The side effects of radiotherapy, however, are immediate and pharmacological management is necessary in the interim.[13]

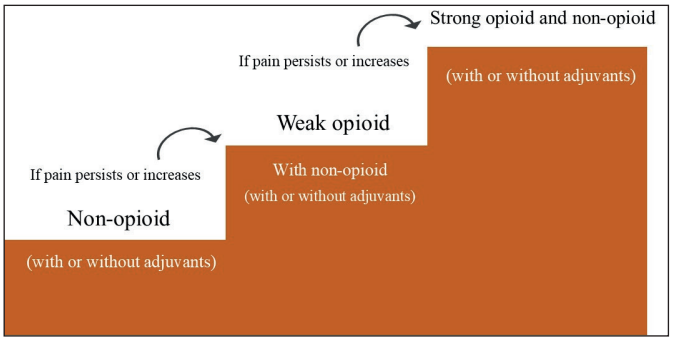
Concomitant use of radiotherapy and bisphosphonates can markedly relieve pain amongst patients with bone metastases, associated with a reduction in the dose of opioid analgesia required by these patients.[14] The utility of radiation treatments in reducing nociceptive signalling in this patient group is well corroborated in the literature.[15–18] There is evidence to suggest that single fraction radiotherapy is as effective as multi-fraction radiotherapy in patients with bone metastasis uncomplicated by fractures,[19] although patients treated with single fraction radiotherapy were more likely to require re-treatment.[20] When it comes to brain metastases and tumours, treatment modality depends on prognostic factors such as the age of the patient, their performance status and the number of brain metastases. In suitable patients, whole brain radiotherapy (WBRT) reduces the severity of a number of symptoms including nausea and vomiting, seizures and headaches.[21] In patients with poor prognoses there is less benefit from WBRT compared to corticosteroids and supportive care.[22]

Cytotoxic chemotherapeutic and targeted agents can function as anti-pain therapies through inhibiting tumour growth, hence reducing nociceptive pain by alleviating compression on viscera. In men with metastatic prostate cancer, a chemotherapeutic agent in combination with corticosteroids are superior to corticosteroids alone in reducing pain.[23,24] Chemotherapy induced peripheral neuropathy is a concern with certain agents, including cisplatin, vincristine and ixabepilone. Use of this modality requires vigilance for neurological symptoms as well as alteration of the dosage and regimen of chemotherapeutic agents if necessary.[25] Targeted therapies such as Tamoxifen[26] and Abiraterone[27] have been found to reduce cancer pain in breast and prostate cancer patients respectively; Imatinib, used to treat renal cancer, is particularly exciting for reducing abdominal pain in the majority of patients within weeks.[24]

Pharmacological pain management

The WHO 1986 guidelines included a simple three-step analgesic ladder (*figure 2*) consisting of aspirin, codeine, and morphine.[2] This was updated in 1997 to include more options at each rung of the ladder, although the aim was still to utilise readily available drugs to their full potential rather than introduce new expensive options that would not be equally accessible across the globe.[28]

Figure 2 – The WHO analgesic ladder for cancer pain management [Figure][29]



Although the ladder has been subject to criticism and numerous adaptations have been suggested, the WHO approach has been found to be effective for 70-80% of patients.[30] In practice, non-opioid analgesics are rarely enough as sole agents and opioids are often added. Different opioids vary in their affinity for receptors at the various binding sites, as well as varying in pharmacokinetics.[31] This leads to variation in adverse effects and tolerance within the drug class.

Six key points are noted relating to the ladder in the 1986 guidelines:

1. Individual dosing is required. It is important to let the patient's perception of the pain guide the dose rather than healthcare professionals' perceptions. When patients say they are in pain, we must believe them. Clinicians must be mindful of racial[32] and gendered[33] bias in pain assessment.
2. Oral therapy should be used in the first instance unless parenteral therapy is absolutely required.
3. Nocturnal pain control is emphasised to maximise pain-free hours of sleep – this may require increased doses of morphine.
4. Patients should be monitored for pain and adverse effects of pharmacological therapy. They should be reviewed regularly and re-assessed if there is an onset of new pain.
5. Adverse effects of strong opioids must be treated. Constipation, nausea, vomiting and respiratory depression can be as significant to the patient's quality of life as pain, and the majority will require co-prescriptions of laxatives and/or anti-emetics.
6. For patients with intractable anxiety and depression, adjuvants may be useful.

Complications of long-term opioid therapy include tolerance and addiction,[34] opioid-induced inhibition of adrenal androgen production,[35] and osteoporosis.[36]

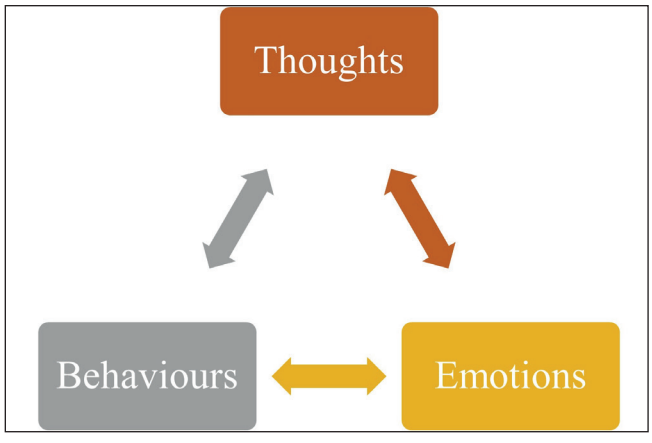
Adjuvants such as tricyclic antidepressants, local anaesthetics, carbamazepine, bisphosphonates and NSAIDs can be effective in the management of cancer pain syndromes.[37] The advantage of this approach is reducing dosages and hence toxicity; there may also be a synergistic effect from multiple therapies acting on many cellular targets simultaneously.

Neuropathic pain in cancer patients requires a different approach than in other patient populations, as typical treatments such as amitriptyline may not be as effective when given as sole agents. Mishra *et al*. found that a combination of opioids, gabapentin, amitriptyline and dexamethasone were effective for neuropathic pain.[38]

Psychological, social, and spiritual pain management

Pain manifested physically is perhaps simpler to understand than the other components of total pain (psychological, emotional, social, and spiritual), but the latter are no less important. Psychological distress can both be caused by pain and exacerbate it. Cancer is frequently comorbid with depression[39] which is itself associated with pain and a lower quality of life. In an interesting analysis, Wang *et al*. found that treatment for depression resulted in a greater decrease in pain than the reverse.[40] The psychological effects of cancer and treatment depend on a host of factors including the diagnosis, prognosis, underlying psychological vulnerabilities and internal locus of control. Interventions that may improve psychological wellbeing *during* treatment include Cognitive Behavioural Therapy (CBT), hypnosis and patient education about the condition and management.

Figure 3 - the 'cognitive triangle' [figure]



CBT is the first line treatment for mild depression and is highly recommended as an adjunct in moderate to severe depression.[41] The principles of CBT rely on the connection between thoughts, emotions and behaviour. A patient may understandably have a negative reaction to their situation but ruminating on thoughts such as "*This pain is going to kill me, I can't bear this*," will negatively affect their mood. "Catastrophising" has a deleterious effect on emotions, which in turn can cause behavioural changes such as social withdrawal. CBT aims to break the cycle by training patients to identify and question catastrophic thinking. Behaviours may also influence emotions and thoughts. Hence behavioural changes such as engaging in exercise, establishing sleep hygiene, and trying relaxation techniques are encouraged. There is some evidence for the benefits of this approach in breast cancer patients.[42]

There appears to be a relationship between the severity of cancer pain and hours spent on social activity with friends and family. Patients with mild pain spend more time on social activity while the converse is true for those suffering more severe pain.[43] This raises the intriguing question of whether there is a similar temporal relationship between the two as with depression. Koopman *et al*. carried out a study investigating pain in a sample of women with metastatic breast carcinoma, finding that pain was greater in those with more "total life stress" regardless of levels of social support. However, more social support reduced levels of mood disturbance.[44]

The patient-carer relationship is a key aspect of social pain. Caregivers often struggle with depression and feelings of hopelessness.[45] There is some evidence to suggest that carers' emotional distress is associated with the patients' pain, however, it is difficult to ascertain whether the pain is caused by the carers' distress or vice versa.[46] Interventions to socially support both patients and carers vary in scope and method, but meta-analyses have shown significant improvements to depression, caregiver burden, and symptom control.[47] Where more social support is needed, the valuable input of social work and occupational therapy is should be considered.

Spiritual pain can be defined as a loss of feelings of connection to a higher power or a lack of meaning. Cancer patients may experience spiritual suffering at the unpredictable nature of their condition, wondering why they were the ones to be afflicted. Being too incapacitated to carry out religious rituals, such as prayer, may also contribute to spiritual pain. Providing spiritual resources such as access to faith-based therapy reduced spiritual pain and symptoms of depression in a population of Muslim breast cancer patients.[48] Similar results have been found in Christian patient populations.[49] Clinicians must work with chaplains and spiritual authorities to support patients in their journeys.

A final aspect of the holistic approach may involve complementary and alternative medicine (CAM). This includes practices such as acupuncture, massage, reflexology, and aromatherapy. There is some evidence that CAMs in combination with conventional medicine improve quality of life,[50] however, there are concerns regarding lack of regulation.

To summarise, pain management is integral to high-quality care for cancer patients. Guiding principles were standardised by the WHO in 1986, these are: to assess

patients comprehensively; to take a careful approach to pharmacological therapies; to consider all aspects of an individual's pain from physical pain to spiritual suffering; and to involve the multidisciplinary team in managing these aspects. The most important principle of all is to practice empathy and understand that while pain may not be measurable, it is very real. Patients are the experts of their bodies – we must trust them.

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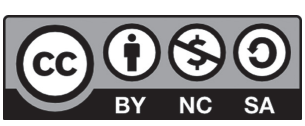

Game Changers

GREEN EGGS AND HAM BY DR. SEUSS: EMPLOYING DIGITAL TOOLS TO IMPROVE READABILITY OF PATIENT-FACING MATERIALS

In this children's book,[1] Sam-I-am tries to convince an unnamed and reluctant character to eat green eggs and ham. Using a vocabulary of just 50 words, with 49 of them being monosyllabic (with the exception of the word "*anywhere*"), Sam-I-am persuades his friend to eat these, who then realises that he actually likes green eggs and ham!

Preparation of patient-facing materials describing treatments and procedures, such as describing COVID-19 vaccines and vaccination to service users, can be difficult to accomplish. Examination of the "readability" of medical texts is becoming increasingly popular, where readability is an objective measure of the reading skills an individual must possess to aid in the understanding the material being read.[2] Adoption of readability calculators and scrutiny of materials for their readability can help medical authors develop materials with improved understanding for patients, carers and family, potentially leading to improved health literacy and clinical outcomes.

Digital readability calculators have now become widely available online and several free and subscription-based tools are available. In particular, the online software package, *Readable*, (www.readable.com) provides several readability scores and text metrics, including the most commonly used scoring parameters, namely the Flesch Reading Ease and the Flesch-Kinkaid Grade Level. The Flesch-Kincaid Grade Level is a widely used readability formula, which assesses the approximate reading grade level of a text (0 to 18th US grade equivalence), pegged to the US grade level of education and estimates the required education of the reader to be able to understand a text. The Flesch Reading Ease formula generates a score usually between 0 and 100, where a higher score means the text is more readable and a lower score means the text is less readable. For example, the Flesch Reading Ease Score of Cochrane Reviews' Plain Language Summaries are generally between 40 and 50, whereas scientific abstract scores are usually 20-30. A Flesch Reading Ease score of 70-80 is equivalent to US 7th Grade (12-13 year old). Such tools are used by simply "cutting-and-pasting" the text under scrutiny into the package and the readability metrics are returned in real time, thereby allowing authors to modify their language in real time to become more readable.

Readability of patient-facing information is important for patients to make informed decisions about their healthcare.[3] Recently (November 2020), the General Medical Council issued new guidelines,[4] where Principle 1 of "*Decision making and consent GMC 2020*" states "*All patients have the right to be involved in decisions about their treatment and care and be supported to make informed decisions if they are able*", as well as (Paragraph 10) - Doctors "*must give patients the information they want or need to make a decision*",[4] hence it is easy to see how such digital tools can assist clinicians in preparing easily read materials that empowers the patient to make an informed decision.

Dr. Seuss' careful choice of words resulted in a Flesch Reading Ease Score of 113.1 and a Flesch-Kincaid Grade Level of -1.1. More importantly, through employment of such easy-to-understand words, he convinces his friend to eat the green eggs and ham. Perhaps there are lessons to be learnt here for us all, in improving the health literacy of our patients, through writing more readable patient-facing materials as shown in the examples in Table 1.

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Table 1: Examples of readability and text metrics

Source	Flesch Reading Ease	Flesch-Kincaid Grade Level	Gunning Fog Index	SMOG index	Number of words	Number of sentences	Words per sentence	Syllables per word
Green Eggs and Ham (by Dr Seuss)	113.1	-1.1	2.3	4.5	799	141	5.7	1
Remdesivir for the treatment of COVID 19 (Cochrane Library)	37.5	9.7	9.8	10.9	30717	4350	7.1	1.9
COVID-19 vaccination: A Simple Guide (Northern Ireland Public Health Agency)	58.3	7.4	8.6	9.6	678	73	9.3	1.6
What Matters To Me? (Patient & Client Council Report)	58.6	7.9	9.6	10.6	10444	901	11.6	1.6

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So you want to be a

Case Based Learning Facilitator

Hamilton, Paul K.

Accepted

What is Case Based Learning (CBL)?

At its heart, CBL is simply the use of clinical cases to aid teaching[1]. The familiar words of Sir William Osler remind us that "medicine is learned by the bedside and not in the classroom" [2] and most readers will recall with clarity some of the memorable lessons they learned as a medical student by being directly involved in a real patient's case, often years after the learning event took place.

Undergraduate medical curricula were traditionally designed using models that saw students study topics related to medicine in their 'pre-clinical' years, prior to being exposed to patients in the latter years of the course. The concept sought to teach students how the healthy body worked before moving on to look at disease. In the late 1990s, many medical schools moved towards newer models which sought to expose students to patients earlier in their studies[3]. In many institutions however, there remained a disconnect between classroom-based learning of basic sciences and related disciplines, and clinical teaching. Using clinical cases to help students learn this 'pre-clinical' information was often done in an ad hoc manner with occasional tutorials being used to highlight the real-world applicability of what had been taught.

Problem-based learning (PBL) has been used as a teaching tool in many medical schools. PBL exposes students to 'problems' which they attempt to solve by exploring a topic in depth. Studies have shown that graduates from PBL courses may develop enhanced skills in problem solving, self-directed learning and other skills that will serve them well in their careers[4]. In PBL, students generally tackle issues in groups and explore topics of their choosing as they see fit, but they can waste time 'going off on a tangent' and may fail to maximise on the learning available[5].

CBL utilises a guided inquiry method to help students get the most from their learning experiences[5]. Groups of students are joined by a facilitator during CBL sessions. The main role of the facilitator is to monitor discussions and keep the students on-track, ensuring that they consider the key topics during their discussions. CBL employs discrete learning outcomes to focus study and enhance learning[1].

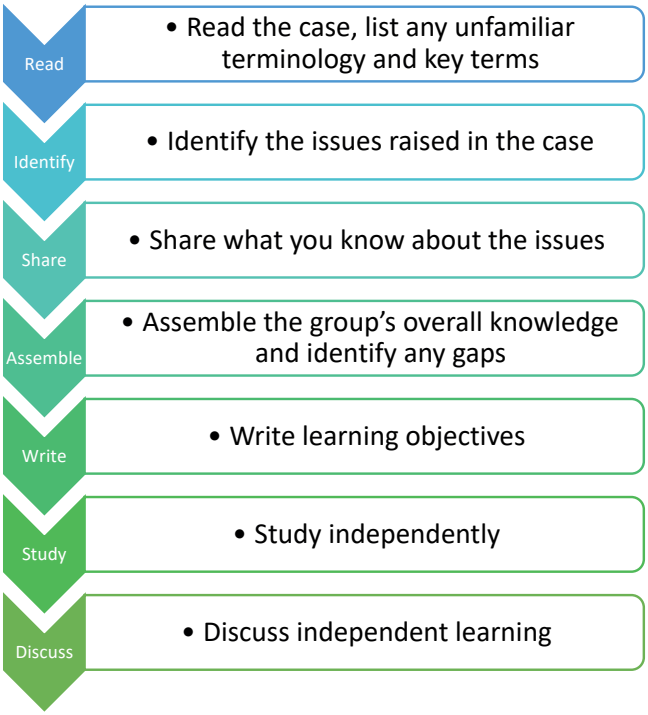
CBL at Queen's University Belfast

A completely new undergraduate medical curriculum began in Queen's University Belfast in September 2020. CBL forms the framework for the first two years of the course (the focus of this article) but will also be used extensively in later years also. During their first two years of study, students spend two weeks on each of 23 cases. These cases have been carefully crafted to expose students to a range of simulated patients all of whom have a range of issues. Cases have been written to help students contextualise their learning, to aid recall, and to improve the integration of the curriculum.

When it comes to the time when students study the cardiovascular system, for example, they study two cases sequentially. The characters in these cases have problems relating to this body system and, as the students listen to lectures, participate in tutorials and practical classes, and learn clinical skills, they should consider how what they are studying applies to the case in question. The cases therefore act as the curricular 'skeleton' off which all other learning opportunities hang. They bring a patient, albeit a virtual one, to the centre of the students' learning.

How does it all work?

Each case runs over a two-week period and students meet with their facilitator three times for a two hour session. COVID-19 restrictions mean that CBL is currently being delivered remotely, but this is likely to change in the future. The 'story' of the case unfolds over the first two sessions and students approach these sessions in a structured way as shown in the figure below.



What learning do students get from CBL?

In addition to learning topics that come readily to mind when thinking about an early stage medical student (e.g. anatomy and physiology), cases are designed to be rich learning opportunities pulling in a range of topics for consideration. The characters are from diverse backgrounds, different social classes and with psychological and behavioural issues to consider as well as physical. Cases afford students the opportunity to consider several ethical dilemmas and matters of professionalism. 'Skill builders' are integrated into cases to develop competency in radiological and laboratory results interpretation, physiological test result interpretation e.g. electrocardiograms, and prescribing.

Furthermore, students learn how to work in teams, how to chair meetings, how to allocate tasks and form group contracts. They discover how to identify gaps in their knowledge, how to ask good questions and how to interrogate the literature to answer those questions. CBL sets students up for professional focused inquiry as they begin their journey of lifelong learning.

How has CBL been received?

CBL is now into its second year and feedback to date has been very pleasing. Students seem to enjoy it as do facilitators. New facilitators are generally struck at how well students cope with the cases, how autonomous the groups become and how little input from the facilitator is generally required.

How can I get involved?

If you are interested in hearing more about becoming a facilitator, please contact the author of this article. CBL requires a large number of enthusiastic facilitators to run successfully. Students work in groups of up to ten persons, so 32 facilitators are required for each case. Generic training will be provided, followed by case-specific training. Each case is supported by a detailed handbook for facilitators as well as a brief and debrief session. You do not need to be an expert on the topics that a particular case covers – in fact this may be a disadvantage. You are not there to teach, but rather to guide the students as they explore the material.

Final thought

One wonders what Sir William would make of CBL. He likened studying medicine without seeing patients to a sailor not taking to the sea. Hopefully he would have viewed CBL as a way of training future doctors to sail in safe, calm waters before being released into the ocean.

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Letters

THE BELFAST CUTANEOUS INSTITUTION AND MALCOLM'S INTEREST IN SKIN DISEASE

Editor,

It has been claimed that there was no record of dermatology in Belfast until 1865 when Henry Samuel Purdon established the Belfast Dispensary for Diseases of the Skin in Academy Street.[1,2,3] Andrew George Malcolm, however, mentioned in a brief note, probably written shortly before his death in September 1856, that in July 1848 he had revived the Belfast Cutaneous Institution. Unfortunately no other reference to this establishment has been discovered.

Dr H G Calwell, Malcolm's biographer, gave a copy of the note (which he entitled *A Record of A G Malcolm's Life Written by Himself*) to the Public Record Office of Northern Ireland.[4] Malcolm called it *Mems. of Public Matters* and listed in it various events in his life including "Opened revived Extern Department for the Treatment of Injuries and Cutaneous Diseases and Affections of Children at the General Hospital" in December 1848; "Purchased large collection of Thibert's Wax Models of Cutaneous Disease for about £15" in November 1849; and "Put up a steam bath for Scalp-Diseases which (December) works well at the General Hospital" in November 1851. He also recorded delivering six courses of instruction on Diseases of the Skin from 1849 to 1856, that in 1852 consisting of 16 lectures for which he charged 10/6 (just over 52p).

In a lecture to the Belfast Medical Society on 2 February 1852 he discussed his reasons for modifying the classification of diseases of the skin. The minutes read: "After specifying his objections to previous systems as founded too exclusively either upon anatomical considerations or on the sensible qualities of cutaneous affections, the writer selected, in preference, pathological relations as the basis of his first general division, and arranged all skin diseases under the 2 primary heads or orders of Functional and Organic. The former class he subdivides according to the tissues or structures of which the functions are altered; and the organic order he arranges under 4 pathological genera according as they are the result of common irritation, of animal poisons, of constitutional specific disease, or consist of malformations and other vicious developments." [5]

Malcolm, like Purdon, was not a full-time dermatologist but clearly he had an early interest in skin disease, as did the unknown founder of the Belfast Cutaneous Institution.

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CONCERNS FOR PEOPLE WITH CYSTIC FIBROSIS (PWCF) WHEN TRAVELLING PRE COVID-19

Editor,

There are currently over 300 adult and 200 paediatric persons with cystic fibrosis (PwCF) in Northern Ireland, who attend the regional CF centres at the Belfast City Hospital and the Royal Belfast Hospital for Sick Children, respectively. A combination of a high burden of daily treatment combined with moderate to high disease severity has made travelling difficult or impractical for many PwCF, although travelling is becoming more popular for young adults with CF, who have relatively stable disease. For some PwCF, the prospect of travelling to unknown destinations may generate fear of acquiring a new respiratory infection and other concerns, as depicted in the artwork of the Front Cover of this issue of the journal, however advances in therapies including transmembrane conductance regulator (CFTR) modulators, have enabled many PwCF to consider and embark upon travel to various global destinations.[1]

The front cover of this issue of the Journal depicts "*Travelling with cystic fibrosis*", A person with cystic fibrosis' perspective of travelling with CF - Caroline Anne Moreland 2019 (with permission). The picture shows a collection of cats, which represent PwCF. The artist describes them "as odd and outside of normal society, hence the moustaches and eye-patches. Like most people, they have a desire to travel and explore the world but are limited by the issues which are represented by the thorns of the rose bush. The roses themselves are a gesture to "65 roses", the phrase used to help children pronounce "cystic fibrosis". So rather than travel, they stay at home because of restrictions, represented by the zipper."

Through a service improvement project, we examined travel-related difficulties and concerns experienced by our local CF adult population, so that we are able to further support PwCF health literacy needs, when preparing, during and post travel. To establish this baseline, we designed a self-completing, voluntary, anonymous questionnaire amongst adult PwCF attending outpatient CF clinics during the summer of 2019 (pre-COVID), to gain an insight into (i) specific concerns when travelling and (ii) the availability of

online travel advice/resource from UK CF Centres and other sources. Free text questions were used to collect respondent demographics and responses to the questions asked. The survey was conducted using the guiding code of ethics and practices established by the American Association of Public Opinion Research (AAPOR) (www.aapor.org). In addition, a *Virtual Focus Group* was held to explore the PwCF experience when travelling. The availability of published online travel guidance from CF Centres (n=25) and CF charities were also examined.

There were 68 respondents to the survey, including 31 males, 33 females and 4 respondents who did not enter their gender. Respondents who declared their age (n=63) ranged from 17 to 71 years (median = 30 years; 94% of respondents in age range 20-39 years). PwCF cited nine concerns when travelling, as listed in Table 1. The most frequently cited concern was access to affordable travel insurance and confusion with providers of such cover. Previously, it has been reported that 18% of PwCF have travelled with no insurance and 23% have travelled with insurance which did not cover CF.[2] Another common concern was the need to maintain an effective cold chain for temperature-sensitive medications, particularly DNAse, as a mucolytic agent to aid airway clearance. One PwCF was concerned about their PEG when swimming and attempted to mitigate any potential contamination from water, by applying a waterproof dressing to the PEG. Another PwCF reported damage of liquid nutrition packs during transit, negatively impacting on their holiday experience and as such has resulted in avoidance of future air travel.

Table 1: Concerns raised by people with cystic fibrosis (PwCF) realting to travel

High cost of travel insurance
Acquiring an infection on the plane or on vacation
Complaints from other passengers due to coughing
Uncertainty of another PWCF on the same flight
Medications- having enough medications for the trip, incomplete doctor's letter
Ensuring supplemental feeding supplies do not get damaged in transit
Ensuring appropriate cold chain for medications
Issues at security- detection of peg tube, transport of needles, medications
Limited space, limitations on hand luggage/space required for medications

Analysis of online travel resources for PwCF showed that 9/25 CF centres in the UK offered varied freely available online travel advice, although there was no detailed advice on the cleaning of the nebuliser when travelling. The UK CF Trust offers valuable travel advice[3] but refers PwCF back to their NHS CF healthcare team, for specific individual clinical guidance. Further valuable resources are available to address the needs of PwCF when travelling, including the British Thoracic Society's (BTS) guidelines on air travel in people with respiratory disease[4,5] and the European Cystic Fibrosis Society (ECFS) recommendations on travelling with CF.[6]

The current policy in most CF centres is that PwCF are encouraged to discuss with their CF healthcare team at clinic, their potential travel plans well in advance of the actual proposed date of travel. Such travel plans may include requirements/aspirations, for work/leisure/family and further details are sought, including intended destination, the number of hours flying required, the anticipated time away from home, facilities at their intended destination, etc. These are reconciled in conjunction with their clinical status and where appropriate, discussed with the CF multidisciplinary team, so that the PwCF is well informed and prepared for travel, when/where travel is a safe option.

In contrast, it is interesting to note differences in the perceptions of PwCF and those of healthcare professionals, in relation to travel. Previously, Hirche and colleagues[5] listed recommendations from the healthcare professional's viewpoint in an evidence-based manner, as detailed in Table 2. When the concerns of the PwCF are compared to the recommendations from the healthcare professional, complaints about in-flight coughing, acquiring an infection on the flight, another unknown PwCF on the flight and issues at security, were unique to the PwCF. Healthcare professionals listed an additional 14 CF travel-related considerations. This comparison highlights an important chasm between PwCF

Table 2: Checklist for the CF-healthcare team relating to considerations for people with cystic fibrosis when travelling (adapted from5)

Consultation with CF healthcare team • prior to travel (medical assessment, optimisation of clinical status, travel counselling) • first point of call if health-related issues encountered during holidays/travel
Flight travel & staying at high altitudes Consideration of medical safety in relation to health status and contraindications
In-flight oxygen • requirement consideration • inform airline if required
Vaccinations & anti-malarial treatments dependent on destination (i) mandatory and recommended vaccinations **(ii)** anti-malarial recommendations
Consideration of infection risks during travel and at destination • endemic infection risks • prevention of acquiring CF-relevant organisms from the environment or other PwCF • adherence to infection prevention and control measures e.g. hand washing, clean/disinfect nebulisers
Consideration of availability of CF clinical support at destination
Private travel insurance • essential to have adequate private travel and health insurance whilst travelling • awareness of reimbursement of healthcare and repatriation costs and healthcare agreements between home country and holiday destination
Documentation supplied by local CF-healthcare team & carried at all times • list of medications, dosage, medical devices, consultant and patient details • detailed medical report • chronic illness letter (for potential use as fast track in theme parks etc.)
Medications • storage temperature precautions • photosensitivity attributed to drugs • adaption of medications by healthcare team considering climate, diet, prophylaxis and circumstances • medications for prevention of salt deprivation and fluid loss • appropriate supply for duration of holidays/travel
Voltage Check for electrical compatibility and plug type in relation to medical devices
Activities Consider activities during vacations such as sports which could impact on health
Immunocompromised/organ transplant recipients Consideration of the following • increased susceptibility to travel related and opportunistic infections • drug interactions (CF-medications and travel-related medications) • safety of live vaccines and decreased vaccine efficacy

and the healthcare team and emphasises the need for good communication, to improve health literacy amongst PwCF and improve patient safety when travelling.

Travel recommendations to PwCF should be a syntheses of the concerns articulated by the PwCF, as well as recommendations from the CF healthcare team. In order to support these, we have prepared a new and novel short animation entitled "*All aboard – Travel Recommendations with Cystic Fibrosis*" [7] to help guide PwCF considering travelling.

The arrival of SARS CoV-2 in early 2020 and post-BREXIT arrangements have further transformed and confounded the travel landscape for PwCF. CF multidisciplinary teams should be aware of these patient-articulated factors that may still limit travel opportunities for those patients who are clinically fit-to-travel and should attempt to engage with the relevant stakeholders through enhanced communication to help facilitate travel arrangements for PwCF.

Acknowledgements

We wish to acknowledge with thanks the PwCF respondents who kindly took the time to complete the questionnaire and participated in the virtual Focus Group. These data were presented in June 2021 as an ePoster presentation at the 44th (2021) European Cystic Fibrosis Society's Annual Conference (Virtual) (P-228). The authors thank Ms Caroline Anne Moreland for her artwork reflecting on a person with cystic fibrosis' perspective of travelling with CF. This project was a product of the Cystic Fibrosis Study Buddies Programme designed to enable improved health literacy and essential skills for life and employability in young CF adults and supported by Charitable Grants from Vertex Pharmaceuticals Inc., USA. (CG-2017-106614 & CG-2015-104576). Vertex Pharmaceuticals did not play any role in project conceptualisation, design, execution, analysis, nor any editorial role in manuscript writing or approval.

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CONFLICT OF INTEREST:
None

AVAILABILITY OF DATA AND MATERIAL
None available

COMPETING INTEREST
None

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INCIDENCE OF ACUTE ANGLE CLOSURE GLAUCOMA IN THE NORTHERN IRELAND DIABETIC EYE SCREENING PROGRAMME

Editor,

This project aimed to ascertain the risk of acute angle closure (AAC) after the administration of tropicamide within the Diabetic Eye Screening Programme Northern Ireland (DESPNI). DESPNI provides a regional screening service to all of those with diabetes mellitus in Northern Ireland. There are 112000 patients on the register, of these 87 000 have regular annual eye screening using fundus photography.[1] At DESPNI, mydriasis using tropicamide can improve the quality of fundus images obtained. AAC is a rare complication of mydriasis, estimated risk of 0.3–

0.03%, and is an ophthalmic emergency that might lead to permanent visual loss if left untreated.[2] During 2007-2010, of the 95265 DESPNI episodes with Tropicamide dilation, 2 cases were identified, giving the risk of 1 in 31755 and annual incidence was 0.75 cases.[3] The recommendations to DESPNI included clear instructions of AAC symptoms and emphasising the need for urgent treatment should they occur. This was after peer-to-peer education regarding AAC awareness in ophthalmic screening healthcare programme.

This audit aims to assess the incidence and management of AAC occurring within 72 hours of DESPNI attendance with tropicamide mydriasis between 01/09/2016 to 28/02/2021. A retrospective case-note review was carried out, cross referencing medical and DESPNI records, to identify relevant AAC episodes occurring within 72 hours of a DESPNI visit with mydriasis. The standards were extracted from 'Ophthalmic Services Guidance Eye Drops Instillation by Unregistered Health Care Professionals for use within NHS Ophthalmic Services'. For this current audit, 159 patients were identified as having had AAC during 01/09/2016 to 28/02/2021. Only one had AAC within 72 hours of DESPNI's tropicamide dilation and was successfully managed. Over the 54 months period of observation, 206334 patients were screening by DESPNI with a dilation rate of approximately 75%, so altogether 154750 patients were dilated. The incidence of AAC within the screening programme was calculated to be 1 event per 154750 episodes. The annual incidence of angle closure was 0.2 cases per year.

This improves our ability to inform patients of the low risk of AAC within DESPNI. The AAC incidence within DESPNI was calculated to be 1 event per 154750 episodes, this is less than reported in other publications such as the population-based Rotterdam Study, where AAC incidence was 3 in 10000 following tropicamide mydriasis. [4] We advocate the provision of clear instructions to patients in diabetic screening regarding access to emergency ophthalmic care following dilation to prevent visual loss in this rare event.

The authors declare no conflict of interest.
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STROKE, COVID-19 INFECTION OR HERPES SIMPLEX ENCEPHALITIS: A DIAGNOSTIC DILEMMA

Editor,

We present the challenging case of a 71 year-old healthy woman who presented, during the first wave of the Covid-19 pandemic, with a two day history of headaches, fever, confusion and expressive dysphasia. She had no new respiratory complaints. Her background history was not contributory. She was admitted to a Covid-19 isolation unit and a nasopharyngeal swab for viral PCR was sent to test for SARS-CoV-2. Her examination was notable for expressive and receptive dysphasia, vertical gaze nystagmus, right upper limb pronator drift and a positive Babinski's sign on the right side. She was unable to follow more than one stage commands and exhibited perseverance. There was some fluctuation in her clinical signs initially. She was pyrexial at 37.9 degrees but was otherwise haemodynamically stable.

Initial investigations showed a normal serum WCC and CRP of 19.0. Typical laboratory findings of Covid-19 infection such as lymphopaenia, raised ferritin, deranged liver function tests and raised D-Dimer were absent. An urgent CT brain was completed which showed no acute abnormalities. At this time viral PCR for SARS-CoV-2 returned negative. A lumbar puncture was performed which showed CSF containing WBC 396 per microlitre (differentiation - 87% lymphocytes and 13% polymorphs). The CSF gram stain was negative, glucose was 5.2 mmol/L and protein was 1.12 g/L. Herpes simplex virus 1 was detected on viral PCR. MRI brain showed left temporal and posterior insular oedema with cortical effacement without restriction on diffusion weighted images. (figure).

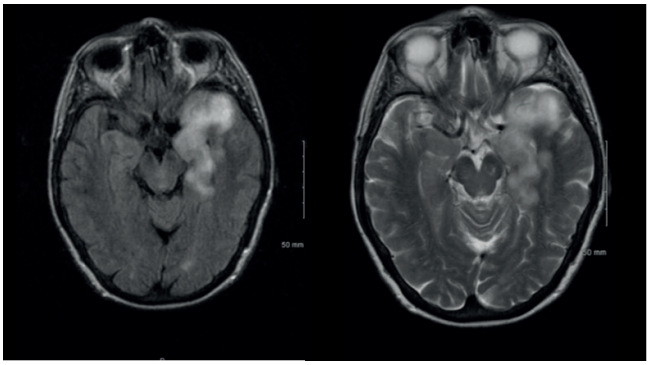

Figure 1.
MRI Brain demonstrating left temporal and posterior insular oedema with cortical effacement without restriction on diffusion weighted imaging.

From the outset we maintained a broad differential. Given the presenting features, stroke, encephalomeningitis and Covid-19 infection were at the forefront of our differential. She was empirically treated with IV acyclovir, ceftriaxone and dexamethasone while awaiting results of lumbar puncture. Following diagnosis she continued on acyclovir alone. This patient gradually recovered with no residual symptoms although she reported retrograde amnesia of her initial presentation. Follow up MRI showed a resolving process.

Discussion

Herpes Simplex virus (HSV) is responsible for 19% of cases of infectious encephalitis.[1] It represents significant morbidity and mortality to patients with a one year mortality rate of 14%.[2] Typically, patients present with symptoms of fever, headache and confusion although speech disturbance can be seen in 57% and focal neurological deficit in 26% of cases.[3] Encephalitis is a known mimic of stroke and atypical presentations can often be misdiagnosed. In some cases this has led to inappropriate treatment with alteplase and in others misdiagnosis can lead to delay in initiating appropriate treatment.[4]

The emergence of Covid-19 has further confounded this area. Neurological manifestations of Covid-19 can been seen in up to 25% of patients.[5] On MRI, unilateral medial temporal lobe oedema, a recognised finding in HSV encephalitis, has been demonstrated in patients with Covid-19 in the absence of HSV.[6] This overlap in features risk delay in initiation of correct treatment for patients.

We feel this case is of particular interest as it highlights the importance of maintaining an open mind when managing a patient who has an atypical combination of symptoms particularly in the context of the current pandemic.

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LARYNGOTRACHEOBRONCHITIS, CROUP, AN UNUSUAL PRESENTATION OF SARS-COV-2

Editor

Laryngotracheobronchitis or croup, whilst common in childhood, is rare in adults. We present an unusual clinical presentation of infection with Sars-COV-2, COVID-19 Laryngotracheobronchitis.

A 52-year-old female presented to the Emergency Department with a three day history of progressive fatigue, hoarseness and dysphagia. On examination she was sitting forward, breathing quietly, aphonic and drooling. She had mild bilateral cervical lymphandenopathy. Flexible nasendoscopy showed mild supraglottic oedema and erythema, but no airway compromise. Chest xray demonstrated "steeple sign" (Figure 1) indicative of laryngotracheobronchitis or "croup."

She had a mild inflammatory response demonstrated by a

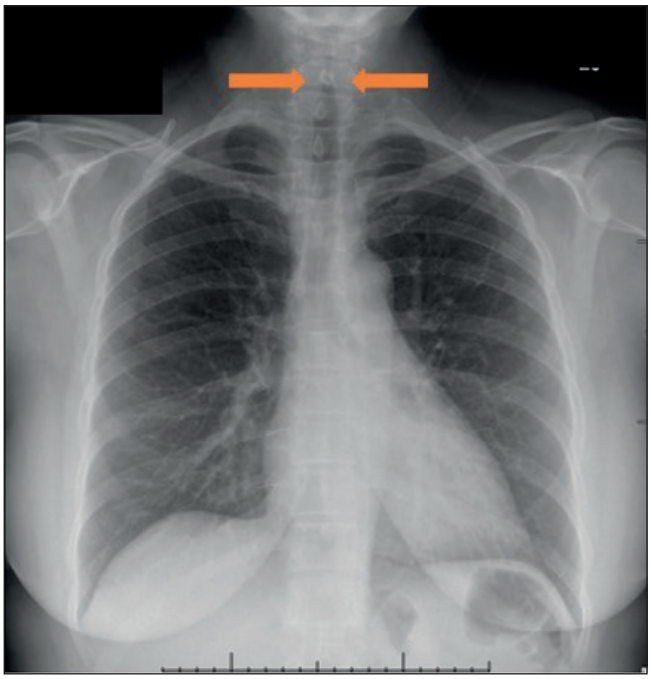

Figure 1.
Erect Chest X-ray of the patient demonstrating the typical "steeple sign associated with laryngotracheobronchitis

C-Reactive Protein of 15mg/L. There were no symptoms to necessitate a COVID-19 test had she not attended hospital, however her polymerase chain reaction (PCR) for SARS-CoV-2 resulted positive, with viral PCR for Influenza A & B, and Respiratory Syncytial Virus (RSV) all negative. The presumed diagnosis was of COVID-19 Laryngotracheobronchitis. Treatment was supportive, in the form of intravenous fluids, humidified oxygen and intravenous

corticosteroids to reduce airway oedema. Following 24 hours the patient improved clinically, and flexible nasoendoscopy revealed resolution of supraglottic oedema. The patient was discharged with a five day course of oral dexamethasone.

Laryngotracheobronchitis, commonly referred to as croup, is an upper respiratory tract infection, almost exclusively seen in the paediatric population. It commonly presents with fever, "barking" cough, stridor, dyspnoea, and hoarseness. Adult croup is more severe than in the paediatric cohort, and often requires aggressive treatment and longer hospital stays[1]. Direct evidence of oedema, and the typical "steeple sign" feature on x-ray, which represents subglottic narrowing, is more commonly found in adults[1]. The most common pathogen amongst children is Parainfluenza virus type-1, however RSV and adenovirus are also commonly isolated[2]. In adults culprit organisms leading to croup include Parainfluenza, Haemophilus influenziae, Influenza, Streptococcus, and RSV[1]. Mainstay therapy is guided by severity of symptoms. Humidified oxygen, corticosteroids and nebulised adrenaline are all recommended in moderate to severe croup in children. In adults there are no formal recommended treatments, however all reported cases have used a combination of treatments recommended in paediatric croup.

COVID-19 infection, caused by SARS-CoV-2 virus has infected over 200 million people, resulting in over 4 million deaths worldwide to date. The majority of healthy individuals are thought to remain asymptomatic, however those presenting with symptoms related to COVID-19 typically experience fever, cough, and loss of taste and smell. In more severe cases respiratory compromise may occur, requiring invasive respiratory support. There is very little evidence in the literature of upper airway oedema related to infection with COVID-19, with only 4 reports of croup in COVID-19 positive children[3, 4]. To date there are only two documented cases of COVID-19 related laryngotracheobronchitis in adults[5]. Despite the relatively indolent clinical course of the patient herein described, timely diagnosis and early intervention could prove to be critical in preventing airway compromise in patients presenting with COVID-19 infection of the upper respiratory tract.

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MELANOMA: MORE THAN SKIN DEEP

Editor,

Melanoma is the 5th most common cancer in the UK, with approximately 40 people receiving a new diagnosis daily. It is deemed the most serious of skin cancers due to its propensity to metastasise widely, which can affect all organ systems including the gastrointestinal tract (GIT). We present three cases of metastatic melanoma who presented with gastrointestinal (GI) symptoms within a three month period to a tertiary centre.

A 72 year old man had a previous history of cutaneous melanoma, treated with wide local excision, three years prior to the current presentation. He presented with melaena, symptomatic anaemia and abnormalities of his small bowel were noted on CT abdomen. Upper GI endoscopy identified multiple small black tumour deposits (Figure 1A). Follow up MR enterography confirmed several small bowel

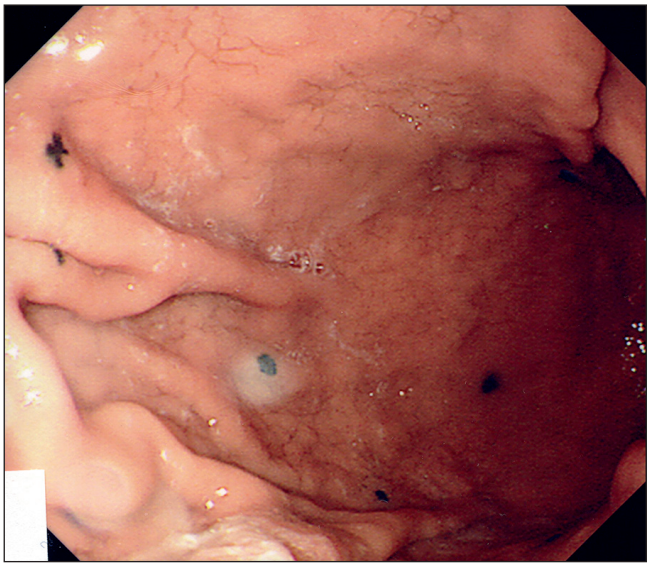

Figure 1A Multiple small black deposits of metastatic melanoma in the gastric mucosa at endoscopy (Patient 1)

lesions which were suspicious for metastatic disease. He subsequently developed small bowel obstruction secondary to intussusception and proceeded to have a small bowel resection. Three separate tumours were removed and histology confirmed metastatic melanoma.

A 66 year old man was referred to the GI outpatient service with symptomatic anaemia, intermittent change in bowel habit and weight loss. CT imaging identified an abnormal gallbladder mass. Subsequent MRI confirmed a 5.6cm mass arising from the gallbladder. Following laparotomy this was identified as a malignant melanoma. Whereas primary gallbladder mucosal melanomas have been reported they are extremely rare, and a metastasis was considered more likely.

A 75 year old man gave a history of melanoma removed by wide local excision from his anterior abdominal wall 15 years previously. He presented to the Emergency Department with melaena and iron deficiency anaemia was noted. Upper GI endoscopy was normal. CT imaging revealed thickening at the duodeno-jejunal junction. At enteroscopy an ulcerated tumour

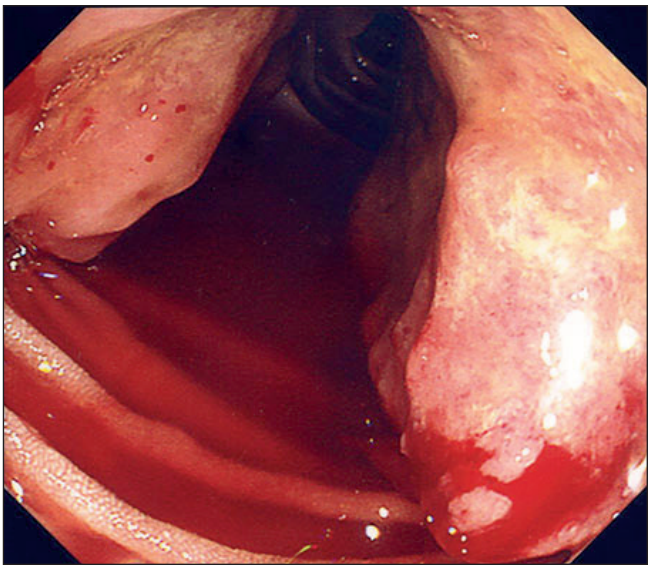

Figure 1B Metatastic (amelanotic) tumour deposit in the third part of duodenum with contact bleeding (Patient 3)

was noted in the distal duodenum, biopsies of which identified malignant melanoma (Figure 1B). He later underwent small bowel resection, with histology confirming metastatic melanoma with clear resection margins.

Discussion

Cutaneous melanoma can metastasize to the GI tract in up to 60%[1] of cases, although symptoms only occur in approximately 1-5% of cases.[2] Our three patients demonstrate that when GI symptoms do occur, they are similar to those expected of primary GI tumours.

As symptoms are often insidious, there should be a high index of suspicion for metastatic recurrence in patients who have a previous diagnosis of melanoma, regardless of the timeframe, as demonstrated by the 15 year interval in our third patient.

Upper GI endoscopy is a first line investigation if GI malignancy is suspected. However since up to 58%[3] of metastases occur in the jejunum and ileum these may initially go undetected, presenting a diagnostic challenge. In addition, standard CT imaging has been reported to have a limited sensitivity (60-70%[1]) for detecting these metastatic lesions.

Endoscopy may identify nodules, ulcers or polypoidal lesions which may be amelanotic, again confounding the endoscopic diagnosis, prior to histological identification.

The above patients highlight the importance of a strong clinical suspicion in patients with a previous history of melanoma who present with anaemia or abdominal symptoms.

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A QUALITATIVE EVALUATION OF INFOGRAPHICS AND ITS USES IN HEALTHCARE COMMUNICATION

Keywords: *Diabetes, Graphics, Healthcare, Infographics.*

Editor,

Infographics are graphic visual representations of data, knowledge or information that are meant to deliver information quickly and clearly. Using infographics, complex information can be easily communicated to the general audience through a variety of platforms, including social media, websites, newspapers, poster designs, televisions and film advertisements. Recently, infographics have been proven to be incredibly effective in informing patients to better understand the procedures and pathological conditions involved in their diseases. Most of the Healthcare industries and professionals engage in infographics to explicitly communicate medical information to their patients. The goal of this research is to emphasize the importance of infographics in information design on type 2 Diabetes in order to provide adequate health information to patients, thereby improving the patients' decision-making abilities and the practitioner-patient relationship. The infographics were discussed with endocrinologist, Dr. Mahavir Singh of the National Institute of Medical Science (NIMS), Jaipur, India.

A total of 200 people from Jaipur's urban and rural hospitals participated in the study. Government Primary Hospitals and Private Hospitals were the target areas for the sample data collection. Visiting patients, patients admitted to hospitals, and their guardians were among the participants, who were of both the genders and the age ranged from 20 to 90 years (Figure 1). For this investigation, a questionnaire with two sections was constructed and used. The demographic information is collected in the first section of the questionnaire (name, gender, age, department and nationality). The second segment includes ten questions that are graded on a five-point Likert scale. The Likert scales for the questions were (1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree. In this research, data was gathered utilizing a Purposive Sampling approach and Quantitative Research Methodology (Figure 1). An infographic design was also mentioned, which incorporates Type 2 diabetic information (Figure 3).

After the survey, the data were analyzed and the following graph was developed based on the research questions as shown in figure 1 and 2.

From the studies, we have discovered that data containing visuals is more adequate and comprehensible than facts containing only textual content. We additionally located that few of the patients who are not able to read the text supplied within the infographics can apprehend the visuals very easily. We would like to conclude that if we exhibit infographic information to the patients, it will help them in better understanding and provide comprehensible information concerning any disease.

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Figure 1: Detailed infographics of 200 Diabetic patients showcasing the age, gender & literacy rate factor.

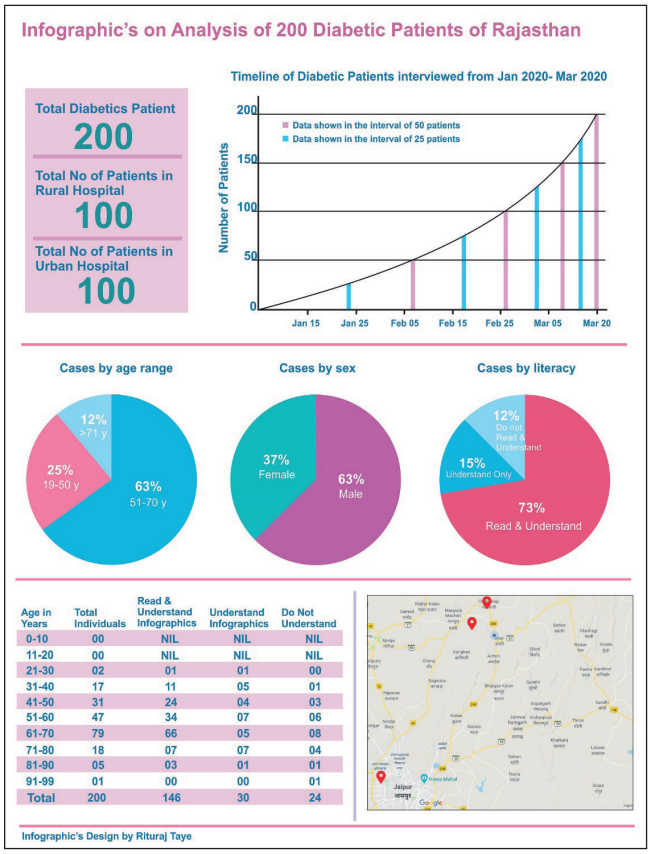

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Figure 3: Infographic design containing information of Type 2 diabetes.

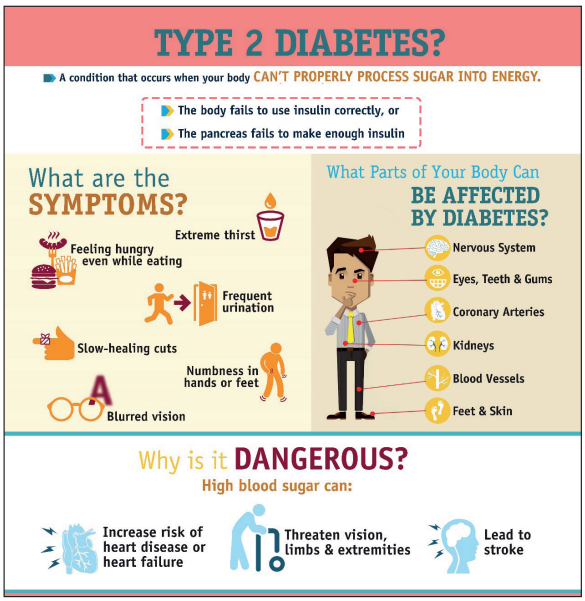
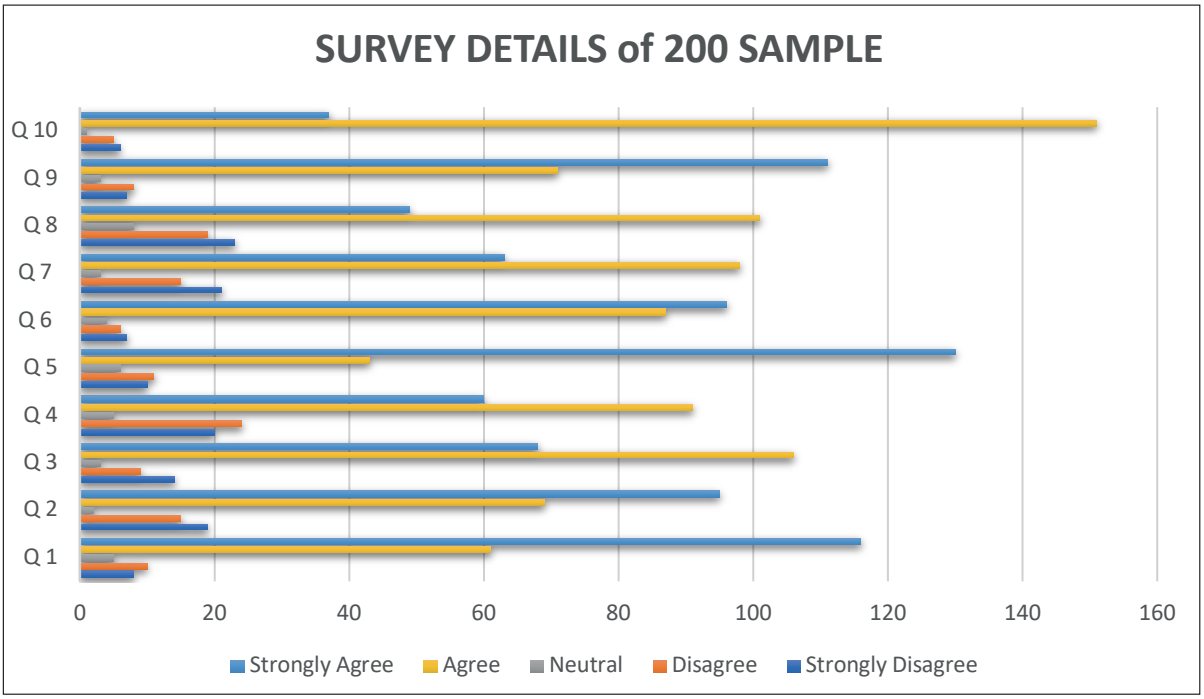


Figure 2: Bar graph representing the 10 questions (Q) from the survey details of 200 diabetic patients based on Likert scales.



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"Travelling with cystic fibrosis"
A person with cystic fibrosis' perspective of travelling with CF.
Caroline Anne Moreland 2019 (with permission)

The picture shows a collection of **cats**, which represent people with CF (PwCF). The artist, describes them as "odd and outside of normal society, hence the **moustaches** and **eye-patches**. Like most people, they have a desire to travel and explore the world but are limited by the issues which are represented by the **thorns** of the rose bush. The **roses** themselves are a gesture to "65 roses", the phrase used to help children pronounce "cystic fibrosis". So rather than travel, they stay at home because of restrictions, represented by the **zipper**.