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Editorial

The Technological Society

Michael Trimble

Another year, another issue, another lockdown. At one point it seemed as though we were going to be like the people of Narnia under the rule of the White Witch, where it was "always Winter and never Christmas."[1] But Christmas has come and has now passed.

The coronavirus has again, inevitably, slowed the process of getting the journal to press. It is sobering to think how much our lives have changed since this time last year when there were early reports of a new viral pneumonia occurring in China. As astonishing as any other aspect of this new situation, has been the ways in which society has adapted to the restrictions and requirements of social distancing. Undoubtedly, one of the success stories arising from the crisis has been the adoption of technological solutions to aid communication. Before Covid-19, I expect for many, the only experience of online meetings had been the occasional Skype call. But now we are all expert at using number of platforms from Teams to Zoom. Certainly this has been a boon given the restrictions on face-to-face meetings but I would hate to see it become the new normal. And yet, it could so easily become so for technology has a way of setting the agenda.

In his classic study *The Technological Society*,[2] French philosopher, sociologist and theologian Jacques Ellul argues that modern society is dominated by *technique*. Technique is more than simply the application of technology as to achieve an end. Technique is ultimately focused on the concept of efficiency, creating an artificial system which "eliminates or subordinates the natural world." Instead of technology being subservient to humanity, "human beings have to adapt to it, and accept total change." An example, offered by Ellul is the diminished value of the study of the humanities within a technological society as people begin to question the value of learning ancient languages and history, things which do little to advance the good of the technical state. In the end, technique trumps all other considerations whether political, social or moral. Rather than ask whether a technological advance should be made, philosophers, ethicists and politicians usually find themselves fighting a rear-guard action after the announcement of some new technology, asking instead how the new discovery should be best utilised. A recent example is given by Judith Woods writing in the *Daily Telegraph* [3] regarding the case of Molly, born in February 2020, but conceived by IVF in October 1992 having spent 27 years frozen at the National Embryo Donation Centre in Tennessee, waiting for someone to choose her. Woods discusses the ethical issues raised by freezing embryos and the questions to which there are, as yet, no answers. In the USA, there is no time limit on freezing embryos. In the UK, they may be kept for 10 years. Embryos stored for medical reasons, for example cancer treatment, can be preserved for longer. In light of advances in freezing techniques, the Government has launched a consultation in conjunction with the Human Fertilisation and Embryology Authority on whether to extend the period for everyone. For Woods this smacks of the *Brave New World* [4] described by Aldous Huxley. (Interestingly, it was Huxley who brought the French edition of *The Technological Society* to the attention of an English publisher, and hence to English readers.) My point here is not to debate the ethics of embryology (that may come later) but to illustrate Ellul's point that the technological development often precedes adequate ethical and sociological discussion regarding its desirability.

And so, back to the more mundane question of communication technologies. There is no doubt that online meetings are efficient. I can move from the virtual classroom to the faculty meeting and then on to a tutorial without leaving my desk. There is no time wasted in journeying from office to lecture theatre. For the university there are obvious savings in staff time and doubtless also potential savings to be made in terms of buildings and accommodation. Yes, certainly the new order is *efficient* but at what cost? Looking at this solely from the perspective of the teacher, I find I miss the social aspect of teaching, both with students and other members of staff. There is no longer the opportunity to do the business between business in committee meetings. We have lost the craic and camaraderie. In the quote above, Ellul was concerned that *technique* meant we had lost sight of the importance of the humanities; I worry if it means we are in danger of losing sight of the importance of our humanity itself. Perhaps I am exaggerating, but then again, perhaps not. In a future editorial I plan to look again at this topic from the perspective of the students but for now this will suffice.

Finally, to close the loop between Lewis, Ellul and Huxley, Lewis and Huxley were Oxford graduates and both wrote dystopian novels about the future – Huxley's *Brave New World* and, perhaps not so well known, Lewis's *That Hideous Strength* [5]. Lewis's book also warns of the dangers of an uncritical adoption of science (represented by a shady, quasi-governmental organisation that goes by the acronym NICE!) Both men died on the 22nd November 1963, but news of their deaths was overshadowed by the assassination of President John F Kennedy.

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LIST OF REFEREES FOR 2020

We pass on our sincere thanks to all our referees for 2020

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Review

The Operative Incidence of Syndactyly in Northern Ireland. A 10-Year Review.

K. McGarry, S. Martin, M. McBride, W. Beswick, H. Lewis

Accepted 19.12.2020

ABSTRACT

BACKGROUND

Syndactyly is a common congenital condition that can present sporadically or in relation to an underlying genetic condition. Little contemporary published data exists detailing specific rates of presentation and surgical intervention, especially in Western European population. This is the first published review of operative intervention rates for the condition over time in Northern Ireland.

METHODS

A ten-year retrospective review of electronic operative records from January 2007 – October 2017 was carried out within Northern Ireland's regional tertiary centre Royal Belfast Hospital for Sick Children (RBHSC). All congenital hand surgery in the country was performed here during the period reviewed, by a single surgeon. Patient age at surgical intervention, their sex, digits involved and clinical grade of syndactyly was recorded.

RESULTS

One hundred and twenty four cases were returned following the review. On individual analysis 22 cases were excluded as they were not primary congenital syndactyly. The remaining 102 cases were all Caucasian. Six cases were toe syndactyly while 96 cases involved the upper limb digits. The group consisted of 70 males and 32 female infants. Age range at time of surgical intervention was 8 months to 14 years with a median age of 26 months. For clinical grade of upper limb syndactyly; 35 cases in the data set were classed as simple incomplete, 34 cases as simple complete, 17 as complex and 5 cases as complicated syndactyly. The remaining 5 cases lacked clear documentation. The most common site of syndactyly was between the ring and middle finger (40/102). Annual frequency of operative intervention has trended upwards in the period studied.

CONCLUSION

This case review adds epidemiological data on the operative incidence of syndactyly cases in Northern Ireland - a relatively isolated genetic population. Overall rates of incidence have increased over the past 10 years. It remains unclear if this is due to new environmental influences on the developing population or increased referral for surgical intervention over time.

Levels of evidence - IV (Case Series)

INTRODUCTION

Syndactyly (Greek Syn=together; Dactylos=digit) is a digital malformation in which adjacent fingers and/or toes are joined by soft tissue or bony bridges beyond the normal web due to failed separation during embryonic limb development[1]. It is one of the most common hereditary limb malformations in the western world, with a prevalence ranging from 3–10 per 10 000 births to 10–40 per 10 000 births in specific settings[2]. The syndrome is twice as likely to occur in males and most commonly found in caucasian populations. The third, fourth, second and first web spaces are affected in decreasing frequency respectfully, and the condition is bilateral in half of cases[3,4].

Published geographic variations in frequency of syndactyly suggest the possibility of environmental as well as genetic influence on the disorder[5]. For syndactyly with or without defined genetic causation, as discussed below, perinatal maternal exposure to noxious stimuli[6] may provoke lack of normal apoptosis of interdigital spaces[7] during development[8,9] leaving the fingers fused, and the hand lacking its normal profile. Maternal health is an independent risk factor for development of the disorder; obesity[10] along with smoking, nutritional status[11] and even viral infection[12] have been suggested as possible aetiological factors for syndactyly development.

At least nine syndactylous genetic entities with various subdivisions have also been classified. These include patients with Mendelian autosomal dominant inheritance, recessive inheritance and even X-linked recessive inheritance[13]. The majority of these cases are non-syndromic. Syndromic syndactyly is a recognised separate genetic entity e.g. Acrocephalosyndactyly, Apert and Pfeiffer Syndrome[14,15].

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Sporadic cases that are non hereditary and non syndromic however globally are the most commonly reported form[16]. Present at birth and lacking a clear genetic association these lie apart from postpartum causes e.g. trauma or burns[13].

Despite environmental risk factors and multiple underlying genetic causes being identified in the literature a lack of published epidemiological reports into the disorder remains. This has previously been identified as a limiting factor for further research into certain related issues such as the skewed sex ratio of presentation[17].

In this review we present the number of syndactyly cases operated on in over a 10-year period in Northern Ireland's single paediatric tertiary surgical centre, by a single surgeon, and discuss changes in operative incidence within our population.

MATERIALS AND METHODS

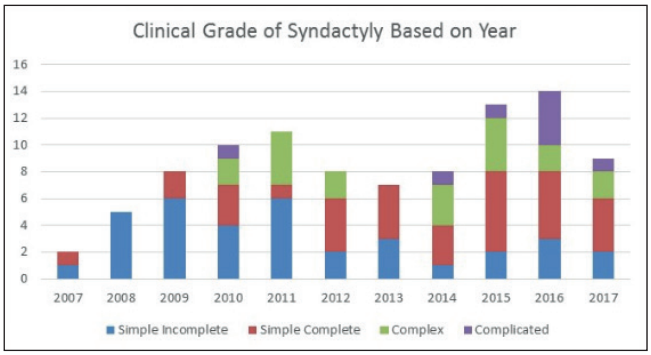
We conducted a ten-year retrospective review of operative records from January 2007 – October 2017 using the Electronic Theatre Management System (TMS) in the Royal Victoria Hospital for Sick Children. This is the only unit in the region where operative intervention for syndactyly occurs thus the data set reflects the totality of operative cases within Northern Ireland within the defined period. Searching for, "Syndactyly," produced a return of 124 cases including the same patient requiring bilateral procedures, digital release or further staged procedures. Cases that were carried out for reasons other than primary congenital syndactyly release e.g. burns were then excluded from the annual totals.

We then analysed each primary syndactyly case individually using electronic or case notes to define age at surgical intervention, sex, digits involved and clinical grade of syndactyly (13). Clinical grade was defined using clinical and x-ray findings to produce; simple incomplete (partial skin bridge between digits), simple complete (complete skin bridge length of digit), complex (where bony and/or bony cartilage bridges are present), complicated (complete bony disruption / interconnection of phalanges). After interrogation of data, cases were presented graphically by intervention rate per year and type of case in an attempt to see if a trend in frequency of syndactyly surgery in the province was present, and if the grade of syndactyly has changed over time.

RESULTS

Of the 124 results returned during the 10 year analysis all the patients were from a Caucasian background and native to the region. Four cases were excluded for syndactyly occurring secondary to burns. A further 18 cases were excluded as these were delayed surgery performed for scar contracture release following the primary syndactyly intervention. The remaining 102 cases were carried out for primary syndactyly release (including staged bilateral release). Six cases were toe syndactyly while the remaining 96 cases involved the upper limb digits. The group consisted of 70 males and 32 female infants. Age range at time of surgery was 8 months to 14 years with a median age of 26 months. For clinical grade of syndactyly 35 cases in the data set were classed as simple incomplete, 34 cases as simple complete, 17 as complex and 5 cases as complicated (figure 1). Annual frequency of operative intervention displayed in figure 2. The most common site of syndactyly was between the ring and middle finger (40 / 102 cases.)

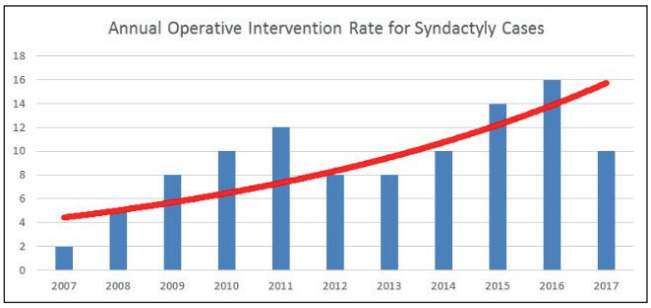
Figure 1



Simple incomplete: partial skin bridge 35/102
Simple complete: full length skin bridge 34/102
Complex: complete bony disruption or interconnection of phalanges 17/102
Complicated: cartilaginous or bony connection of digits 5/102

While the majority of cases had not undergone formal genetic testing, some were found to be syndrome related. Twelve cases presented in patients with a background of Down's Syndrome, five cases with known Poland syndrome, one with Greig cephalopolysyndactyly, one with Phelan-McDermid syndrome and one with Disorganisation Like Syndrome. One patient is additionally undergoing testing for Miller syndrome. Additionally we noted 23 of the patients had been referred for tertiary ENT follow up for a variety of issues such as recurrent tonsillitis or middle ear infections. Frequency of operative intervention increased over the 10 year period analysed (figure 2).

Figure 2



Over the period analysed our operative workload has increased both in number of cases and complexity of those undertaken.

DISCUSSION

The results demonstrate the operative incidence of syndactyly cases in Northern Ireland population has increased over the past 10 years. Unlike previous studies[2] our data highlights that it is upper limb rather than lower limb syndactyly more commonly encountered within the N. Ireland population. However, this could be due to presenting bias of parents requesting surgical intervention on hand syndactyly being a more publicly visible anomaly. Additionally the senior author is reluctant to separate otherwise uncomplicated toe syndactyly due to the risk of developing hypersensitive scar in a weight bearing area.

Our study suggests that in the Northern Ireland population the male: female skew of cases is even greater than previously reported in US populations[17]. Given there is no other recent epidemiological studies of UK syndactyly presentations it is not possible to say if this is due to unexplained genetic pathways or as yet undiscovered environmental factors.

Medical comorbidity of some syndactyly cases was also noted. The link between syndromic syndactyly patients and upper airway issues has previously been widely reported[16]. In syndromes such as Apert where significant associated craniofacial abnormalities occur cocordinaly anaesthetic and airway issues are part of standard preoperative planning[18]. Less clear is the link between sporadic syndactyly and upper airway conditions. Eight referrals to tertiary paediatric Otorhinolaryngology were carried out in our cases series for syndromic patients with recognised upper airway symptomatology. However in 15 cases, no underlying related genetic syndrome was previously diagnosed, prior to an Otorhinolaryngology referral. The literature to date is sparse on the relationship between upper airway conditions and sporadic syndactyly presentations[19]. This is a reminder for all clinicians involved with management of infants with congenital hand to screen for other systemic morbidity as part of their general pediatric examination and work-up.

CONCLUSION

This study provides the first epidemiological review of the operative incidence of syndactyly in the Northern Ireland region over time. Syndactyly continues to present as one of the most common conditions referred to the paediatric hand surgery service in the region. The data presented over the last 10 years highlights an increasing incidence of surgical intervention in the Northern Ireland population, in more complex syndactyly cases.

A number of these patients had additional associated established medical conditions or syndromic causes however the majority of cases we reviewed were sporadic and simple in nature. Medical teams reviewing and managing these conditions regardless should be aware of the possible need for referral to other services should recurrent symptoms in other systems be identified regardless of the underlying genetic cause of syndactyly. This study confirms that although increasing in number with time the general trends displayed e.g. male sex, type and location (middle and ring finger most commonly) are in keeping with other contemporary studies seen elsewhere in both Western Europe and America[20].

The authors confirm they did not receive funding for this study nor have they any other conflicts of interest to declare.

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Type of article for submission: Retrospective study

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Clinical Paper

Evaluation of internet derived patient information for Acute Pancreatitis

CE Miller, JBM Ward, DC Yoganantham, A Bond

Accepted

Abstract

INTRODUCTION: Possibly In the UK there are currently over 26,000 patients admitted to hospital for acute pancreatitis per annum and the incidence is rising. 55% of patients consult the internet for information regarding their medical condition. As the number of people using the internet has increased 57% since 2006, it is increasingly important for medical professionals to direct patients to accurate online sources of information. This paper aims to evaluate the quality of information available online for acute pancreatitis.

METHODS: The term 'acute pancreatitis' was searched using http://www.google.com, http://www.bing.com, and http://www.yahoo.com. The top 10 results of each of these websites were assessed using the University of Michigan consumer health website evaluation checklist.

RESULTS: Of the 30 websites found, 4 were excluded from the evaluation. Within the 26 evaluated websites there was high variability in website quality. However, the authors would have used 18 of the websites again for the purpose of finding out information on acute pancreatitis. 15 websites had a named author of which 11 displayed their credentials. 8 of the websites had been updated within the last year. 10 websites displayed a bias or conflict of interest. Generally, the layout and design of websites was good, however 7 of the websites contained distracting graphics and 9 of the websites had no search facility.

DISCUSSION: Doctors should give patients the information they want and need. With a high percentage of patients using the internet, medical professionals should recommend good quality websites to their patients. Engaging in this process could improve the consenting process as patients would be better informed. Good quality websites allows patients to explore conditions by themselves, with a re-consultation facilitating further discussion. Failure to engage in internet-based information risks patients making misinformed decisions due to bias and conflict of interest.

There are currently over 26,000 admissions to hospital for acute pancreatitis in the UK and the incidence is rising. Pancreatitis is, most caused by either gallstones or alcohol, one in five patients will develop severe and associated sequelae such as necrosis of the pancreas (1,2). It is estimated that around 55% of patients will consult the internet for medical information (3,4) with 60% of patients reporting that they felt that the information was the 'same as' or 'better than' information from their doctors. The number of patients researching their condition on the internet is likely to increase due to access to the internet increasing by 57% since 2006, 96% of the UK now have access (5).

The internet can report on the latest updates in medicine before they are incorporated into a textbook or have been peer-reviewed. The wealth of information available online to patients may be more current than a doctor's knowledge. However, it is provided by a variety of sources such as the National Health Service (NHS), charities, drug companies and private businesses. This has the potential to provide patients with information that may not be accurate or digestible, with *Gupte et al* demonstrating that 20% of patients found conflicting information on the internet to that given to them by their consultant (4).

The internet has the potential to be an invaluable resource for medical professionals by providing good quality patient education. Patients may use the internet before a consultation to try to form a diagnosis by themselves, following the consultation for reassurance and afterwards to share their patient experience. It is therefore important that medical professionals can direct patients to accurate online sources of information. This paper aims to evaluate the quality of information available online for acute pancreatitis.

METHODS: This paper looks at the top 10 websites as found by three search engines: www.google.com, www.bing.com and www.yahoo.com at 20:00 on the 15th December 2019. These websites were then evaluated using the University of Michigan Consumer Health Website Evaluation Checklist (UMCHW). The purpose of this tool is to assess the quality of health information by quantifying the following features: authorship, how up to date the information the information

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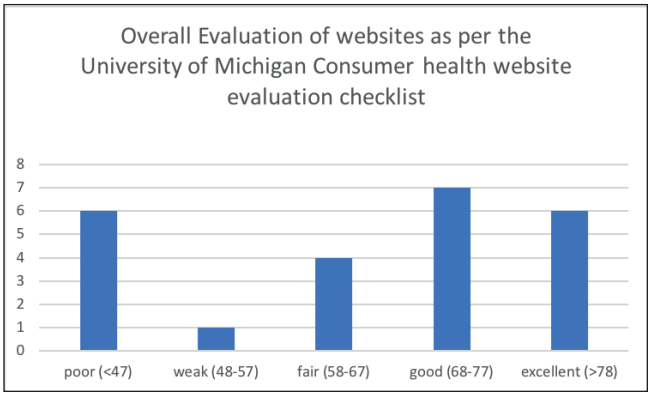
is, information quality and accuracy and the ease of use of the website. This allows for the calculation of a single score out of 100 in order to categorise if a website is poor (< 47) , weak (48-57), fair (58-67), good (68-77) or excellent (>78) in quality.

RESULTS: Of the 30 websites 4 were excluded from the evaluation, due to the need for subscriptions or relevance e.g. an alcohol awareness site which mentioned that acute pancreatitis was a complication. Therefore 26 websites evaluated using the UMCHW tool. Overall there were 6 excellent and 7 good websites. The authors would have used 18 of the websites again for the purpose of finding out information on acute pancreatitis (see table 1).

Table1: Overall evaluation of websites as per the UMCHW tool.

15/26 websites had a named author of which 11 had their credentials displayed and were experts in the field of



pancreatitis. 8 of the websites had information that had been updated within the last year, of which 2 of these had been updated within the last month. All websites appeared to be displaying factually correct information. However, 10 websites displayed a bias or conflict of internet e.g. provided by private healthcare providers. 11 of the websites contained a bibliography of the information that had been published. Regarding the value of the information; out the available 24 points the mean score was 16.5 with a standard deviation of 5.8.

7 of the websites contained distracting or flashing images or graphics. 20 of the websites had the most relevant information at the top of the page and 10 of the websites used colour to enhance the user's ability to get the most relevant information. Generally, the websites were well labelled with accurate headings for the content, with all bar 1 having a return home page or accurate titling, with easy to navigate scroll and back buttons. 9 of the websites had no help facility for searching.

DISCUSSION

One of the duties of a doctor is to give patients the information they want or need in a way they can understand (6). As such a high percentage of patients are now using the internet in their search for more information, healthcare professionals should include the use of websites in this process. Regarding pancreatitis, the authors would have used 18 of the 26 websites again and generally they felt the information available was useful and informative. However, the calibre of the information on the websites as scored by the UMCHW showed a large variance in the quality of information available (mean: 15.8, sd 5.8). This high variance may hinder a patient's search for independent information.

The use of websites can hinder a patient search for accurate information this may be due to bias or conflict of interest e.g. being provided by a private health provider, this occurred in 8 of the websites. Furthermore, several of the websites were difficult to navigate through and 7 had flashing graphics which would make the process of information gathering more difficult. Not enough websites commented on authorship and less than half displayed the authors credentials.

However, after the case of Montgomery v Lanarkshire Health board 2015 (7) it is now statute that doctors must give patients the information that they want, the difficulty of this, is that each patient will want different information. That is why the authors recommend the use of good and excellent websites. Patients will be able to read these websites and any areas which are of concern to themselves can be discussed at further consultations. If a patient finds a topic which is of concern on a website e.g. what symptoms to look for regarding a developing pseudocyst or the possible ways of preventing further acute attacks on a good website, they can then discuss this at a further appointment. Thus, by advising patients to use recommended online resources medical professionals have followed the guidance of this case.

As previously mentioned, 20% of patients have conflicting information between what is available online and what the healthcare professional has said to them. With the use of internet increasing and the search for independent medical information growing, medical professional must include the internet resources in their approach for informing patients. The UMCHW checklist is easy to access and use. We recommend that healthcare professionals use it to evaluate any site that they recommend to patients.

General recommendations in creating and assessing websites are that

- Authors details with credentials and contact information should be clearly displayed
- The dates of the last review of the information displayed on the website
- Conflicts of interest should be clearly stated
- Adverts should not interfere with the user therefore no flashing
- Limited use of medical jargon and easily understood language should be used

By recommending websites that score well on the UMCHW

and adhere to the above principles departments can formulate approved website lists which patients may then use. Without this approach we risk patients making uninformed inaccurate decisions about their healthcare.

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Clinical Paper

Nasal Trauma: Who Nose what happens to the non-manipulated?

Hope N, Young K, .Mclaughlin K, Smyth C

ABSTRACT

Background: Nasal trauma is the most common facial injury worldwide. Prompt assessment allows for recognition of injuries requiring surgical intervention in the form of nasal bone manipulation. The literature is unclear to what extent patients undergoing conservative management subsequently require surgical intervention.

Methods: A retrospective chart review of all patients presenting with nasal injury between July 2017 and July 2018 who underwent conservative and surgical management was undertaken. Re-referral and subsequent surgical intervention were documented.

Results: In a cohort of 390 patients with nasal injury 229 patients underwent conservative management. Average age was 29 years. Males comprised 60% of our conservative cohort and 81% of the manipulated cohort. 8.3% of patients managed conservatively and 12% of those undergoing manipulation were re-referred.

Conclusion: Nasal trauma assessment is a significant workload for an ENT unit. Conservative management is appropriate following clinical assessment and does not lead to increased intervention compared with those who are surgically manipulated.

KEYWORDS: Nose Nasal Bone Nose Deformities, Acquired

INTRODUCTION

Nasal bone fractures are the most common facial skeleton fractures in the United States, with an estimated incidence of 53.2/100,000 [1]. Similarly in the UK, facial injuries approximate 500,000 attendances per year to accident and emergency (A&E) departments [2]. Of these injuries nasal bone fractures were found to be the commonest facial skeleton fracture [3].

There is a male to female propensity in nasal bone fractures. Mechanism of injuries for significant facial injuries varies, however the incidence of assault and excessive alcohol consumption are found to be on the rise [4].

The impact on patients' lives can be very significant following nasal injury and inadequate management has been shown to have a negative psychological impact on the self-esteem and confidence of patients [5]. A recent questionnaire from a group in London found that 64% of patients would choose to have their manipulation when looking at events in hindsight [6]. Furthermore, patient satisfaction with outcome was highest when nasal bone manipulation was performed within 2 weeks of injury [6].

Nasal injuries can require urgent intervention. After an assessment, patients are either managed conservatively, are offered a manipulation of their nasal bones, or will require more invasive intervention. Following the set-up of a nasal fracture clinic in Waterford, Ireland, Basheeth et al found that the 11% of patients required formal septorhinoplasty [7].

The high incidence of nasal injuries adds significant pressure to A&E departments and presents a challenge to ENT departments on how best to manage and treat the subsequent nasal fractures. The aim of this study was to conduct a retrospective study to compare the outcomes of those patients who were managed conservatively versus those who were manipulated when they were assessed for their nasal injury. Following a literature review, it is believed this is the first paper that specifically identifies patients who initially underwent conservative management and were later found to require definitive intervention.

MATERIALS AND METHODS

A retrospective case note review of all patients undergoing assessment for nasal injury over a 12-month period was performed. All patients referred from other healthcare professionals with concerns regarding nasal injury were included. A diagnosis of nasal fracture was made based on clinical findings. A decision to manipulate nasal bones was a shared decision between clinician and patient. Charts were readily available due to the nature of the evolving service provision of acute presentations to the ENT department. Demographic data was recorded, in addition to mode of injury, date of injury and length of time to assessment. Subsequent referral by a General Practitioner for nasal assessment was documented. If a further referral had been received, a decision to offer further operative intervention was also recorded.

ETHICAL CONSIDERATIONS

This chart review was undertaken as part of wider NHS development. In view of its retrospective nature, ethical approval was not required

RESULTS

A total of 390 patients were assessed following nasal injury. Of these, 58.7% (n=229) were managed conservatively,

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given advice at their appointment and discharged. The mean age of patients managed conservatively was 29.1 (range 35 weeks to 87 years). The average time from nasal injury to formal ENT assessment was 10.6 days. The majority of patients were male, 59.8% (n=137).

Figure 1 shows the documented mechanisms of trauma. Falls were the most commonly reported injury in patients who were managed conservatively (n=83), followed by assaults (n=58) and sports related injuries (n=35). Mode of injury varied by sex and is reflected in Figure 2 and Figure 3. Women more commonly suffered from falls, 54.3% (n=50)

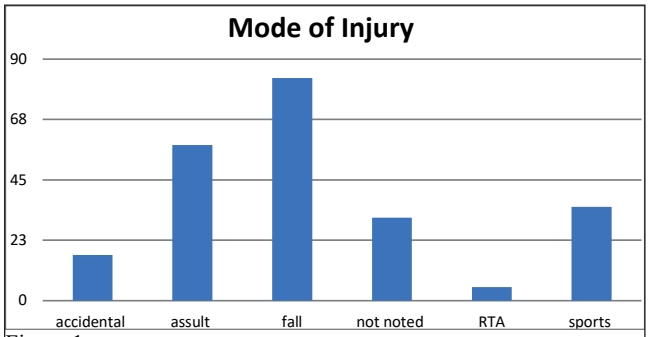

Figure 1

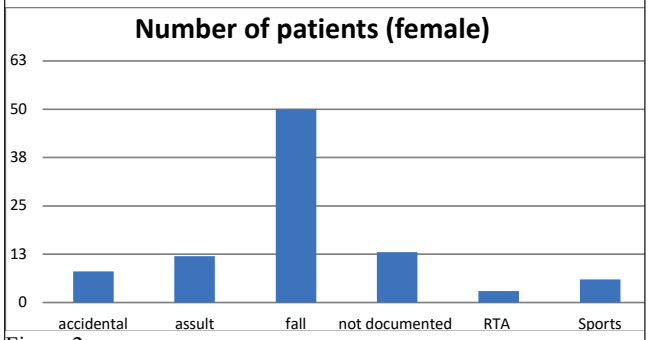

Figure 2

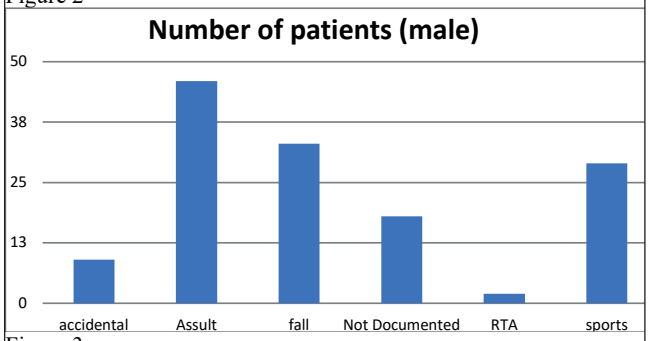

Figure 3

whereas the most common injury reported by men were assaults, 33.6% (n=46).

Of the 161 patients undergoing nasal bone manipulation 21.1% (n=34) were performed under local anaesthesia on initial attendance and 78.9% (n=127) under general anaesthetic. Males were more likely to require manipulation of their nasal bones with 82.4% of local anaesthetic procedures and 81.1% of general anaesthetic procedures being performed on males.

8% (n=19) of patients who were managed conservatively have subsequently been referred back to the ENT department for consideration of further management of their nasal symptoms. A total of 3% (n=7) of the conservatively managed cohort subsequently were offered formal operative intervention in the form of a septoplasty or septorhinoplasty.

In comparison, 11.8% (n=15) of patients who underwent MNB under general anaesthetic were referred back to the ENT outpatient clinic. Of these, 9 patients were offered definitive surgical intervention. Of those patients manipulated at ward level under local anaesthetic, 14% (n=5) were referred back, of which 5.8% (n=2) were offered definitive surgical intervention.

DISCUSSION

Facial trauma and in particular nasal trauma is commonplace. The incidence has been reported as 53 per 100,000. Our dataset represents a large cohort and the demographics are comparable with literature on nasal trauma aiding the validity of the results. Our results show that the vast majority of patients are seen, assessed and discharged in an appropriate manner.

It was interesting to note, but perhaps unsurprising, that in the conservative group of patients, males only made up 59.8% of the total number of patients. This differs significantly with those undergoing manipulation either under general or local anaesthetic (81.1% and 82.4% respectively). The authors suspect this difference is largely due to greater force of injuries to the nasal bones from life situations that young males find themselves in such as sports and assaults.

In our series, only 8.3% (n=19) of patients managed conservatively were subsequently referred in by their General Practitioner for a further opinion. Of these only a small number went on to have definitive intervention at a later stage. This is compared to the 11.8% of patients who were referred following general anaesthetic manipulation and 14% of patients who were referred following local anaesthetic MNB. The referral rates following intervention are in keeping with unsatisfactory results documented by Murray and Maran in 1980 [8] and similarly by Crowther and O'Donoghue in 1987 [9]. Given that the psychological impact from potential change in appearance, in addition to change in nasal function, this small number of formal interventions suggests that conservative management, when selected, is appropriate in the vast majority of cases.

The assessment of nasal trauma is clinical and as such it can be difficult to quantify severity of injury. However, it seems logical that those patients who undergo manipulation of nasal bones may have experienced more severe injuries. As such this cohort are at an increased risk of having post procedural residual deformity or problems with nasal function and are therefore more likely to require definitive surgical management in the future. We observed that patients were more likely to be re-referred back to ENT services if they had previously undergone a manipulation

of nasal bones. Patients that had previously underwent a manipulation of nasal bones were also more likely to be offered elective surgical intervention when compared to patients that had been re-referred who had previously been managed conservatively. This would be in keeping with the observation that more force is required to cause nasal bone fracture, and therefore greater damage to the nasal structure.

From the literature it is apparent that earlier intervention results in higher patient satisfaction with the overall procedure. Sharma et al found that there was a negative correlation between patient satisfaction and increasing time from injury to procedure [6]. We also know that as time progresses, nasal healing occurs and can hinder good manipulation. In our cohort, the average time to assessment was 10.56 days highlighting that ample opportunity to ensure manipulation within 14 days was given if deemed necessary.

It must be noted that due to the nature of this piece of work, there may be a, as of yet undocumented, group of patients who have yet to seek referral for their nasal symptoms. This is due to those patients who may not have yet sought referral to ENT from their GP. We therefore may see in the future that the true number of patients seeking a further opinion is under-reported in this cohort – however this number is expected to be small. Further to this, there is anecdotal evidence only, to suggest that a small volume of charts may not have been available due to use in legal proceedings. One final limitation on documentation of further referrals and intervention would be that only National Health Service notes were available and therefore referrals and intervention in the private sector may mean referral rates are underestimated, although the impact of this is felt to be limited.

CONCLUSIONS

In summary, nasal trauma is a significant workload within an otolaryngology department. The incidence of further referral following discharge at a nasal injury assessment is not well documented in the literature, nor is the subsequent rate of intervention. Clinical assessment, and where appropriate, manipulation of nasal bones remains paramount in treating this common condition. This study will help us better counsel patients with mild nasal injuries, allowing the clinician to reassure patients that opting not to undergo manipulation at the time of assessment is not simply postponing the need for intervention. Given that increasing emphasis is placed on value for money within an NHS that is being squeezed for resources, it is imperative that we have knowledge of, and can justify, the early assessment and intervention in such groups of patients. The information presented here will be of importance in not only service planning, but also highlights the training opportunities that are present from assessment of nasal injuries by the more junior members of staff.

Authorship Contribution

N Hope - Data collection and analysis manuscript preparation

K Young - Data collection, and analysis manuscript preparation

K.Mclaughlin - Data collection, manuscript preparation

C. Smyth - Patient cohort identification, data analysis, manuscript preparation

Conflict of Interest

There are no conflicts of interest to declare

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Clinical Paper

The Effect of the COVID-19 Pandemic on the Workload of an Adult Major Trauma Centre in Northern Ireland

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ABSTRACT

Introduction: Based in Belfast, the Royal Victoria Hospital is the only Major Trauma Centre in Northern Ireland. Due to the COVID-19 pandemic, on 23rd March 2020, Northern Ireland was placed into 'lockdown' with the majority of the population advised to "stay at home". The objective of this paper is to identify what effect the lockdown restrictions had on the workload of the Major Trauma Service at the Royal Victoria Hospital.

Method: Patients were identified at the orthopaedic trauma meetings and from direct referral to the Major Trauma Service (MTS). Patients admitted and seen by the MTS from 23/03/20, the day lockdown was announced, to 29/05/20, when restrictions were partially lifted, were included in the analysis. Admissions data from this time period was then compared to admissions data from the same period in 2019 (23/03/19 - 29/05/19).

Results: When comparing pre-lockdown and lockdown groups there was an overall decrease of 26% in admissions to the MTS (n=57 vs n=42). Road Traffic Accidents were reduced by 53% (n=31 vs n=15) and falls from >2m were reduced by 29% (n=21 vs n=15).

Conclusion: Overall the number of admissions to the major trauma service was reduced during the lockdown period. A significant proportion of the reduction may be a result of social restrictions that reduced volume of traffic on Northern Irelands roads. Further study of future lockdowns and including admissions data of other MTCs in the UK would allow us to draw more robust conclusions.

INTRODUCTION

Major trauma (MT) is the leading cause of death and a major cause of disability in people aged under 45. Defined as an injury or combination of injuries that are life-threatening and could be life changing because it may result in long-term disability.[1]

The Major Trauma Network in Northern Ireland was created in 2017 following evidence that the regionalisation of major trauma services resulted in better patient outcomes.[2] Prior to this there was considerable variations in the standard of major trauma care based upon where and when patients were injured.[1] The Royal Victoria Hospital (RVH) in Belfast was nominated as the adult Major Trauma Centre (MTC) for Northern Ireland and has become the main hospital from which major trauma patients are treated. The Belfast Hospital for Sick Children is the nominated MTC for paediatric patients. Six other hospitals across Northern Ireland were designated as Trauma Receiving Hospitals. Patients who are injured with <=45 minute travel time of the MTC are taken directly to the MTC emergency department. Those who are >45minutes from the MTC are taken to an emergency department of the nearest Trauma Receiving hospital and then subsequently transferred to the MTC following stabilisation.

The Major Trauma Service (MTS) was established in January 2018. Consisting of a multidisciplinary team of doctors, specialist nurses, dieticians, physiotherapists and occupational therapists. This team routinely review and provide input for any patient who is admitted as a result of trauma with an injury severity score (ISS) of >15 or who require the care of more than one hospital specialty.

As a result of the COVID-19 pandemic, on 23/03/20 the UK and Northern Ireland was placed into 'lockdown' with the majority of the population advised to "stay at home". The lockdown restrictions were subsequently eased on 29/05/20. The objective of this paper is to identify what effect these restrictions had on the number of patients admitted the MTS at the RVH.

METHOD

Patients were identified at the Orthopaedic Service trauma meetings, as all patients who triggered trauma calls are discussed, even if they have no orthopaedic injuries and fractures is not the lead speciality. (Trauma calls are fast bleeps that are sent to all members of the on-call trauma team to notify them that a major trauma patient has arrived in ED). Patients were also identified by direct referral from the admitting speciality to the MTS. Of the patients identified by the meeting or referral, those with ISS >15 or who require input from more than one speciality then received input from MTS and were therefore included in this study.

Those patients that died prior to arrival in hospital were not included. Patients that arrived in ED but subsequently died prior to leaving the department were only included if seen prior to death by the MTS.

RVH regularly submits to the Trauma Audit and Research Network (TARN). All patients attending RVH as a result of traumatic injuries who have an ISS >9 are submitted to TARN. Due to the differences in the admission criteria for the MTS and eligibility criteria for TARN, TARN data was not used as it is not representative of the workload of the MTS.

All patients who met the admission criteria were subsequently included in this study. Details recorded were; age, sex, ISS, lead speciality, date of admission, date of discharge, home trust, emergency department of first contact, trauma call code and mechanism of injury. Data of all patients seen by the MTS was collected from 06/01/2019 until time of writing, and is on-going.

Mechanism of injury was categorised into: fall from >2m, fall from <2m, road traffic accident (RTA) or other. RTAs were inclusive for accidents involving, motor vehicles (cars, vans & lorries), motorbikes and pedestrians if hit by one of the aforementioned vehicles.

Patient data from 23/03/20 to 29/05/20, the duration of lockdown, was then retrospectively analysed and compared to the data from the same 68 day period of 2019.

RESULTS

Between 23rd March, 2019, and 29th May, 2019 (pre-lockdown), 57 patients received inpatient input from the major trauma service. During lockdown, 42 patients were identified and received input.

	Pre-Lockdown			Lockdown	
Total Admissions	57			42	
Male	38	67%		32	76%
Age	47.4	SD 21		50.8	SD 18
Mean ISS	27.8			22.0	
Lead Speciality					
Ortho	40	70%		27	64%
Neuro	11	19%		5	12%
Thoracic	3	5%		7	17%
Gen Surg	2	4%		2	5%
Medical	0	0%		1	2%
ED	1	2%		0	0
Hospital of first contact					
Major Trauma Centre	45	79%		30	71%
Trauma Receiving Hospital	12	21%		12	29%
Mechanism of Injury					
RTA	31	54%		15	36%
Motor Vehicle driver or passenger	12			5	
Motorcyclist	13			7	
Cyclist	2			0	
Pedestrian	4			3	
Fall from >2m	21	37%		15	36%
Fall from <2m	3	5%		4	10%
Other	2	4%		8	19%

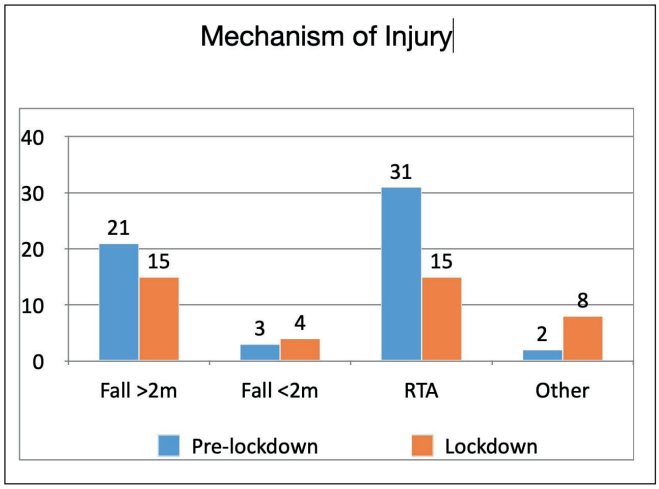
Pre-lockdown, 67% of patients were male (n=38) with a mean age of 47.4 years compared to the lockdown group with 76% male (n=32) with a mean age of 50.8 years. Patient demographic in each group is outlined in table 1.

Pre-lockdown, 54% (n=31) of admission were as a result of an RTA, 37% (n=21) from falls >2m, 5% (n=3) from falls <2m and 4% (n=2) from other mechanisms.

During lockdown 36% (n=15) of admission were as a result of an RTA, 36% (n=15) from falls >2m, 10% (n=4) from falls <2m and 19% (n=8) from other mechanisms [Figure 1].

Within the RTA category patients injured either driving or passengers of motor vehicle went from 12 pre-lockdown to 5 during lockdown, motorcyclists 13 to 7, cyclists 2 to 0 and pedestrians 4 to 3.

When comparing pre-lockdown and lockdown groups there was an overall decrease of 26% in admissions to the MTS. RTAs saw a reduction of 53%, 29% reduction in falls from >2m, 33% increase in falls from <2m and 400% increase in other mechanisms [Table 1].



DISCUSSION

The lockdown measures put in place due to the COVID-19 pandemic had a considerable effect on society within Northern Ireland. The majority of the population being instructed to work from home and to only venture out for shopping and daily exercise. With this change in social behaviour, a change in major trauma admission was expected, which resulted in redeployment of doctors and nurses to different departments within RVH.

Overall the major trauma service at RVH saw a 26% reduction in admissions when compared with the same time period of the previous year. A large proportion of that reduction was as a result of fewer admissions from RTAs. A similar trend was also seen in Police Service of Northern Ireland (PSNI) road death and injury statistics. Although not directly comparable as the data is presented as monthly

figures, the months that were partially or fully involved in lockdown (March, April and May) saw reductions in people killed or seriously injured (KSI) on Northern Ireland's roads when compared to the previous year. March saw a reduction of 43% in people KSI, April 58% reduction and May was down by 50%.[3] When MTS admissions were broken down into separate categories based upon vehicle type involved, all vehicles saw a reduction in admission as well. This points towards a reduction of risk for all road users during lockdown.

With fewer people commuting to work it is probable that the overall number of vehicles on Northern Irelands roads was significantly reduced during this period. This could have made the roads safer overall which resulted in less RTAs. PSNI estimated that traffic levels "over halved" during lockdown but we are unable to confirm this statement with published figures, as the road usage statistics for 2020 in Northern Ireland are not yet publicly available.[4]

Falls from >2m saw a reduction in 29%. It is plausible that this was a result of reduced number of people working in high risk areas, such as at construction sites or up ladders for example, but the data collected did not contain this information so it is not possible to apply causation to this hypothesis.

With regard to falls from <2m and other mechanisms, we are not able to draw reliable conclusions from the data as number of patients presenting from each mechanism is too small.

CONCLUSION

Overall, the admissions to the Major Trauma Service at the Royal Victoria Hospital were reduced during lockdown when compared to the previous year. The reduction in admissions was mostly a result of fewer RTAs and falls from >2m, which is likely as a result of the social restrictions placed upon the population of Northern Ireland during lockdown. However, the sample size collected is small and it is not possible to rule out random variation as a possible cause for the reduction. Combining data from other MTCs around the UK would allow for more robust conclusions regarding the pandemics affect on MT admissions to be made. It is possible that another lockdown may be imposed on Northern Ireland which would allow for further study of its effect on admissions to the MTS.

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Clinical Paper

Prevalence, Behaviours and Burden of Irritable Bowel Syndrome in Medical Students and Junior Doctors

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Keywords: Irritable bowel syndrome, medical students, junior physicians, anxiety, depression

ABSTRACT

Background

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder which can have a strong impact on patients' quality of life including influence on various social aspects and psychological ramifications. The aim of the study was to assess the prevalence and consequences of IBS in medical students and junior doctors in Malta.

Method

An online survey was sent out to all medical students enrolled at University of Malta and all doctors training with the Malta Foundation Programme.

Key Results

The prevalence of IBS was 17.7% (total number =192), with 6.2% being previously diagnosed with IBS and the rest (11.5%) having symptoms consistent with IBS according to the Rome IV criteria. There was no statistically significant difference in BMI and in activity level as determined by the Godin Leisure-Time Exercise Questionnaire between IBS and non-IBS group.

Absenteeism was significantly commoner in students/doctors with IBS (47.1%) than in those without IBS (9.5%; p=0.0001). Of those previously diagnosed with IBS, 66.7% self-medicated compared to 45.4% of those diagnosed through the questionnaire. 71.6% of those in the IBS group tried dietary modification as to control their symptoms.

On the Kessler 6 Distress scale, 91.2% of the IBS group had a score ≥6, with 44.1% having a score ≥13. The mean Visceral Sensitivity Index Score was 40.1 (95% CI 33.6 - 46.6).

Conclusion

IBS is prevalent, yet under-recognized, in medical students and junior doctors. Measures should be instituted for timely, confidential detection and management of IBS and its related psychological consequences.

INTRODUCTION

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder (FGD). A meta-analysis assessing 80 separate study populations encompassing 260,960 subjects revealed a pooled prevalence of 11.2% (95% CI, 9.8%–12.8%). The prevalence is higher for females when compared to males (OR, 1.67; 95% CI, 1.53–1.82).[1]

Like other FGDs, IBS is postulated to be a disorder of gut-brain interaction. The biopsychosocial conceptual model for FGDs encompasses psychosocial factors such as life stresses, personality traits and social support together with altered physiology involving motility, visceral hypersensitivity, immune dysfunction, altered microbiome and diet. [2]

A diagnosis of IBS is made through history-taking, examination and limited, yet relevant, investigations. As per the Rome IV Criteria, the diagnostic criteria for IBS are abdominal pain with at least two of the following: relation to defecation, association with a change in stool consistency and/or association with a change in stool frequency. Symptoms must be felt at least one day per week in the previous three months.[3] Though they do not improve the performance of the IBS diagnostic criteria,[4] the presence of alarm features (such as rectal bleeding, unintentional weight loss and/or positive family history of colorectal cancer) should be sought as they might point to organic disease[5].

IBS can have a strong impact on quality of life (QOL) and social function. Patients with IBS report lower health-related QOL than the general population and patients with ulcerative colitis, asthma, GORD and migraine.[6–8] There is also an association with psychological-psychiatric conditions with levels of anxiety and depression being significantly higher in IBS patients when compared to healthy controls. A meta-analysis concluded that the prevalence rate of anxiety symptoms in IBS patients is about 39.1% whilst that of depressive symptoms is around 28.8%.[9]

Stress has been correlated both as trigger and an exacerbating factor for IBS.[10] Stress has been shown to affect the

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gastrointestinal system by altering gut permeability[11], intestinal motility[12] and visceral hypersensitivity.[13] Stress can lead to either overactivity or underactivity along the hypothalamic-pituitary-adrenal axis and of the autonomic nervous system, metabolic system and immune systems. This results in altered brain-gut interactions, thus causing or exaggerating the symptoms of IBS.[14]

Medical students and junior doctors are a category of individuals exposed to high levels of stress due to heavy workloads and various responsibilities. In medical students and junior doctors prevalence of IBS ranges from 9.3% to 35.5%.[15]

Various tools are available to assess the psychological repercussions of IBS. The Visceral Sensitivity Index (VSI) is a validated tool used to measure gastrointestinal specific anxiety (GSA) in IBS. It consists of 15 items with a six-point response scale (strongly agree to strongly disagree). The questions cover different aspects of fear, anxiety and hypervigilance related to gastrointestinal sensations and discomfort. The items on VSI are reverse scored (i.e. 1–6 becomes 5–0) and totalled to calculate the final score, with scores ranging from 0 (no GSA) to 75 (severe GSA).[16,17] The Kessler Psychological Distress Scale (K6) is a tool developed to assess risk of severe mental illness, with a score of 6 or greater being suggestive of mental distress and a score of 13 or more suggesting severe mental illness.[18]

OBJECTIVE AND METHOD

The primary aim of the study was to assess the prevalence of IBS in medical students studying at the University of Malta and Foundation Doctors with the Malta Foundation Programme. The secondary aims were to assess anxiety and distress in IBS patients.

A cross-sectional study was carried out by sending an online questionnaire (Supplementary Material) to all medical students enrolled at University of Malta and all Foundation doctors training with the Malta Foundation Programme in March 2019. The timeframe was chosen to avoid the exam period. Participation was voluntary and no identifiable data was collected to ensure confidentiality.

RESULTS

One hundred and ninety-two (n=192) participants completed the survey. One hundred and thirty-five participants (70.3%) were medical students. The rest (n=57; 29.7%) were Foundation doctors. Overall, the prevalence of IBS was 17.7% (n=34) with 6.2% being previously diagnosed with IBS and the rest (11.5%) having symptoms consistent with IBS according to the Rome IV criteria.

The number of females in the IBS group (76.5%) was slightly higher than the non-IBS group (60.7%; p= 0.11). The majority of respondents' age was between 18-24 years (79.4% for IBS group, 76.6% for non-IBS group). There was no statistically significant difference in Body Mass Index (BMI) between IBS and non-IBS group. Similarly, there was no significant difference in smoking status, physical activity level as determined by the Godin Leisure-Time Exercise Questionnaire, with similar proportions being present in the active group. (Table 1)

Table 1: Demographics of the IBS and non-IBS cohort.

	IBS	**Non-IBS**
Total Number	34 (17.7%)	158 (82.3%)
Female	26 (76.5%)	96 (60.7%)
Age		
18-24	27 (79.4%)	121 (76.6%)
25-29	6 (17.6%)	29 (18.4%)
30-34	1 (2.9%)	8 (5.1%)
BMI		
<18.5	2 (5.9%)	6 (3.8%)
18.5-25	22 (64.7%)	102 (64.6%)
25-30	8 (23.5%)	37 (23.4%)
>30	2 (5.9%)	13 (8.2%)
Smoking status		
Non-smoker	27 (79.4%)	145 (91.8%)
Ex-smoker	5 (14.7%)	7 (4.4%)
Smoker	2 (5.9%)	6 (3.8%)
Godin Scale Score		
>24 (active)	22 (64.7%)	115 (72.8%)
14-23 (moderately active)	7 (20.6%)	25 (15.8%)
<14 (sedentary)	5 (14.7%)	18 (11.4%)

Of those previously diagnosed with IBS, 66.7% had been prescribed a medication, with the same amount also self-medicating with other medications. Antispasmodics were the commonest (66.7%) and were prescribed in all instances. Only one participant had been prescribed a Selective Serotonin Reuptake Inhibitor (SSRI). Participants also opted to self-medicate with a variety of medications, including proton pump inhibitors, probiotics, analgesics, laxatives, loperamide, anti-emetics, active carbon and peppermint oil.

In the group that were unaware of their IBS as diagnosed through the questionnaire, 42.9% of them had seen a specialist. In comparison, 22.7% of those unaware of their diagnosis had been prescribed a medication with 45.4% self-medicating. The use of antispasmodics was lower (22.7%) in this cohort. Of those who self-medicated the commonest

were: antispasmodic (40%), medication for pain relief including Paracetamol, Codeine or NSAID (40%), probiotics (30%) and medications intended for acid reflux (30%).

Dietary modification to control symptoms was slightly higher in those previously diagnosed with IBS (75%) than those diagnosed through the questionnaire (68.2%).

Absenteeism was significantly commoner in students/ doctors with IBS (47.1%) than in those without IBS (9.5%; p=0.0001). In the IBS group, though commoner, there was no significant difference in absenteeism in those aware of their diagnosis (58.3%) when compared to those diagnosed through the questionnaire (40.9%).

The mean VSI score was 40.1 (95% CI 33.6 - 46.6), with 32.3% scoring above 50. On the K6 scale, 91.2% of the IBS group had a score ≥6, with 44.1% having a score ≥13.

Out of the 34 participants found to have IBS, 10 were Foundation doctors (29.4%) and 24 (70.6%) were medical students. Only 1 doctor had been previously diagnosed by a specialist with IBS. There was no statistically significant difference between two cohorts regarding prescribed medication (p=0.52), self-medication (p=0.82) or dietary modification (p=0.96). (Table 2). Though medical students had a tendency to higher VSI (p=0.19) and Kessler scores (p=0.28) as well as absenteeism (p=0.1), this was not statistically significant.

Table 2: Comparison of Foundation Doctors and Medical Students diagnosed with IBS.

	Doctors	**Medical students**
Prescribed medication	3 (30%)	10 (41.7%)
Self-medicated	5 (50%)	13 (54.2%)
Modified diet	7 (70%)	17 (70.8)
Missed lectures/work	2 (20%)	12 (50%)
VSI Score		
>50	1 (10%)	10 (41.7%)
25-49	6 (60%)	10 (41.7%)
<24	3 (30%)	4 (1.7%)
Kessler Score		
>13	3 (30%)	12 (50%)
<13	7 (70%)	12 (50%)

DISCUSSION

This study investigates IBS in medical students and junior doctors in Malta. The prevalence of IBS was higher (17.7%) than the quoted pooled rate of 11.2%.[1] A world-wide study covering 73,076 respondents published in 2020 estimated the pooled prevalence rate of IBS to be even lower, with a rate of 4.1% (95% CI, 3.9%- 4.2%) in those answering an Internet based survey and 1.5% (95% CI, 1.3%- 1.7%) in those undergoing a household survey.[19]

A systematic review published in 2015 pertaining to prevalence rates and risk factors for IBS in medical students identified 16 studies on the topic. The prevalence rates ranged from 9.3% to 35.5%. However it is worth noting that none of the studies used the Rome IV criteria (previous versions of the Rome criteria were utilized) and none were performed in European countries.[15] More recent studies give prevalence rates of 14%- 29.3% with none of the studies being European[20–24] . Furthermore there was a wide variation in the prevalence rates, varying between 4.8%[25] and 61.7%[26]. Thus, the prevalence rate of IBS in our cohort was similar to the mean prevalence rates among studies, though higher than the general population.

In keeping with other studies, IBS was more prevalent in females than in males [3] with a male to female ratio of 1:3. This difference may be due to differences in pathophysiology (including hormonal factors, and alteration of cytokine and immune function) or in symptom type or burden.[27] The prevalence rate and this demographic feature support the validity of our study.

Out of our entire IBS cohort, only 35.3% were aware of their diagnosis. The remaining participants were unaware, though 42.9% of these had seen a specialist and 58.3% had been prescribed an antispasmodic. Communicating the diagnosis in IBS is one of the important pillars of its management. Doctors could be hesitant to deliver the diagnosis for various reasons, including worry over the reaction of the patient and uncertainty from the side of the doctor.

Our study failed to show an association between IBS and BMI, smoking status or physical exercise. A review on the relationship between obesity and IBS concluded that the association remains unclear, with some studies showing a link and others failing to do so.[28–30] Despite the known perils of smoking, a link with IBS has not been demonstrated though some studies have shown that smoking independently predicted the presence of IBS.[31] Exercise improves symptoms of IBS,[32,33] with physical activity being associated with improvement in gas transit and abdominal distension in healthy subjects.[34] The uptake of physical activity is, however, low, with patients with IBS seemingly having a more sedentary lifestyle[35–38] though not all studies support this finding.[39]

Nearly half (47.1%) of our IBS cohort missed classes or work because of gastrointestinal symptoms. Few studies have assessed IBS-related absenteeism in students. In studies with medical students, one study cited a prevalence of 2.3%[24] and another of 10.7%.[37] In a study conducted on university students in Germany found to have IBS, 79.5%% did not miss a class because of gastrointestinal symptoms, 13.5% missed one day, 5.4% missed a full week and 1.5% missed

more than one week.[40] In our study, junior doctors had a tendency towards lower levels of absenteeism, suggesting either adaptation to their symptoms or a reluctance to take time off from work.

IBS has been shown to impact work productivity and work attendance, resulting in reduced quality of life and cost to the employer. Self-reported rates of presenteeism (loss of work productivity) range from 31.4%-86.6% whilst those of absenteeism (absence from work) are 5.6%-24.3%.[41–43] Respondents with IBS-diarrhoea predominant incurred an estimated $2486 more in indirect costs than controls.[44]

A 2001 study showed that IBS affected personal relationships, with 19% of patients in a relationship stating that their partners experienced difficulties in having a physical relationship with them and 45% stating that IBS interfered with their sex life. Apart from presenteeism and absenteeism, the study also revealed that, because of IBS, 12% of patients did not work at all and 32% did not apply for a new job involving a lot of presentations /meetings.[45]

Several studies have evaluated the effect of stress on IBS in medical students, all showing that symptoms of anxiety and depression were more common in the IBS cohort than the non-IBS.[22,23,38,39,46–48] Various questionnaires and tools were used, making pooling of data difficult. Only one study utilized the VSI in university students. This study was a validation of the Japanese version of the VSI and the mean score for patients with IBS was 25.1 (95% CI 20.2 – 30.1).[49] Typical mean VSI values in IBS patients in the general population range between 27.8-38.[17,50,51] Our study has demonstrated significant levels of GSA with a mean VSI score of 40.1. There is also substantial mental distress with 91.2% of the IBS group having a score ≥6 and 44.1% having a score ≥13 on the K6. These scores might actually be higher to due participants reluctancy to answer truthfully over fear of responses being traced back to them, with the associated stigma. These figures are worrying as medical students and junior doctors are already under constant stress due to exams, studying and hospital workloads including night duties. Furthermore, our IBS cohort will be studying and training for a number of years, thus having to cope with their condition for a prolonged period of time. Interestingly, our study showed a tendency for medical students to have higher stress scores that junior doctors, possibly due to tension caused by academic demands.

The study has shed light on prevalence, risk factors and ramifications of IBS amongst medical students and junior doctors. Limitations of the study are the possibility of response bias, nonresponse bias and recall bias. In order to reduce the response bias, it was made clear that the questionnaire would be anonymous. To ensure participants felt safe answering the questionnaire, no data that could be traced back to the participants was collected. Our response rate was 27.4%. Responses for online surveys are known to be low. Using a margin of error of 10% and a confidence level of 99%, our sample size should have been 135. We collected 192 responses. Furthermore, it has been demonstrated that response rates of 20% are as accurate as those with a higher response rate (50 % to 70% response rate).[52,53] Recall bias should be low as the questions pertained to symptoms or events that had occurred recently.

CONCLUSION

IBS is prevalent in medical students and junior doctors, yet it is not always recognized and treated, possibly due to underplaying of symptoms or stigma against the condition. In those suffering from IBS, high levels of distress, absenteeism and various lifestyle modifications were documented. The K6 and VSI scores were significantly and worryingly elevated. Measures should be instituted for timely, confidential detection of IBS and its related psychological consequences, possibly by screening questionnaires. This is will allow participants to receive appropriate treatment not only for IBS but also for the accompanying psychological distress.

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Medical History

PROTON BEAMS AND NOBEL LAUREATES

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Key Words: Cyclotron, Radiation Accidents, Mentoring

Running Title: Proton Beams

INTRODUCTION

Physicists and physicians at Queen's University Belfast and Harvard University are both currently engaged in long-term efforts in using accelerated protons to optimize therapy. The Bragg effect of accelerated protons and controlled changes in cellular oxygen tension are promising therapeutic modalities, as recognized by the 2019 Nobel Prize in Physiology or Medicine recently awarded jointly to Harvard Researcher William G. Kaelin, Jr., Sir Peter J. Ratcliffe and Gregg L. Semenza (a Harvard College Alumnus) for "their discoveries of how cells sense and adapt to oxygen stability"[1,2,3,4,5,6,7,8]. This Medical History is an account of my[1] observations as both a participating physician and a thirty-four year survivor of malignancy treated by accelerated proton therapy .

MAGNUS SMEDAL, PROTONS

While stationed at Harvard's Fifth General Hospital at Musgrave Park near Belfast in 1942[9], Major Smedal taught its staff about cyclotrons and Bragg Peaks. His wartime Army service merited three Battle Stars for his service over Omaha Beach, Normandy, and the Rhineland[10]. Post-war, Smedal became co-chair of the Radiotherapy Department at the Massachusetts Institute of Technology's (M.I.T.) High Voltage Research Laboratory associated with Boston's Lahey Clinic and President of the New England Roentgen Ray Society (Table 1). Wisconsin born, Smedal had received his M.D. from Harvard. He had worked closely

TABLE 1. PROTON BEAM DEVELOPMENT	
1932	Joseph Rotblat begins atomic research
1935	James Chadwick Nobel Prize "The Neutron and Its Properties"
1937	Scattering of neutrons, Rotblat's doctoral thesis (suggested by Niels Bohr) First cyclotron built at Harvard University for research in nuclear physics
1938	Rotblat splitting of uranium atom
1940	Otto Frisch and Rudolf Peierls blueprint for atom bomb, consult with Rotblat and Chadwick Frisch moved to Liverpool University
1942	Smedal of MIT at Musgrave Park, Belfast
1946	Robert R. Wilson, "Radiological Use of Fast Protons", *Radiology* 47:487-91
1948	Chadwick to Cambridge University More advanced cyclotron built at Harvard funded by U.S. Office of Naval Research (ONR)
1949	Joseph Rotblat appointed as Professor of Physics at St. Bartholomew' s Hospital, London; held Chair until 1976.
1956	Reconstruction of Harvard Cyclotron-160 MeV external beam
1957	Windscale radioactive fire at Sellafield, Cumbria
1959	Radioactive fire at Liverpool Street Station, London

Table 1 Proton Beam Development

with M.I.T. Professors John J. Trump and Robert J. Van de Graaff, developer of the Van de Graaff generator, a particle accelerator used in physics research, but with limited clinical applications[9].

1 This and subsequent first-person references are to the first author.

Figure 1 Bragg Stamp. Diamond Jubilee commemoration of Sir William (1860-1942) and Sir Lawrence Bragg's Nobel Prize in Physics. In 1915, Lawrence's brother, Robert, was killed at Gallipoli.

Peak effects and focus and distance of protons were described by the Braggs during their sojourn in Adelaide, Australia in 1903 and 1904[4,11,12](Fig. 1) (Table 2). On 7 January 1904, William H Bragg spoke at the Tenth Meeting of the Australasian Association for the Advancement of Science at Dunedin, New Zealand[13], home ground of Ernest Rutherford, who was

TABLE 2. NOBEL PRIZE AWARDEES CONTRIBUTING TO DEVELOPMENT OF CLINICAL USE OF PROTON BEAMS	
YEAR	**AWARDEE/S**
1908	**Ernest Rutherford**
1915	**William H. Bragg and Lawrence W. Bragg**
1922	**Niels Bohr**
1935	**James Chadwick**
1939	**Ernest Lawrence**
1979	**Allan M. Cormack and Godfrey N. Hounsfield**
1989	**Norman F. Ramsay**
1995	**Joseph Rotblat**

Table 2 Nobel Prize Awardees contributing to Development of Clinical use of Proton Beams

also presenting a paper[14] (Fig 2) (Table 2). Bragg's address was titled , "Some recent advances in the theory of the ionization of gases"[13].

THE BRAGGS

The Bragg family had lived for many years in the County of Cumberland where in the 1820s John Bragg married Lucy Brown, who was then living near Belfast. Around 1840, when William, the eldest of their four children was twelve, John Bragg was lost at sea between Belfast and Cumberland. In 1846, John and Lucy Bragg's second son, Robert John went off to sea as an indentured apprentice until the late 1850s, when he bought a farm, Stoneraise Place, near

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Figure 2 Lord Rutherford, OM, FRS, of Nelson (1871-1937). Oil on canvas, 152.8 cm x 101.5 cm, 1934, by Sir Oswald Hornby Joseph Birley (1880-1952), No. G-826-2, National Art Gallery, New Zealand, courtesy of the Alexander Turnbull Library, Wellington. Born in New Zealand in 1871, in October 1907 Rutherford left McGill University for the Professorship of Physics at Manchester. Rutherford became the world's first successful alchemist when he turned nitrogen into hydrogen, protons and oxygen. In 1919, Rutherford was elected Cavendish Professor of Experimental Physics at Cambridge University. In 1938 Lord Rutherford was succeeded by Sir (William) Lawrence Bragg, who with his father Sir William had shown that "Protons have a well defined range, with a sharp increase of ionization at the end of the range that is the 'Bragg peak'."

Wigton in Cumberland, in the parish of Westward. In 1861 he married Mary Wood, the daughter of the Vicar, the Rev. Robert Wood and his wife. On July 2, 1862, Mary Wood Bragg gave birth there to the first of their three sons, William Henry[4,11,12,15].

CYCLOTRONS

In 1929 plans for the first cyclotron came from Ernest Lawrence of Berkeley, California[16]. By 1937 cyclotrons were functioning in Boston at both Harvard University and M.I.T. Also described by Smedal, was the work of Cockroft and Walton in the Cavendish Laboratories at Cambridge University, who had, like Joseph Rotblat in Warsaw, split atoms[17](Table 1) (Table 2).

NOBELIST, FRS, SIR JOE

In 1937, Joseph Rotblat was appointed Associate Director of the Atomic Physics Institute of the Free University of Poland, having completed his doctoral dissertation at the University of Warsaw in the same year on inelastic neutron scattering. That year he married Tola Gryn, a student of Literature. His doctoral degree was awarded in 1938[17]. Rotblat learned of the work of Otto Hahn and Fritz Strasseman, who had communicated their results on neutron bombardment of uranium to produce barium to Lise Meitner and her nephew Otto Frisch, who deduced that uranium nuclei had been split. Through associations with the Curies, Joseph Rotblat was invited to study in Paris, but accepted the invitation of James Chadwick[18] (Fig. 3) (Table 2), protégé since High School of Ernest Rutherford then Professor of Physics, Victoria University of Manchester[19] (Fig. 2). Chadwick asked Rotblat to join him at Liverpool University, where

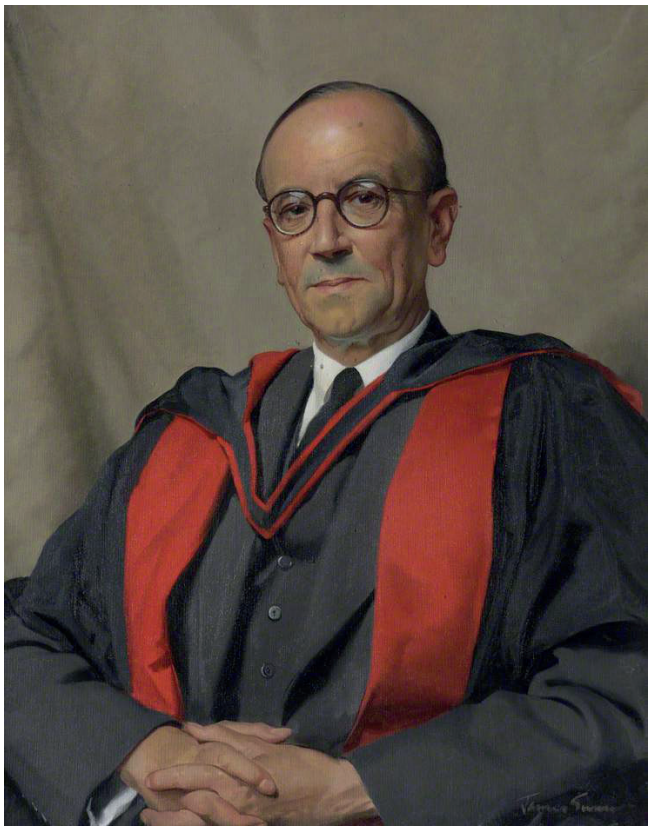

Figure 3 Sir James Chadwick, CH, FRS (1891-1974). When at Manchester High School Chadwick solved one of the experiments set by local Professor of Physics Ernest Rutherford (Fig. 2). Leader of the British scientists at Los Alamos, he was awarded the U.S. Medal for Merit in 1946. Chadwick and his wife remained in the U.S. until he returned to Cambridge University as Professor of Human Philosophy and Master of Gonville and Caius from 1948 to 1958. Portrait by Herbert James Gunn (1893-1964), oil on canvas 74 x 61 cm, No. GC0043. Reproduced with permission.

he was building a cyclotron for the study of basic nuclear reactions. Rotblat arrived in Liverpool on 18 April 1939; Tola remained in Warsaw because of her husband's small Liverpool stipend. Rotblat returned in August of 1939 to bring Tola back to Liverpool. An attack of appendicitis prevented her from travelling even though all the necessary documents had been arranged, and Joseph Rotblat returned to Liverpool alone on 31 August 1939, just before the German invasion of Poland. Over the ensuing months her husband did everything in his power to arrange Tola's rescue, but in 1941, British Intelligence uncovered her murder in the Madjanek concentration camp on the outskirts of Lublin. This information was not communicated to Rotblat, who only learned of her death in 1945 from his sister: Joseph Rotblat never remarried[17]. Magnus Smedal had been briefed in 1941 about Tola's death.

WORLD WAR II

In 1943, FDR and Churchill agreed that Britain should join the U.S. endeavor known as the Manhattan Project to produce the atomic bomb. James Chadwick (Fig.3) and Joseph Rotblat were recruited to join the project at Los Alamos, New Mexico, although Rotblat's entry was delayed due to his Polish citizenship. Harvard's cyclotron was moved to Los Alamos in 1943[20]. Chadwick was Head of the British Delegation: Robert R. Wilson, a protégé of Ernest Lawrence and Robert Oppenheimer, became head of the Cyclotron Group (R1) and later the Head of the Research Division of the Manhattan Project at Los Alamos[20]. After World War II, Harvard made Robert R. Wilson, manager of the Harvard cyclotron in the Manhattan Project at Los Alamos, New Mexico, a non-tenured Associate Professor of Physics. In 1946, in his seminal paper in *Radiology* on the potential therapeutic advantages of proton beams and their focused Bragg Peaks, Robert R. Wilson wrote: "The range of a 125 Mev proton in tissue is 12 cm, while that of a 200 Mev proton is 27 cm. It is clear that such protons can penetrate to any part of the [human] body"[21]. After a year, he moved to Cornell and thence to the U.S. National Fermi Laboratories in Illinois, where he later became Head.

RICHARD, NOT ROBERT

Putney-born Richard Wilson earned his BA and D.Phil at Christchurch, Oxford. In 1955, Richard and his wife Andrée moved to Harvard's Physics Department where Richard was appointed Mallinckrodt Professor of Physics[22].

ROTBLAT, POST LOS ALAMOS

At the end of 1944, Joseph Rotblat resigned from the Manhattan Project on political, humanitarian and scientific grounds, and returned to the University of Liverpool, succeeding James Chadwick as head of Nuclear Physics as the Chadwicks had remained in the U.S.[17,23].

Rotblat's work at Liverpool emphasized the medical applications of radioactivity. In 1949 Rotblat applied for and was awarded the chair of Professor of Physics for London University at St. Bartholomew's Hospital Medical College. He held these titles from 1950 until his retirement in 1976[17,24,25,26] (Fig. 4). Joseph Rotblat's resignation from the Manhattan Project was grounds for ongoing American suspicion and he was denied entry to the United States for many years.

WINDSCALE AND BELFAST, 7-11 OCTOBER 1957

Less than forty miles from the farm near Wigton, Cumbria

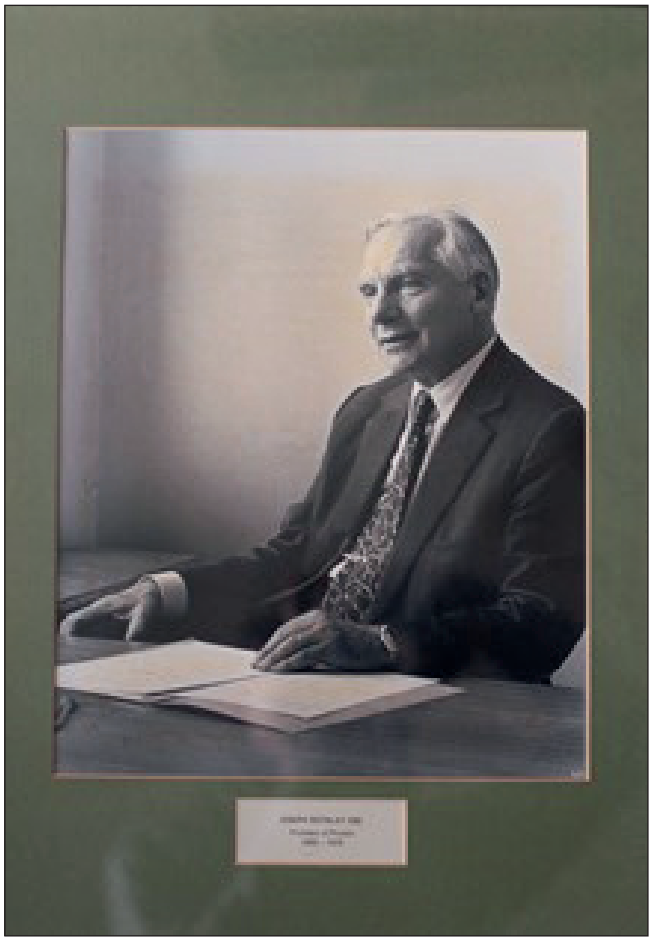

Figure 4 Sir Joseph Rotblat, KCMG, FRS, Professor of Physics, 1950-1976. From the Archives of St. Bartholomew's Hospital, London (No. SBHT1965) and reproduced with their permission. After World War I, Joseph Rotblat first attended a vocational school and helped support his family by working as an electrician. After discovering the evening classes at the Free University of Warsaw he earned a diploma and then a degree, and studied at the Radiological Laboratory of the Polish Scientific Society, where he drew the attention of Professor Ludwick Wertenstein. Wertenstein's collaboration and experience with Rutherford and Chadwick at Cambridge's Cavendish Laboratory did much to further Rotblat's career:Nobel Peace Prize, 1995.

where William H. Bragg was born almost a century earlier, the most serious nuclear disaster in British history took place in October 1957 at the Windscale facility, Sellafield,

Cumbria[27,28,29]. At Sellafield the radioactive plumes from the burning atomic piles were subjected to light winds from the northeast: winds aimed at the 160 miles to Belfast. Early on October 11, 1957, the wind freshened and veered from the north and then blew from the northwest for twelve hours. Belfast was saved but both Newcastle-upon-Tyne, Liverpool and Harrow on the Hill received significant radiation as did the Low Countries and Scandinavia. Professor Rotblat, at St. Bart's in London, was consulted. Milk, seaweed and St. George's Channel plaice were found to be slightly radioactive[28,29,30,31,32]. My father[9]as a former Bart's trainee of Professor of Surgery George E. Gask, DSO, CMG (1875-1950)[33], consulted with Professor Rotblat as to where Ernest Rutherford's tidal currents and drainage maps for the United Kingdom were kept[17,24]. Coastal Command of the RAF provided them. Eating seaweed was proscribed until further notice.

RADIOACTIVE FIRE IN LONDON

On May 29, 1959, at 7:25 a.m. as Chief Resident at Bart's, I answered the Disaster Phone in Admissions. There was a radioactive cloud of smoke headed west from Liverpool Street Station London Parcels Division[34]. Twenty uniformed Metropolitan fire fighters from Bishopsgate, accompanied by Liverpool Street Station Officer Philip O'Hare and escorted by Metropolitan police arrived at Admissions. Safety precautions were ordered by Mr. J.K.H. Cunningham, Assistant Chief Officer of the London Fire Brigade[34]. I summoned help from Professor Rotblat at his Highgate home. He brought Geiger counters and radiosensitive emulsions[24]. Meanwhile, Bart's nurses and orderlies tagged clothes bags with corresponding fire-fighters' numbers and surnames. Station Officer Philip O'Hare, told me that he thought two lead containers of thorium X[35,36] stored in the parcels office enroute to hospitals had burst and burned during the fire which was now contained. Rotblat surveyed the very low contamination of the firemen accompanying Station Officer O'Hare and ordered the Metropolitan Police to take them to their homes where they were to rest for at least twenty-four hours. O'Hare's hands and forearms were washed five times and the measured thorium X radioactivity declined with each washing. The subsequent health of O'Hare was monitored by Dr. Robert M. MacKenna, Head of Dermatology at Bart's.

On Washington's Birthday in February 1960, my wife and I went to the American Embassy in Grosvenor Square to obtain Immigration Papers to work at the Massachusetts General Hospital in my case and Boston Children's Hospital in hers[37]. The Embassy was closed so we returned later that same week. The U.S. State Department officer that interviewed us said "No visas". I told him to get his boss which he reluctantly did. The supervisor looked at our dossiers and said "Yes to both". When I returned to Bart's I was told the initial refusal was because Professor Rotblat had been, and was still banned from the U.S. on the directive of F.B.I. Director J. Edgar Hoover, in part because of his departure from Los Alamos in 1944. Later the Kennedy Administration overrode this ban.

BOSTON 1960

I arrived at the Massachusetts General Hospital at 7:30 a.m. on July 1st, to be told I was late and directed immediately to my first U.S. patient, a disordered teenager, who bit me. Nick Zervas, then a junior neurosurgeon, threatened the teen with a carotid needle and we proceeded successfully[38].

In 1961, at the age of 27, I was made Head of Neurosurgical Anaesthesia with Professor J.C. White continuing as Head of Neurosurgery. He was soon to be succeeded by William H. Sweet, former Rhodes Scholar, gifted pianist, and Senior Neurosurgeon at the University of Birmingham, UK[39].

My promotion was prompted by John E.A. O'Connell (1906-2001), Head of Neurosurgery at Bart's since 1946[40,41]. In 1935 O'Connell had won a Rockefeller Foundation Fellowship to Ann Arbor to work with Max Peet and thence to Chicago to train with Percival Bailey. During this Fellowship, John O'Connell was "proud to have met Harvey Cushing"[42]. O'Connell returned to Bart's in 1937 to become a Chief Assistant to Sir Geoffrey Keynes. During World War II, O'Connell worked on the Neurosurgical casualties of London's Bombing Blitz; in this he liaised with William Sweet at Birmingham.

John O'Connell, friend and supporter of Rotblat, was twice Hunterian Professor, also President of the Society of British Neurological Surgeons. In 1958, O'Connell operated on the first pair of his six craniophagus twins[41]. Always most courteous, John O'Connell was a devoted and skilled fly-fisherman[40].

BOSTON

From my point of view, the most taxing of cases were induction of general anaesthesia outside the M.I.T. nuclear reactor and maintenance during the boron-capture nuclear bombardment[43]. With the help of E.P. Richardson, Jr., Head of Neuropathology and Larry Martin, Massachusetts General's Deputy Director, we succeeded in getting the U.S. Federal Government to close the Harvard-M.I.T. boron capture programme.

ADVANCES WITH PROTON BEAMS

For May 25, 1961 Raymond Kjellberg, Assistant in Neurosurgery, Massachusetts General Hospital asked me to anaesthetize a two-and-a-half-year old girl with a malignant tumor of the central part of her brain in preparation for proton therapy[20,43,44]. This first anaesthetic was "a remarkable feat"[44,45]. Her airway was challenging and the Bragg Peak effect was said to be more effective if the arterial oxygen tension was low[45]. The protons were delivered in "three fractions over several weeks and the total dose was 8,000 rads"[44]. These Bragg effects shrank the tumor which had been resistant to chemotherapy and conventional deep X-ray therapy, by 80 percent. I found Dr. Kjellberg and the

physicists, Directors of the Third Harvard cyclotron, Richard Wilson and Norman Ramsay to be both fascinating and congenial (Table 1)(Table 2).

Norman Ramsay, like myself, a Clare Cambridge University graduate[46,47], later asked me about our Harvard colleague for twenty years Jim Watson and his sojourn in 1952-1953 almost next to my student accommodations in Clare Memorial Court, "M" for me and "R" for Jim Watson[48]. I said that I had there been introduced to Lawrence Bragg, successor to Lord Rutherford as Head of the Cavendish Laboratory[49]. Jim Watson referred to Sir Lawrence Bragg only as "My Boss"[48,49]. Max Perutz[50], who helped us with some hemoglobin work[51,52] has confirmed that it was in Jim Watson's suite of Clare rooms that "My Boss" wrote the Nobel Committee Recommendation for the Double Helix, DNA, for Watson's Nobel Prize[49]. A delayed Nobel Prize in Physics was awarded to Norman Ramsay in 1989 for Atomic Time Keeping[47]. The GPS system of widespread and essential deployment has ensued.

Norman Ramsay has written "our Post-doc Allan Cormack was paid from our funds, and we knew he was boondoggling some on the evenings." "Well, it turned out that Cormack was doing calculations on his own." What he was doing was developing the theory for CT-Scans[46,53]. Cormack's Nobel Prize was shared with Electrical Scientist Sir Godfrey Hounsfield of EMI[54] knighted in 1981 and memorialized by the quantitative description of radiodensity known as the Hounsfield Scale[55] (Table 2). Rarely if ever has this "Boondoggle" been surpassed in its benefits and dangers for humanity.

ACKNOWLEDGEMENTS

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Medical History

A SHORT HISTORY OF OCCUPATIONAL DISEASE: 1. LABORATORY-ACQUIRED INFECTIONS

Petts D, Wren MWD, Nation BR, Guthrie G, Kyle B, Peters L, Mortlock S, Clarke S, Burt C.

ABSTRACT

Laboratory-acquired infections are as old as laboratories themselves. As soon as the culture of microorganisms was introduced, so too was their transfer to laboratory workers. It is only in relatively recent history that such infections have been fully understood, and methods of spread and their prevention or avoidance developed. This paper endeavours to provide an overview of the history of laboratory-acquired infection and the steps taken, particularly in the UK, for its prevention.

INTRODUCTION

Infections acquired in the laboratory are as old as microbiology laboratories themselves. As soon as the culture of microorganisms was established, so too was their transfer to laboratory workers. The manipulation of samples and cultures has always posed a risk to the health of workers. The first recorded laboratory-acquired infection (LAI) was a case of typhoid fever in 1885 (reported in Kisskalt[1]) and was soon followed by cases of brucellosis, tetanus, cholera, diphtheria and sporotrichosis, all recorded in the years from 1887 to 1904.

Kisskalt in 1915[1] published the first survey of LAIs. Between 1885 and 1915, he found 50 cases of typhoid fever, six of which were fatal. The routes of transmission included aerosol generation, sharps injuries, ingestion, mouth pipetting and splashes onto mucous membranes.

American surveys in 1915, 1929 and 1939 recorded infections with psittacosis and Q fever (primarily in microbiologists) that followed the grinding and centrifugation of yolk sac cultures, thus indicating the importance of the aerosol route.

Widespread interest in LAIs began in the 1950s. Studies by Pike *et al*. (1965),[2] Sulkin (1961)[3] and Grist (in a series of studies from 1979 to 1989)[4-6] all revealed the most common infections to be tuberculosis (25.3%), shigellosis (27.4%), hepatitis (type unspecified, 20.0%), salmonellosis (11.6%), typhoid (3.2%) and brucellosis (2.1%). The numbers of infections and the associated deaths from these studies are listed in Table 1.

The relative risks of infection for laboratory workers and those in the general population (Table 2), as recorded by Baron and Miller,[7] shows the higher risks to laboratory staff of brucellosis, infection with *Escherichia coli* O157 and meningococcal sepsis and meningitis. Additionally, the studies by Grist in the UK showed the preponderance of tuberculosis, hepatitis, shigellosis and *Salmonella* infection in microbiologists.[4-6]

Table 1. Laboratory-acquired infection and associated death rate in the USA and Europe 1951-1978.

Study / report	Infections (*n*)	Associated deaths (*n*)
Sulkin and Pike, 1951 [8]	1275	39
Sulkin and Pike, 1961 [3]	1073	68
Pike, et al. 1965 [2]	641	13
Pike, 1976 [9]	3921	164
Pike, 1978 [10]	158	4

Table 2. Relative risk of infection between laboratory workers and the general population (after Baron and Miller [7]).

Organism / disease	Risk /100,000 microbiologists	Risk /100,000 general population
Brucellosis	64.1	0.08
E. coli O157	8.3	0.96
Meningococcal sepsis/meningitis	25.3	0.62
Salmonellosis	1.5	17.9
Shigellosis	6.6	6.6

In 1919 the first laboratory safety manual was published by Fricke[11] in Germany. It recommended the use of wraparound laboratory gowns with long sleeves, no eating in the laboratory, the avoidance of mouth pipetting and the decontamination of pipettes.

The published literature records five major routes for the acquisition of a laboratory-acquired infection. Generation of aerosols was the most common route described. Surveys show that they may have caused between 35% and 65% of cases. Reitman and Wendum (1956)[12] recovered 118 viable particles of *Serratia indica* per cubic foot of room air sampled over 10 minutes when a tube containing 50 mL of a broth

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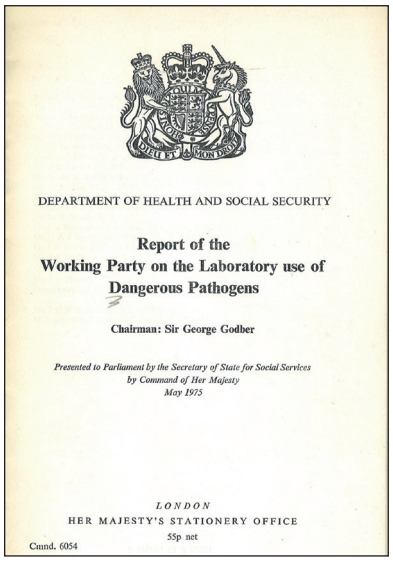
DEPARTMENT OF HEALTH AND SOCIAL SECURITY

Report of the Working Party on the Laboratory use of Dangerous Pathogens

Chairman: Sir George Godber

Presented to Parliament by the Secretary of State for Social Services by Command of Her Majesty May 1975

LONDON
HER MAJESTY'S STATIONERY OFFICE
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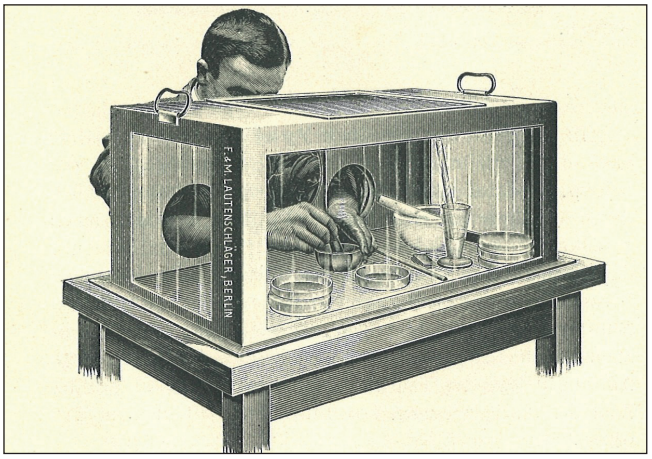
The 1975 Report of the Working Party on the Laboratory Use of Dangerous Pathogens (chaired by Sir George Godber) provided safety advice for handling Category A (now Category 4) pathogens and their classification.

culture was broken during the operation of a centrifuge, demonstrating that aerosol dispersion from a centrifuge was a major hazard.

The Biological Safety Cabinet (BSC) was developed to protect the worker from aerosols. The first cabinet was described by Robert Koch in 1905 followed by Fricke in 1915. They first became available commercially in Germany in 1919.



The first Biological Safety Cabinet was described by Robert Koch in 1905, followed by Fricke in 1915, becoming available commercially in Germany in 1919.

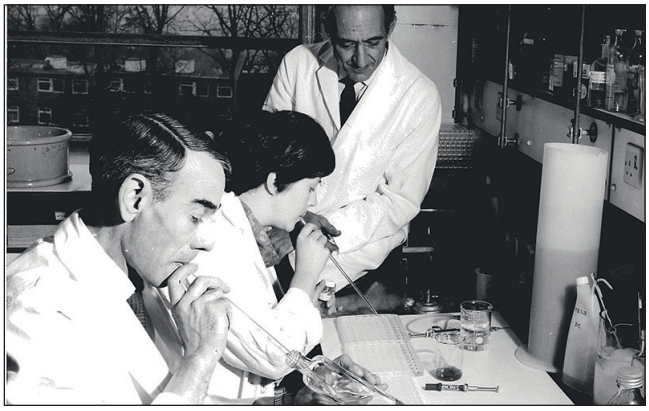
Van der Ende (1940)[13] published the first formal description of a BSC, but it was not until 1948 that stainless steel cabinets with a glass viewing front and an exhaust fan were introduced and not widely used until the late 1960s.

In 1957, Reid[14] reported the incidence of tuberculosis in laboratory workers, the lowest incidence occurring in chief technicians, the highest in junior and student technicians, but both of these were greatly exceeded by the incidence in mortuary workers.

Accidental inoculation caused by needlestick injuries were the most commonly described LAI in some surveys and accounted for up to 25% of infections.

Mouth pipetting, especially of liquid cultures, blood and serum was the cause of approximately 13% of all LAIs in the study by Pike.

Mouth pipetting was recognised by Paneth[15] as a serious hazard and recommended a rubber balloon (teat) to avoid mouth contact, but this was not universally accepted until the 1950s.



Mouth pipetting was recognised as a serious hazard as far back as 1915, but was still widely practised in the 1960s – some 62% of laboratories still mouth pipetted and this figure was not improved by 1977.

Studies by Phillips (1961)[16] and Harrington and Shannon (1978)[17] revealed that mouth pipetting was still widely practised in the 1960s, indeed 62% of laboratories still mouth pipetted and this figure was not improved by 1977.

Phillips and Bailey (1966)[18] demonstrated the considerable aerosol generation with the use of needles and syringes, especially from pressure in the syringe, and recommended the removal of the needle using forceps. Aerosols were also generated from pipettes (especially when the last few drops were expelled).

Splashes and spillages, particularly to the eyes and face, were particularly common when separating a needle from its syringe while still under pressure. Pike's study of 1976 included 177 cases (a quarter of the total cases) due to needle and syringe accidents. Spillages of cultures, noticed and unnoticed, onto bench surfaces and subsequently onto fingers and hands were reported. In the same study, hand to mouth and hand to eye transfer occurred in a further 25% of cases.

Eating, drinking and smoking, once accepted as normal practice in a laboratory but now forbidden, have been implicated in a number of acquired infections. Similar cases have occurred with milk samples. One case of laboratory-acquired anthrax occurred in a laboratory worker who smoked while working with cultures of the organism. Historical examples include cases where food submitted for laboratory testing was wrongly labelled as safe and subsequently eaten by staff members.

A number of high-profile incidents of laboratory-associated outbreaks of serious infections in the UK involving

Table 3. The path of legislation.

Report	Year	Content
Rosenheim Report	1972	Review of precautions to be taken in renal dialysis units. Review of precautions to be taken in laboratories.
Maycock Report	1973	Updated advice given in 1972. Further updated in 2002 to cover hepatitis C and HIV.
Safety in Pathology Laboratories	1972-1974	Booklet produced by a working party chaired by JF Heggie giving safety advice. Further developed by CH Collins into the PHLS Monograph No 6 entitled *The Prevention of Laboratory Acquired Infection* in 1974
Godber Report	1974	Safety advice for handling Category A (now category 4) pathogens and their classification. Reclassified other pathogens into B and C (now 1, 2, and 3). Prompted by outbreaks of Marburg disease and Lassa fever, it recommended the establishment of the Dangerous Pathogens Advisory Group (DPAG). DPAG publishes a Code of Practice for handling samples containing Category A pathogens.
Health and Safety at Work Act	1974	Forms the Health and Safety Executive (HSE). Protection under the Act is extended to laboratory workers in 1976. Introduction of safety representatives who had to be members of a trades union.
Howie Report and Code of Practice	1978	Categorises pathogens into categories 1, 2, 3 and 4. Deals with samples containing hepatitis B virus. Defines duties of the safety officer. Advice on laboratory design, microbiological hazards, notification of laboratory-acquired infections, safety committees and the planning, building and equipping of laboratories.
Shooter Report	1980	Followed the Birmingham smallpox incident in 1978. Recommended the formation of the Advisory Committee on Dangerous Pathogens (ACDP). ACDP has to issue regular updates and advice on newly discovered pathogens and new information on existing pathogens.

healthcare-associated workers and members of the public occurred in the 1960s and 1970s led to a heightened public and legislative interest in LAIs. The most widely known were outbreaks of smallpox and the large number of cases of hepatitis associated with renal dialysis units.

In 1973 a science technician working with equipment used for smallpox research became ill with symptoms that were subsequently diagnosed as this disease. Prior to the diagnosis, her mother and two visitors also contracted the disease. Unfortunately, the technician and her visitors died, but the mother survived. Five years later, in 1978, a medical photographer in Birmingham contracted smallpox. Research into the virus was being carried out nearby, but it was not possible to determine the route of transmission.

In Edinburgh, 40 cases of hepatitis occurred in a renal dialysis unit (26 patients, 12 staff and two home contacts). Eleven of these cases died. The index case was thought to be a patient incubating the infection while undergoing dialysis. Inadequate disinfection of the machine led to the spread of the virus to subsequent patients. The likely routes of transmission to the staff members include the handling of the contaminated machine itself, needlestick injuries and contamination of mucous membranes via aerosol generation.

These incidents highlighted the potential danger of laboratory work with microorganisms to the wider population, but also the risks to laboratory workers themselves. The Thomlinson Report of 1958 focused on the excessive incidence of tuberculosis in laboratory and post-mortem room staff, and listed precautions to be taken in laboratories, PM rooms and animal houses.

These incidents also gave rise to a series of inquiries and reports that led to the development of improved codes of practice and legislation in the UK. These are summarised in Table 3.

The laboratory coat had gone through many incarnations finally resulting in the coat now commonly used, described and published by Dowsett and Heggie[19] in 1972.

CONCLUSIONS

Laboratory-acquired infections have long been known to be a major hazard to those working in healthcare and similar laboratories. However, it has required outbreaks or an accumulation of many cases before the dangers were officially recognised, the routes of acquisition were identified and the necessary control measures put in place. Spread of infection into the wider population led to the development and introduction of legislation, both to protect laboratory workers and the public. Thankfully, we are now more aware of the dangers and how to regulate and minimise the risks.

This article is based on, and expands, the subject of the IBMS History Committee posters exhibited at the Biomedical Science Congress, held at the International Convention Centre, Birmingham, in September 2019. The five posters may be viewed and downloaded as PDF files from the IBMS website (www.ibms.org/historyposters/occupational_health/).

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Medical History

A SHORT HISTORY OF OCCUPATIONAL DISEASE: 2. ASBESTOS, CHEMICALS, RADIUM AND BEYOND

Petts D, Wren MWD, Nation BR, Guthrie G, Kyle B, Peters L, Mortlock S, Clarke S, Burt C.

ABSTRACT

Historically, the weighing out and manipulation of dangerous chemicals frequently occurred without adequate protection from inhalation or accidental ingestion. The use of gloves, eye protection using goggles, masks or visors was scant. From Canary Girls and chimney sweeps to miners, stone cutters and silo fillers, these are classic exemplars of the subtle (and in some cases not so subtle) effects that substances, environments and practices can have on individual health.

INTRODUCTION

It has been known for many centuries that certain diseases were associated with particular occupations (i.e. wool-sorters disease in the textile industry, cowpox in milk maids and respiratory problems in miners and stone workers). It is only in relatively recent history that the cause of many of these conditions was understood, as this paper illustrates.

DANGEROUS CHEMICALS

All chemicals used in work practices or elsewhere pose specific hazards, some of which may result, with sufficient exposure, in a range of occupational diseases. Most chemicals are irritant to the skin or mucous membranes, while others are toxic, allergenic, carcinogenic, mutagenic or teratogenic via skin contact and absorption, inhalation or accidental ingestion.[1]

In 1700 an Italian physician, Bernardino Ramazzini, published the results of his comprehensive studies in *De Morbus Artificum Diatriba* (Diseases of Workers) which described an association between irritating chemicals, dust, metals and other abrasive agents covering 54 different occupations.[2] Ramazzini also noted asthma-like symptoms and dust-like particles in the lungs of bakers and millers.[3] Legislation and compensation systems were slow to develop during the 19th century but were an attempt to respond to an increasing use of chemicals and their resultant hazards to health.

Historically, in the medical laboratory substances such as benzene, benzidine, formaldehyde, 2 naphthylamine, nitroso compounds, a wide range of metal salts and certain organic solvents were widely used, often without adequate protection, and the use of gloves, eye protection, masks and visors was scant. These substances are now classified as Group 1 human carcinogens.[4] Occupational dermatitis and occupational asthma by chemical contact and inhalation, respectively, have become more recent significant health problems.[5]

OCCUPATIONAL CANCER

Towards the end of the 18th century, a possible causal link between chemicals and cancer was reported by two London surgeons. In 1761, John Hill reported an association between snuff, a tobacco product, and nasopharyngeal cancer, and, in 1775, Percival Pott described a high incidence of scrotal cancer in chimney sweeps. Pott, a surgeon at St Bartholomew's Hospital in London, published his findings,[6] which he attributed to contamination with soot. This excellent epidemiological study is considered to be the first report of a potential carcinogen. Pott's work led to the foundation of occupational medicine and to the Chimney Sweep Act of 1788. In 1895, Ludwig Reyn reported that aromatic amines used in certain dye industries in Germany were linked to bladder cancer. In 1907, compensation was awarded to workers with skin cancer as a result of handling tar or pitch, and occupational cancer became a notifiable disease in 1920.

In 1902 the somatic mutation theory was published by Theodor Boveri[7] as an attempt to explain cancer development. It is now known that carcinogens include chemicals, ionising radiation and certain viruses that have the potential to cause cancer by inducing genetic mutations that may promote conditions for the development of tumours. This effect depends on the carcinogen, mode and period of exposure, a person's lifestyle and their genetic susceptibility. It is estimated that there are around 120 Group 1 human carcinogens identified and that historically it has been estimated that around 5% of cancer-related deaths are attributable to occupational exposure to carcinogens.[8,9] Between 1922 and 1995, luminous paint containing radium, the chemicals dibenzene, anthracene, dibenzo(a)pyrene, asbestos and hepatitis B virus, hepatitis C virus and smoking were all identified as causes of cancer

Bruce Ames, an American biochemist, developed a bacterial culture procedure using cultures of *Salmonella typhimurium* in the early 1970s.[10] The organisms he used had a mutation so that cultures required histidine to grow. The addition of a rat liver homogenate and a possible carcinogen could induce a mutation, thus increasing the number of colonies on the culture. Ames' early studies of almost 200 suspect chemicals gave a 90% positive result rate. Animal studies and, more

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recently, cell culture has revealed that chemicals giving rise to cancer in animals also give rise to cancer in humans, although differences in dosages were often apparent.

Controlled studies of comparative frequency of cancer in the workplace using a candidate carcinogen was compared to the frequency in the general population but was limited by non-workplace exposures and the need for long-term studies as long periods of time may occur between exposure and the development of cancer (eg bladder cancer).

WAS LEWIS CARROLL'S 'HATTER' MAD OR POISONED?

In the 19th century mercuric nitrate was used to remove hair from the skin of animals such as rabbits. The hair was shaped into felt cones, then shrunk in boiling water. Treated felts thus released volatile mercury, which had a toxic effect on hatters and milliners, resulting in erethism. Symptoms of erethism include delirium, hallucinations, irritability and excitability.

OTHER OCCUPATIONAL DISEASES

From 'Canary Girls' and chimney sweeps to miners, stone cutters and silo workers, these are classic exemplars of the subtle, and not so subtle, effects that substances, environments and practices had on individual health. Reid (1957)[11] also researched the incidence of tuberculosis in non-laboratory health workers and reported high levels among chest physicians and surgeons (4.0/1000), and Gehanno (2016),[12] working in France, reported an incidence of 0.075/1000 in nursing staff.

Many podiatrists have been found to be hypersensitive to dust from nails, resulting from the use of grinding burrs, and have suffered from asthma, allergic rhinitis and conjunctivitis. High levels of serum precipitating antibodies to *Trichophyton rubrum*, the common cause of nail dystrophy, have been recorded in this group of workers.

Radium was discovered by Marie and Pierre Curie in 1898 and was purified as a metal in 1911. In 1917, the US Radium Company produced a radium-infused paint which was used to paint numbers on clock and watch dials that glowed in the dark. Women undertaking this work would lick their brushes to produce a fine point and some developed jaw abnormalities, severe anaemia, leukaemia and sarcomas. Seriously affected women (called 'Radium Girls') were awarded $10,000 compensation together with $600 a year for ongoing medical and living expenses.

During the First World War a shortage of munitions led to the so-called 'shell crisis', and so the Munitions of War Act, passed in 1915, brought all private armament companies under Government control. Over one million women were employed in the munitions industry and their conditions of work, wages and hours were brought under strict control. Three hundred deaths occurred due to explosions (silk clothing being banned to prevent the occurrence of static electricity). The manufacture of tri-nitro toluene (TNT) involved the use of nitric and sulphuric acids, the fumes from which turned both skin and hair yellow (hence 'Canary Girls'). Toxic jaundice was reported in 400 women with 100 deaths occurring. Pregnancy in these women gave rise to yellow 'Canary Babies'.

The nature of the environment in which sewer workers are occupied presents particular risks. Although gastroenteritis is likely to be a common risk, the most serious problem is Weil's disease (the most serious form of leptospirosis). Hepatitis A and allergic alveolitis may also occur.

Asbestos exposure in electricians and in the construction industry was very common in the past. Mereweather and Price[13] found that the greater the exposure to asbestos fibres the greater the risk of developing mesothelioma. By 2015 a total of 157,000 persons were recorded as having asbestosis, with 3600 deaths.

Miners and stonecutters have suffered from pneumoconiosis and silicosis throughout history. Respiratory disease from breathing dust dates back to ancient Greece. Agricola in 1556 CE[14] reported lung problems from dust inhalation in miners, and have been known in history as miner's phthisis, grinders asthma and potter's rot. The pneumatic hammer drill (1897) and sandblasting (1904) led to an increase in silicosis, and by 1990 the number deaths in miners due to pneumoconiosis in the UK reached 29,000. Moreover, pneumoconiosis and silicosis have been associated with an increased risk of tuberculosis, lung cancer, scleroderma, systemic lupus erythematosus and rheumatoid arthritis in these occupations.

Hypersensitivity pneumonias are occupational diseases of farmers (farmer's lung), compost workers and bird fanciers (pigeon fancier's lung) the inhalation of spores or foreign protein leads to typical symptoms. Farmer's lung was first reported in 1713 and in 1932 Campbell[15] described the condition in dairy farm workers handling mouldy hay. Between 0.4% to 0.7% of the farming community in the United States has been found to be affected by this condition.

In the UK the incidence is reported to be 420-3000 cases per 100,000 workers, with a fatality rate of up to 20%. Improvements in farming techniques have reduced the incidence of disease over the years. The causative organisms are listed in Table 1.

Musicians are also at risk of contracting infections from their instruments. Hypersensitivity pneumonitis and death from a condition known as 'Bagpiper's Lung' has been recorded in players of this instrument. It is caused by the inhalation of fungal spores colonising the bag of the instrument. Similar conditions have been reported involving saxophone and trombone players. Such occurrences highlight the need for regular cleaning of musical instruments.

A case of anthrax due to the release of spores from the skin (hide) of an African drum occurred in Florida, USA in 1974. Subsequent cases have been recorded in Scotland (2006), New York (2006), Connecticut, USA (2007) and London in 2008.[16,17] The cases in Scotland and London subsequently proved fatal.

Farmer's lung	Exposure to spores of *Trichosporon asahii* and *Trichosporon mucoides*
Compost workers	Exposure to spores of *Saccharopolyspora rectinurgula* and *Eumotium amstelodarii*
Pigeon and bird fancier's lung	Inhalation of bird proteins (droppings, feathers)

Table 1. Hypersensitivity pneumonias.

CONCLUSIONS

Many occupations and pastimes are now recognised as being hazardous, but not all of the hazards were immediately obvious. It has often required an accumulation of many cases before the dangers are identified, and the necessary control measures put in place. Laboratories use many dangerous chemicals but are not unique in being a hazardous working environment, as specific occupations have been shown to have specific risks or illnesses. We are, however, now more aware of the dangers and how to regulate and minimise the risks.

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Medical History

A SHORT HISTORY OF OCCUPATIONAL DISEASE: 3. LEISURE CAN MAKE YOU SICK

Petts D, Wren MWD, Nation BR, Guthrie G, Kyle B, Peters L, Mortlock S, Clarke S, Burt C.

ABSTRACT

The risk of infection associated with occupations can, and does, extend to certain leisure and sports activities. Generally, such pastimes are regarded as important for human health and mental wellbeing. However, infections may, rarely, be acquired during leisure activities that include water sports and water-related relaxation, and certain sports.

INTRODUCTION

It is well known that certain diseases are associated with particular occupations or activities. It is only in relatively recent history that the cause of many of these conditions was understood, and methods of spread and their prevention or avoidance were developed. This paper endeavours to provide an overview of occupational infectious diseases that are particularly associated with certain leisure and sports activities.

DISEASES ACQUIRED DURING LEISURE ACTIVITIES

Generally regarded as important for human health and mental wellbeing, leisure and sports activities are an increasingly important aspect of life. However, infections may, rarely, be acquired during such activities.

WATER-RELATED INFECTIONS

Water has long been recognised as an important vehicle for the spread of infection and contact with it may present high risk. Ancient Egyptians used copper vessels to store water to keep it fresh and free from contamination. Infections associated with swimming pools, water parks, water play areas, spas and aquaria, as well as lakes, rivers and the sea have all been described.

Inadequate chlorination of the water in swimming pools coupled with poor hygiene on the part of some users have resulted in infection with *Cryptosporidium*, *Giardia*, *Shigella* spp., *E. coli*, norovirus, polio virus, ringworm and verrucas. *Pseudomonas aeruginosa* contracted in the pool has given rise to 'swimmer's ear' and the use of inflatables and water slides have given rise to *Pseudomonas* folliculitis as a result of inadequate cleaning.

Sea water bathing can also lead to infections with halophilic *Vibrio* species. *V. alginolyticus* has caused severe swimmer's ear', and wounds contracted on beaches have become infected with *V. alginolyticus* and *V. vulnificus,* the latter causing severe infection.

With jacuzzis, footbaths and spas, poor hygiene (particularly inadequate cleaning of their drains leaving as it does a reservoir of organisms) is the major factor associated with infections resulting from the use of these devices. *Pseudomonas* folliculitis, skin infections, infection with *Staphylococcus aureus* and other organisms have occurred. Although rare, cases of Legionnaire's disease have been associated with jacuzzis. Outbreaks of Legionnaires' disease and Pontiac fever have also been associated with spas.

Infections resulting from the use of Garra Rufa fish to give so-called 'fish pedicures' (Figure 1) include *Mycobacterium marinum, M. fortuitum* and *M. intermedium*. Cellulitis, loss of nails and toes have been reported.

Credit commons.wikimedia.org CC BY-SA 4.0

Figure 1 So-called fish pedicures using Garra Rufa fish have resulted in *Mycobacterium marinum, M. fortuitum* and *M. intermedium* infections.

Mycobacterium marinum (previously known as *M. balnei*) was first isolated from a fish tank in 1926 and is now recognised as an occupational hazard for pet shop workers and keepers of aquaria. It was first described as causing infection in humans in 1951 when large outbreaks occurred in badly maintained swimming pools. In 1962, infection with this organism was recognised as being associated with fish tanks, and the condition was called fish tank granuloma.[1] Lesions appear on the hands and cooler parts the body. Marine

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biologists and professional fisherman are also at risk.

Recreation waters present risks to canoeists and rowers. Leptospirosis (pretibial fever and especially the severe form, Weil's disease) is an ever-present risk especially where the environment is contaminated with urine from rodents. Hepatitis A and enteroviruses including polio as well as norovirus have all been reported. Bacterial gastrointestinal infections have been reported following contamination with raw sewage and in tropical waters schistosomiasis should be considered.

The toxins from blooms of cyanobacteria (Figure 2), produced in warm weather, can cause eye irritation, dermatitis, joint and muscle pain, and, more seriously, gastroenteritis, pneumonia, liver damage and certain neurological conditions. Amoebic dysentery and amoebic meningitis have also been associated with warm waters.[2]

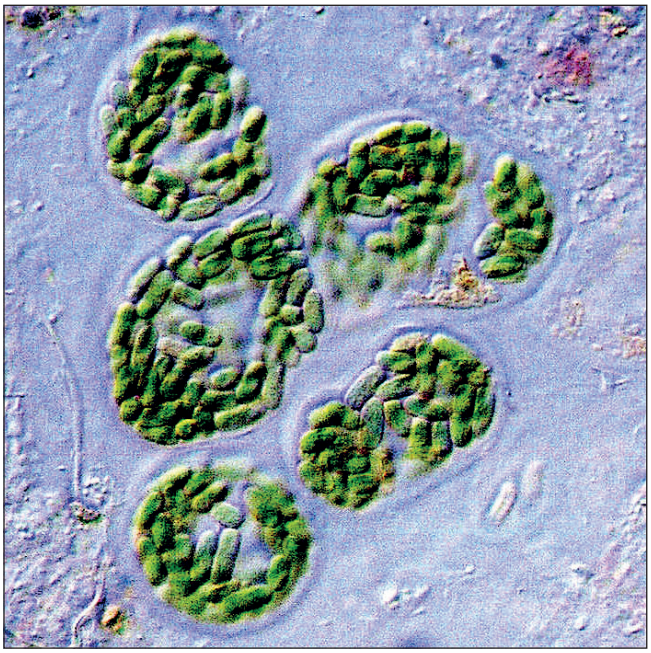

Figure 2 The toxins from blooms of cyanobacteria, produced in warm weather, can cause a range of problems, from eye irritation to liver damage and certain neurological conditions.

INFECTIONS RELATED TO SOME OTHER SPORTS AND PASTIMES

Herpes gladiatorum (scrum pox) was first described in the 1960s. It is caused by herpes simplex type 1 virus although infections with type 2 may also occur. It is mostly associated with contact sports such as rugby (scrum pox) (Figure 3) and wrestling (wrestler's herpes or mat pox). In 1991 a large outbreak of wrestler's herpes occurred among high school wrestlers, with 60 out of 175 affected developing lesions on the head (73%), extremities (42%) and trunk (28%).[3]

Other infections recorded include impetigo (*Staphylococcus aureus*, *Streptococcus pyogenes*), ringworm due to *Trichophyton tonsurans*, and viral infections such as chickenpox from cases of shingles.

Figure 3 Herpes gladiatorum was first described in the 1960s,and is mostly associated with contact sports such as rugby and wrestling.

Athletes are at particular risk of pitted keratolysis, a skin infection associated with pit formations on the soles of the feet. The causative organisms have been identified as various corynebacteria, *Dermatophilus* spp., *Kytococcus* spp., *Actinomyces* spp. and *Streptomyces* spp.

Hill walkers and climbers are prone to infections of the feet following long periods in the wet, or damage caused by blisters and wounds.

Dermatophyte infections (athlete's foot) are common, but bacterial infections less so. Lyme disease may be a risk in areas where deer are present, and camping in areas where cattle faeces poses the small risk of infection with *Escherichia coli* O157.

CONCLUSIONS

Many occupations and pastimes are now recognised as being hazardous, but not all of the hazards were immediately obvious. It has often required outbreaks or an accumulation of many cases before the dangers are identified, and the necessary control measures put in place. Recreational activities have been shown to have specific risks or be associated with certain illnesses. From the use of jacuzzis, footbaths and spas to the appearance of herpetic rashes in wrestlers, we are now more aware of the dangers inherent in certain leisure and sporting pastimes, and how to regulate and minimise the risks.

This article is based on, and expands, the subject of the IBMS History Committee posters exhibited at the Biomedical Science Congress, held at the International Convention Centre, Birmingham, in September 2019. The five posters may be viewed and downloaded as PDF files from the IBMS website (www.ibms.org/historyposters/occupational_health/).

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James Logan Prize Essay

The Challenge of Cancer Pain Assessment

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Key words: Cancer pain, pain assessment, pain management, palliative care, symptom control, oncology

INTRODUCTION:

Pain is a debilitating consequence of a cancer diagnosis, affecting approximately 50.7% of patients[1]. Often going beyond the physical threshold, cancer pain is a multidimensional experience affecting the psychological, social and spiritual domains of patients' lives. Nonetheless cancer pain is not inevitable; it is estimated that pain can be controlled in up to 90% of cases[2]. In the United Kingdom (UK), this under-treatment of cancer pain is widely recognised to be due to human factors, rather than a lack of available treatment options. Inadequate assessment is a major barrier to pain control, and this evaluation can be limited by patient, provider and system challenges; optimising these factors is likely to bring the greatest improvements to pain management.

CANCER PAIN ASSESSMENT: CURRENT GUIDANCE

Pain is a complex phenomenon and varies widely both across the cancer continuum and the patient population. During cancer treatment 55% of patients experience pain[3]. The aetiology of this is multifaceted, involving interactions between tumour, treatment and psychological factors, as well as pre-existing comorbidities patients may have. After remission, 40% of cancer survivors continue to have pain and treatment-related factors (e.g. post-radiotherapy fibrosis) play an important role[4]. The experience of pain also differs between cancer patients: pain may be acute, chronic or intermittent; neuropathic or nociceptive, and can affect patients' sleep, mood and even cancer prognosis to varying degrees[5,6].

The assessment provides a basis for inferring the individual pathophysiology and consequences of pain, helping to guide diagnostic and treatment decisions. Current guidance recommends that cancer pain should be evaluated at every clinical visit, incorporating a pain history, physical examination, psychosocial assessment and appropriate diagnostic investigations[7-9]. Throughout assessment, 'total pain' should be assessed, looking beyond the tumour to address the psychological, cultural, spiritual and social influences of pain[10]. As pain is inherently subjective, self-report is the gold standard of assessment, however validated assessment tools can be used to aid systematic evaluation and communication. While the National Institute of Health and Care Excellence (NICE) recommends unidimensional tools (e.g. visual analogue score), The British Pain Society (BPS) advocates for the use of multidimensional tools (e.g. McGill Pain Questionnaire)[8,9].

PATIENT CHALLENGES: Misconceptions and misinformation:

The assessment of pain relies on patients' self-reports, however in practice patients may be reluctant to accurately report their pain. This may be due to concerns about side effects or addiction to pain medications; not wanting to 'complain' about pain; trying to ensure that doctors prioritise cancer treatment over symptom control; or misconceptions about the inevitability of pain[7,11]. Older patients, those with a lower education level, and Asian patients have been reported to have higher prevalence of common cancer misbeliefs. Chen et al. found that Asian patients were particularly worried about opioid tolerance and had fatalistic views about cancer pain[12,13]. Lee et al. found in systematic review that patient education programmes can help to correct misconceptions and in turn reduce cancer pain, albeit slightly. In one study, Koh et al. found that the use of an educational booklet had the greatest effect on changing misconceptions around opioids, whereas views on pain 'distracting doctors from cancer treatment' changed the least. This reduced pain however did not improve satisfaction with pain management, suggesting changes in pain are not substantial and resonating that 'total pain' is multidimensional[14,15].

RECALL BIAS:

The retrospective nature of pain histories may also lead to inaccurate reporting, with retrospective recall generally overestimating pain[16,17]. Lindberg et al. found that negative emotion at the time of recall also lead to an overestimation of pain in a group of breast cancer survivors[18]. Electronic diaries collecting real-time, patient-reported pain measures (PROMs) can help to minimise recall bias. Electronic diaries are easy to use and improve symptom recording, including the level of detail of pain reports and analgesia use[19-21]. PROMs have shown to increase the frequency of pain discussions, improve patient satisfaction and reduce pain intensity[22].

CANCER SURVIVORSHIP:

Advancements in cancer screening and treatment have improved cancer survival. In the UK there are currently over two million people living with or beyond cancer, with 62%

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living beyond five years after diagnosis[23]. There is a lack of guidance and research however into pain assessment in this population. Nijs et al. suggests that pain in cancer survivors should first be assessed for a neuropathic component, followed by classification as either nociceptive or central sensitisation pain[24]. However, this model fails to acknowledge the holistic nature of pain (e.g. spiritual and psychological distress) and is based on non-systematic evidence (i.e. expert opinion).

Moreover, with the chronic nature of pain in survivors, concerns around opioid tolerance and addiction need to be addressed. Vizthum et al. found that 8.3% of veteran cancer survivors in the United States had persistent opioid use, with 2.9% being classified as being opioid-dependent[25]. The 'pain medication questionnaire' (PMQ) and 'screener and opioid assessment for patients with pain' (SOAPP) tools can be used to predict opioid misuse in those with chronic pain, however further research needs to assess the validity of these tools in those with cancer pain. Pain management needs to balance optimising pain control with harm reduction principles, and should consider how changes in the processing of pain stimuli and the stigma of addiction can affect assessment[7,25].

HEALTHCARE PROVIDER CHALLENGES:

Improving undergraduate education:

Several studies have outlined that the frequency and quality of cancer pain assessment by healthcare professionals (HCPs) is inadequate: the 'EPIC' report showed that 22% of patients were not asked about pain; Berry et al. found that doctors omitted addressing emotional issues; and El Rahi et al. demonstrated that nurses failed to examine pain intensity and characteristics in cancer patients[26,27]. Poor knowledge, insufficient experience and common misbeliefs around cancer pain, particularly opioid addiction, are the most pervasive challenges to assessment for both nurses and doctors[7,11,13,28].

In the UK, the topic of pain, including cancer pain, is underrepresented in both medical and nursing school, with students only receiving 13 and 10.2 hours of teaching respectively; only 4.8% of time was devoted to pain assessment for medical students[29]. The International Association for the Study of Pain recommends that pain education should be integrated across different modules and use a diverse range of teaching methods, including online-learning, interprofessional learning and patient stories. This has shown to improve student knowledge and beliefs around pain, setting the foundation for effective pain management[30,31].

PAIN ASSESSMENT TOOLS:

However, education alone is unlikely to lead to substantial improvements and should be combined with changes to working practice. The use of pain assessment tools, particularly multidimensional tools, are limited. In one nationwide Swedish study, 97% of cancer departments reported using history alone to assess pain[32]. Reported barriers to use of assessment tools include time constraints, lack of policies and guidelines and insufficient training in using pain assessment scales[33]. It has been proposed that pain assessment should be incorporated as the 'fifth vital sign' in patient records as a means to promote HCPs in assessing pain regularly and systematically[10,34]. However, unlike heart rate or temperature, pain is not an objective measure and over-relying on these tools takes away the individual voices from patients expressing their pain.

INFORMAL CAREGIVERS:

Family members, and other informal caregivers, play a key and often overlooked role in cancer pain management. This responsibility is only expected to increase with an ageing population, increasing prevalence of chronic illness and care being moved towards the community. However caregiver reports of pain are not always congruent with those of the patient; over-reporting being associated with patient concealment of pain and poor patient-caregiver communication, whilst under-reporting can result from caregiver fears about opioid addiction and 'distracting' doctors from curative treatment[35-38]. Caregiver misconceptions have also shown to influence patient beliefs around cancer pain[35]. Moreover, caregivers may not have the knowledge or skills to assess pain and educational programmes should address this[39]. Mehta et al. found that caregivers particularly struggled with identifying pain that they did not have direct experience of and distinguishing between pain types[38,40]. Furthermore communication may be poor between caregivers and HCPs, with one study finding that only 24.3% of hospice interdisciplinary meetings about pain included caregivers[41]. Shared-decision making can be facilitated by actively involving caregivers in care plans and team meetings[42,43]. Nonetheless, greater involvement in decision-making should not add undue stress to caregivers. Watching their loved ones experiencing pain is deeply distressing, and holistic support needs to be offered to all those involved in patient care.

SYSTEMIC CHALLENGES:

Inter-disciplinary collaboration:

In the UK, cancer services are divided across community and hospital-based care, involving multidisciplinary input from primary care, oncology, surgical, palliative care and allied health services. The role of pain medicine specialists however is surprisingly limited[6]. For example, despite 92% of palliative care units in England having access to specialist pain services, only 16% regularly use them[9]. While specialist-input is not efficient in every case, partnership between cancer and pain services may help in the assessment of more complex cases (e.g. chronic pain and substance use disorders). Partnership between oncology and pain specialists can be facilitated through greater crossover in training and funding for joint-services, including research projects and out-of-hours pain services.

In contrast, general practitioners (GPs) are already known to be heavily involved in cancer care. More recently, their role in survivorship care, particularly pain management, is being increasingly recognised[23,44]. However, a key area of

concern for GPs is providing surveillance testing for cancer survivors, where new-onset and increasing pain may indicate recurrence[10,44]. Likewise, improving partnership between oncologists and primary care can help improve this aspect of pain assessment for cancer survivors. This can be facilitated through shared data management systems, treatment summaries and survivorship care plans[44-46]. However, cancer survivors are a heterogenous group and collaboration is unlikely to suit all patients. For example, Hudson et al. found that while prostate cancer survivors preferred primary care follow-up, breast cancer survivors preferred care from oncologists[47]. Moreover, Cheung et al. found that the majority of oncologists were resistant to a shared-care model[48].

RESEARCH CHALLENGES:

Cancer services are underpinned by the values of evidence-based medicine. However the quality of research on cancer pain assessment is often poor, particularly in the development of pain assessment tools where few are validated and tested[49]. Multiple studies do not adequately describe their methodologies, with the risk of bias often being unclear. Furthermore, recruitment into research studies is as low as 5.5%, limiting the generalisability of results[14,50]. Ransom et al. found that barriers to participation included patients having non-cancer related pain syndromes and participant perception of study burden[50]. It is imperative that researchers improve the transparency of their work, recruit from a broader patient base and collaborate with each other to improve the quality of their research.

There are also key research gaps that need to addressed, including the assessment of cancer survivors and culturally diverse groups, as well as developing a unanimous classification system for cancer pain[51]. In more recent times, the COVID-19 pandemic has undoubtedly disrupted services and increasing time constraints, staff burnout and psychological stress among patients may contribute to inadequate pain assessment in the future. Further research needs to assess the impact of COVID-19 on cancer services and the effectiveness of pain assessment with changes to working practice (e.g. telemedicine).

CONCLUSION:

Pain is a distressing and often feared consequence of a cancer diagnosis, disrupting all aspects of patients' and their families' lives. The assessment of pain forms the foundation of successful management, however the multidimensional nature of cancer pain makes this a complex task. Effective pain assessment needs to address common misconceptions and knowledge deficits; improve clinical recording; and facilitate HCP, caregiver and researcher collaboration around cancer pain. As HCPs, we all have an ethical duty to strive towards an improved standard of care and only by working together, can we provide hope to numerous patients suffering with cancer pain.

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Book Case

BOOK REVIEW:

Baskett T. *The Dog Comes with the Practice: Tales of a Junior Doctor in Ireland and Canada*. Clinical Press Ltd. Bristol, U.K., 2020.

Having been associated with the medical school of Queen's University Belfast for over 55 years, I read the little book by Professor Tom Baskett with great interest. Drawing on his extensive diaries and records, it is an account of some of his noteworthy reminiscences gathered during his medical education as a student of medicine in Belfast over 60 years ago, his time as a residential junior house doctor in the Royal Victoria Hospital Belfast in the early 1960's and then his post-graduate experiences as a trainee in obstetrics in Belfast and Canada. Shortly after his year as a house doctor Tom married a nursing sister, and consequently she was required to resign from her post and take a substantial cut in her salary. In order to supplement their income Tom took on various locum posts in general medical practice. The title of the book "The Dog comes with the Practice", is derived from his first locum GP position in a country town to enable the incumbent doctor to take his family on their summer holiday. The proceeds of that locum paid for Tom's honeymoon.

After gaining fellowships in surgery and obstetrics during training in the Royal Maternity Hospital Belfast Tom and his young family emigrated to Canada. In the NHS, promotion to the rank of consultant was slow in the 1960's and 70's, since there was little expansion in the number of senior posts. Excellent trainees were obliged to wait for senior consultants to retire or die in post - or to emigrate.

Having arrived in Canada, Tom describes some of the situations that he encountered in Winnipeg, Manitoba and an outreach service in Churchill on the edge of Hudson Bay, largely populated by members of Inuit tribes. Tom went on to have a successful career in academic obstetrics and medical education in Canada finishing as a professor in Halifax, Nova Scotia. The current narrative does not cover his later career.

In the early 1960's the NHS was less than twenty years old. The education of medical students had scarcely evolved from the systems and practices that were prevalent in the early part of the twentieth century. In the second half of their course, students lived and worked in the wards of the teaching hospitals as unpaid apprentice doctors. On the basis of "see one, do one, teach one" they learned their skills largely from more senior trainees who were progressing slowly towards consultant posts. Surgical skills were gained from assisting in operations, performed by registrars and consultants.

While attached to the cardiology unit run by the influential innovator Frank Pantridge, Tom learned the novel techniques of CPR (cardiopulmonary resuscitation) and external cardiac defibrillation to revive patients who otherwise would surely have died. Later he worked with the Professor of Medicine. Having witnessed Tom and nurse successfully resuscitate a patient who had been admitted to his ward with a myocardial infarct, the Professor stated he would rather be allowed to die in peace.

Medical students and house doctors, while living and working closely together for long hours formed bonds of friendship that have sustained them and endured over the decades. Of the 59 graduates in the year of 1964, nearly 40 met up in Belfast in June 2014 to celebrate 50 years since graduation. I had the honour of meeting up with the group during that event.

Tom's description of life as a medical student and young doctor is authentic, told with humour and laced with direct quotes from colleagues and patients, often in the colourful Belfast vernacular, though I suspect some of the expletives have been toned down. The book is a valuable account of a system of training that is now part of history. That system produced competent, resilient Belfast graduates who practiced successfully throughout the world.

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BOOK REVIEW:

The Cognitive Autopsy: A root cause analysis of medical decision making.

Pat Croskerry. Oxford University Press 2020, ISBN 9780190088743 (paperback), 9780190088767 (epub), 9780190088774 (hardback). RRP £38.99

Please do not be put off by the title. The cognitive autopsy sounds daunting, but, in this excellent book Professor Croskerry had me gripped. A cognitive autopsy is a dissection of the processes behind the medical decision-making in a case. This involves an examination of how the clinician thought and of the external factors or biases that impinged on that process. In this book, Professor Croskerry uses real-life cases where there had been an error in the diagnostic or the management process, examines the cases and describes concisely the thought processes and the biases which contributed to the error. I found this book illuminating and I could relate to the errors described in the real-life cases.

The author, Professor Pat Croskerry, is an Emergency physician who also lectures at the Medical School in Dalhousie University in Nova Scotia, Canada. He has authored many articles and book chapters about patient safety and clinical decision making. This book is a collection of 41 real-life cases collected over years of clinical practice by Professor Croskerry and his colleagues. Previous collations of these cases formed the Applied Cognitive Training in Acute-Care Medicine manual, used by Professor Croskerry and colleagues in Dalhousie University. He has a particular interest in the thought processes that lead to a diagnosis and how biases may lead clinicians astray. He has an interest in patient safety and he quotes that medical error is now listed as one of the leading causes of

death. He has an interest in the cognitive errors that may contribute to medical error in the diagnosis and management of patients. In this book, he introduces and explains the topic in a very easy-to-follow manner.

The book is laid out with a short introduction, which in 17 pages explains a lot of theory behind how we think and process information. Type 1 (heuristic or intuitive) and type 2 (systematic and analytical) thinking is explained in detail. Cognitive bias and the cognitive theory behind how we acquire expertise are expounded. This introduction provides the reader with the basics to allow them to perform their own "cognitive autopsy" in the following clinical cases.

Each case follows a similar pattern of a clinical synopsis followed by a dissection of the thought processes and cognitive biases that led to the error in that case. After the first few, I found it stimulating to read the case and then try to identify the cognitive biases in the case myself. I would then read the analysis and explanation by Professor Croskerry.

Multiple biases were demonstrated in each case and were explained in detail. I could relate to all of these from my own clinical experience and I have no doubt any other clinician reading this book will feel the same.

At the end of the cases there is a conclusion chapter, 5 appendices and a glossary which is an excellent reference tool when working through the book. The glossary lists in alphabetical order the biases referred to through the clinical cases with a succinct explanation of the bias. I used the glossary frequently. A few biases had very catchy titles and I shall explain a few now for your enjoyment. "Psych-out error," is where clinicians may attribute symptoms in patients with a psychiatric diagnosis to the underlying psychiatric diagnosis. "Deformation professionelle" refers to the specialty clinician ruling out diagnoses they commonly encounter in their specialty and the danger of not recognising diagnostic clues to alternative diagnoses. "Zebra retreat" refers to the situation where a rare diagnosis (zebra) is suggested by certain factors, but, the clinician retreats from it thinking as it is rare it is unlikely. This leads to a delay in the diagnosis. "Yin-yang out" is the situation where a patient has had multiple previous investigations (which the author refers to, as having been worked up the yin-yang) and the clinician discounts the possibility of a new pathology or evolution of symptoms on this presentation, hence, delaying appropriate investigations and treatment.

This book is potentially of interest to us all, but, in particular those of use with an interest in the diagnostic process, human factors and in medical error. It is a very light read and can be enjoyed one case at a time. It lends itself well to a teaching text, which was what Professor Croskerry had used previous versions for. This book may be an excellent introduction to the field for those of us who have little previous knowledge of cognitive thought processes or diagnostic error, however, it is also detailed enough to serve as a comprehensive text for those with more knowledge.

I feel this is a worthwhile read and heartily recommend this.

Dr Ian Wallace,
Consultant Physician &
Endocrinologist.

Game Changers

SURGICAL AMBULATORY SERVICE (SAmS) – ONE STEP BEYOND EmSU!

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We previously reported how the Emergency Surgical Unit (EmSU) revolutionised the management of unscheduled general surgery in the Belfast Trust.[1] Having just celebrated its 7th birthday it has established itself as a pioneer of 'good surgical practice', delivering high quality emergency surgical care all day, every day. Regardless, Emergency Departments continue to be overwhelmed and new initiatives have spawned to address the ever-increasing demand.

Ambulatory care is the latest initiative to emerge with the principal aim of avoiding hospital admissions whilst affording more ergonomic, efficient care at source. NHS England have established a template for 'Same Day Emergency Care'[2] and this blueprint has been successfully piloted and developed. Twelve established principals underpin successful Surgical Ambulatory Emergency Care.[3]

Recognising a list of 'Ambulatory sensitive conditions', pathways and protocols can be designed to facilitate enhanced patient flow and high-quality care. SAmS, the Belfast Trust model, was piloted on the 1st June 2017 becoming fully operational one year later. It now boasts a full complement of Medical and Nursing staff operating 5 days a week drawing referrals from Emergency Departments and Primary Care.

SAmS manages a median of 20 cases daily with access to 'same day' radiology and expedient endoscopy and surgery. Its success is reflected by a 20% decrease in the number of admissions to EmSU. Successful clinical environments can create more work but treat patients who would otherwise suffer from the frustration of protracted investigation pathways and lengthy waiting lists if managed through traditional channels.

With the backdrop of Covid19, to avoid overcrowding in Emergency Departments, we are on the cusp of seismic regional change through the introduction of Urgent Treatment Centres whose principal aim is to triage to Ambulatory Care. Well established Ambulatory Units like SAmS are pivotal to the success of this model.

"It is not the strongest of the species that survives, nor the most intelligent; it is the one most adaptable to change." [4]

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HEART IN THE RIGHT PLACE: THE AMBULATORY CARDIOLOGY UNIT

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How we deliver healthcare is rapidly changing. In 2015 the Belfast Health and Social Care Trust piloted the Ambulatory Cardiology Unit (ACU), with the aim of improving quality of care. ACU provides a facility where patients attending the emergency department with new or known cardiac conditions can receive early follow up and evaluation by the cardiology team. For clinical presentations such as syncope, timely assessment by specialist staff has already been shown to reduce unnecessary hospitalisations, improve diagnostic rates, and reduce healthcare costs.[1]

In its first year ACU was involved in 1644 patient episodes. A review of the first year of service demonstrated an overall reduction in admissions to cardiology beds by 13.5%. In particular, admissions with atrial fibrillation were reduced by 24%, syncope by 29% and pericarditis by 45%. Only 1.7% of patients assessed in ACU required hospital admission within 30 days.[2] This indicates a safe and effective change in healthcare systems and structure.

There are ever increasing pressures on our unscheduled care services. In this climate, any workable alternative should be considered. ACU has demonstrated how a small service can have a significant impact and this model has potential to be adapted by other specialities.

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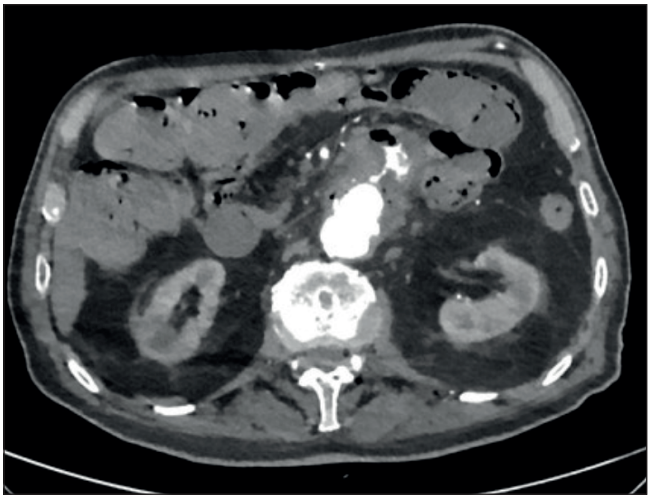
Curiositas

UNDERGRADUATE QUIZ

This patient presented to the Emergency Department with lower abdominal pain and rectal bleeding.



What is the cause for the presentation?

Dr Ian Bickle, Consultant Radiologist, Chesterfield Royal Hospital, North Derbyshire, UK

POSTGRADUATE QUIZ

Can you explain the appearance of the bony pelvis in this patient?

Dr Ian Bickle, Consultant Radiologist, Chesterfield Royal Hospital, North Derbyshire, UK

AND FINALLY…

Why is green a good choice for hospital linen?

Pitamber Kaushik, School of Interwoven Arts and Sciences, Krea University, Sri City, Andhra Pradesh, India

ANSWERS See overleaf

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

CURIOSITAS: Answers

UNDERGRADUATE QUIZ

On this CT angiogram of the abdominal aorta, a thin fistulous tract arises from the anterior aspect of the infrarenal aorta and communicates with the third part of the duodenum. High attenuation signal is seen within the third part of the duodenum equitable to the contrast filled aorta. This is an aorto-enteric fistula.

Aorto-enteric fistulas may be primary or secondary, the latter occurring following reconstructive aortic surgery, be that open repair or an endovascular stent procedure.

Dr Ian Bickle, Consultant Radiologist, Chesterfield Royal Hospital, North Derbyshire, UK

POSTGRADUATE QUIZ

This patient has undergone a Sharrard procedure, an operation as undertaken by John Sharrard of the Children's Hospital, Sheffield, England. The procedure was subsequently performed elsewhere by other surgeons. Radiologists and clinicians may incidentally observe this bizarre appearance of the pelvis and be curious to its origin.
The chief elements of the procedure consist of an iliopsoas transfer, undertaken to provide hip stability for patients with hip abductor weakness. In this case, the patient has severe spina bifida. The iliopsoas muscle is transplanted from the lesser trochanter of the femur, through a surgically created hole in the wing of the ilium. It is then attached to the greater trochanter of the femur. The evidence of this procedure having been performed on a plain radiograph is a large bony 'window' in the mid ilia.
For interest, the components of an external urethral sphincter are also evident in this radiograph.

Dr Ian Bickle, Consultant Radiologist, Chesterfield Royal Hospital, North Derbyshire, UK

AND FINALLY…

In 1914, American surgeon Harry Sherman realised that the glare from white-coloured hospital textiles and surfaces adversely affected his anatomical discernment. He thus created a "spinach green" operating theatre with all walls and textiles coloured the same, green being the complementary colour of red in the traditional RYB colour model. This enabled the operator or medical staff to easily and readily spot traces of blood on those surfaces as well as focus on the minute details and fine features of wounds.[1,2]

It is well known that prolonged focus on one colour can result in lingering pseudo-negative afterimages of its complementary colour once the gaze is shifted from the original subject of focus, owing to ocular pathways for that colour becoming fatigued due to prolonged stimulation and all the other pathways working normally.[3,4] During medical procedures, physicians and surgeons frequently need to focus on wounds, openings and interior tissue most of which appear vividly red. Blinking or shifting away from such periods of focus result in green "floaters" or "ghosts", afterimages of the subject in the complementary colour of the original. These potentially distracting, persistent green afterimages obviously will blend into green surroundings and ambience better than white or any other colour. Additionally, upon prolonged viewing of one particular colour, the eye becomes desensitized to it. Sustained focus on the bloody innards of a patient soon compromises ocular acuity as the colour appears to fade in the mind, rendering the medical staff incapable of discerning its nuances and performing the medical procedure well. This fading is an expression of the body's general tendency to become desensitized to any unvarying sensory stimulus.[5,6] The availability of immediate green surroundings, i.e. hospital textiles, enables the physician or surgeon to quickly switch their stimulus before it saturates their red colour pathway.

We are evolutionarily hardwired to become alert and vigilant upon seeing red, it being the colour of blood, whether of prey, predator, or oneself. On the other hand, blue stimulates thought and intellect, and makes it difficult to pacify or tranquilise the patient.[7] Green on the other hand, tends to placate the viewer.[8] Green linen is likely to help ease a patient into a more convenient state to carry out a medical procedure. Thus, in every regard, green is the best choice of colour for Hospital textiles.

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Letters

AD ERRATUM

This table was omitted from the letter ***The Microbiology of the Caman,*** letters, UMJ Vo. 89, Number 2, September 2020, page 130

Table 1: Description of bacteria identified from camogie hurls and their clinical relevance

Bacteria identified	Clinical relevance & pathological involvement in infection
Bacillus subtilis/vallismortis/amyloliquefaciens	Soil organisms
Bacillus altitudinis/pumilus	Former: Opportunistic pathogen causing skin infection
Brevibacterium iodinum	Opportunistic pathogen. Natural host is soil
Kytococcus sedentarius	Opportunistic pathogen responsible for keratosis plantaris sulcatum and common amongst athletes. Also responsible for peritonitis and fatal haemorrhagic pneumonia
Micrococcis luteus	Opportunistic pathogen isolated from protective equipment in Japanese contact sport Kendo
Morexella osloensis	Opportunistic pathogen causing skin manifestations and also osteomyelitis
Stenotropomonas rhizophila	Isolated from the rhizosphere of oilseed rape and potatoes.

A RARE CASE OF NON-ISLET CELL TUMOUR HYPOGLYCAEMIA

Editor,

Non-islet cell tumour hypoglycaemia (NICTH) is a very rare paraneoplastic syndrome. The true incidence is unknown as many cases go undiagnosed. Only a few hundred cases are reported in English language medical literature since it was first described in 1929.[1] The following describes a case of NICTH.

A 75-year-old undergoing chemotherapy for advanced endometrial carcinosarcoma; was admitted after routine blood tests revealed a severe acute kidney injury. Endometrial carcinosarcoma is a rare type of uterine malignancy that is classified as a mixed epithelial and mesenchymal tumour. Renal function normalised rapidly after bilateral nephrostomies were inserted.

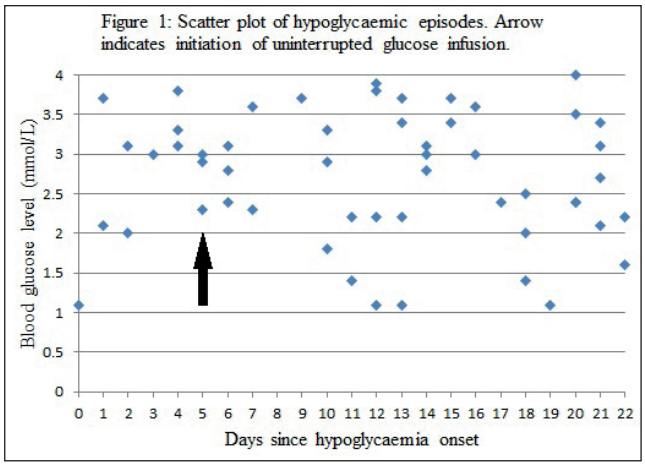

Figure 1: Scatter plot of hypoglycaemic episodes. Arrow indicates initiation of uninterrupted glucose infusion.

However, during convalescence the patient developed hypoglycaemic symptoms with a low blood glucose of 1.1mmol/L. This was unresponsive to oral glucose, so intravenous glucose was administered. There was no history of any endocrine disorder or any previous hypoglycaemia. Hypoglycaemic attacks then became more frequent and an uninterrupted 10% glucose infusion was needed, however this did not prevent hypoglycaemic episodes (Fig 1).

DIFFERENTIAL DIAGNOSIS

There was negligible suspicion of alcohol or exogenous insulin use. Other hypoglycaemic agents were ruled out by a medication review. Critical illness such as sepsis or liver failure seemed unlikely as inflammatory markers and liver function were unremarkable. Malnutrition was considered, however a dietician assessment reported adequate calorie intake. Adrenal insufficiency was ruled out with a normal Synacthen response. Insulinoma was excluded by suppressed serum insulin and C-peptide in the setting of hypoglycaemia

Table 1: Laboratory investigations

Parameter	Patient value	Normal value and/or interpretation
free thyroxine	17.6pmol/L	12-22pmol/L
thyroid stimulating hormone	1.22mIU/L	0.27-4.2mIU/L
cortisol response to Synacthen at 30minutes	643nmol/L	>450nmol/L
growth hormone	0.5ng/mL	suppressed
Whilst hypoglycaemic (blood glucose 2.3mmol/L) serum insulin	<3mU/L	2.6-24.9mU/L
C-peptide	0.5ug/L	1.1–4.4ug/L; indicating hypoinsulinaemic hypoglycaemia
Further investigations advised by endocrinology IGF1	3.8nmol/L	4.8-21.6nmol/L
IGF2: IGF1 ratio	21.8	<10; indicating NICTH

(Table 1). NICTH was considered once the above list of more common causes of hypoglycaemia had been excluded.

TREATMENT & OUTCOME

Calorie intake was optimised and steroid dosage was increased, but this had little effect in preventing hypoglycaemic episodes. The continuous glucose infusion was escalated to 20% glucose, however hypoglycaemia remained refractory. Interval imaging showed malignant disease progression and the options to treat her cancer with surgery, radiotherapy or chemotherapy had been exhausted. The patient died 22 days after the hypoglycaemic attacks began.

DISCUSSION

NICTH is a rare paraneoplastic condition that occurs due to tumoral over secretion of insulin-like growth factor 2 (IGF2). It occurs most commonly in patients with tumours of mesenchymal and epithelial origin.[2] IGF2 binds to insulin receptors which increases glucose uptake by skeletal muscle and inhibits glucose release from the liver. IGF2 also acts on the pituitary gland and pancreas to suppress the secretion of growth hormone and glucagon.[3]

In NICTH, the majority of overproduction is of 'big' IGF2 (a prohormone form of IGF2). This prohormone cannot easily be measured and only contributes a small fraction of the total IGF2 level. Therefore, total IGF2 may be reported as normal in NICTH. However, IGF1 is suppressed due to feedback inhibition and so the IGF2: IGF1 ratio is high. An IGF2: IGF1 ratio of greater than 10 confirms the diagnosis of NICTH.[4]

Only half the cases of NICTH have a known tumour at the onset of hypoglycaemia. The remaining half present with hypoglycaemia and a tumour is diagnosed later.[5]

Surgical removal of the tumour in NICTH is curative, however there is no consensus on the optimum strategy for managing inoperable patients. When surgical resection is not feasible, other antitumour therapies such as chemotherapy, radiotherapy or tumour embolization should be considered. In refractory cases, glucocorticoid steroids are the most commonly used medication used to treat NICTH.[1]

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DELAFLOXACIN, A NOVEL FLUOROQUINOLONE ANTIBIOTIC WITH ACTIVITY AGAINST HOSPITAL-, COMMUNITY- AND LIVESTOCK-ASSOCIATED METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* (MRSA)

Editor,

Delafloxacin is a new fluoroquinolone antibiotic, approved for treatment of acute bacterial skin and skin structure infections (ABSSSIs) caused by both Gram-positive and Gram-negative organisms.[1] It recently received its regulatory licence from the European Medicines Agency in December 2019 (https://www.ema.europa.eu/en/medicines/human/EPAR/quofenix). For a seminal review on this background to this antibiotic, please see the recent seminal review by Mogle and colleagues.[1]

As with any newly introduced antibiotic, it is important to evaluate a new antibiotic in the context of the local epidemiology and resistance rates, to aid physicians in the positioning of such a new antibiotic. To date, there have been no reports on the activity of delafloxacin against methicillin-sensitive (MSSA) and methicillin-resistant (MRSA) *Staphylococcus aureus*, within the Northern Ireland context, hence we wished to examine the *in vitro* susceptibility of MSSA and MRSA isolates to this new antibiotic.

Staphylococcus aureus (n=23) isolates [15 MSSA & 8 MRSA] were employed in this study, as detailed in Table 1. Isolates were obtained from the MicroARK Microbiology Culture Repository housed within the Northern Ireland Public Health Laboratory, Belfast City Hospital. Isolates within each category were selected at random for employment in this study. No other criteria were used in the selection of these organisms. Prior to use, all isolates were passaged twice by subculturing on Columbia Blood agar (Oxoid CM0031, Oxoid Ltd., Basingstoke, UK), supplemented with 5% (v/v) defibrinated horse blood for 24h at 37°C, under aerobic conditions. *In vitro* susceptibilities were examined on all 23 isolates, by employing Etest® gradient for delafloxacin (range:0.002-32 mg/L), as per manufacturer's instructions (Biomerieux Ltd., France) and in accordance with EUCAST methodology[2] and interpretive criteria.[3] Susceptibility of

isolates to delafloxacin, as determined by the Minimum Inhibitory Concentration (MIC) value (mg/L), are quoted in Table 1.

Given the current EUCAST breakpoint for *S. aureus* sensitivity (S) ≤ 0.25 mg/L, none of the isolates tested were considered resistant to delafloxacin. Presently, there are no published reports of fluoroquinolone susceptibility to *S. aureus* solely in Northern Ireland, however when combined with data from England, the latest published ciprofloxacin resistance rates for 2018 in MSSA and MRSA bacteramia were 5% and 62%, respectively.[4]

Delafloxacin is the latest addition to the fluoroquinolones in the antibiotic armamentarium. Early indications show that it may have a good *in vitro* susceptibility profile against *S. aureus*. In a study involving ABSSSIs in 1,042 patients from which 685 *S. aureus* isolates were recovered, delafloxacin MIC_{90} values against levofloxacin-non-susceptible *S. aureus*, MRSA and MSSA isolates were all 0.25 µg/ml and where *S. aureus* was eradicated/presumed eradicated in 98.4% (245/249) of delafloxacin-treated patients. These Phase 3 clinical trial data suggest that delafloxacin could be a good option for the treatment of infections caused by *S. aureus* isolates causing ABSSSIs, including MRSA isolates, where high rates of ciprofloxacin and levofloxacin non-susceptibility are observed.[5]

Physicians who think that the use of a fluoroquinolone may have a potential role in treating *S. aureus* infection in their patient should discuss options with their local microbiologist.

DECLARATION OF INTERESTS

The authors do not have any interests to declare. Delafloxacin E-test strips were kindly offered to hospitals throughout Europe (www.ihma.com) and were supplied gratis by Menarini Pharmaceuticals, Italy. Neither IHMA, nor Menarini Pharmaceuticals nor their agents were involved in study conceptualization, experimental design, experimental execution, data analyses, report writing nor had any role in the editorial process, funding or any other aspect of the study or writing.

Table 1: *In vitro* susceptibility of NI methicillin-sensitive and resistant *Staphylococcus aureus* to delofloxacin

Organism (Source)	**Number of isolates**	**Minimum Inhibitory Concentration (MIC) [mg/L]**	
		Mean	**Range**
Staphylococcus aureus (methicillin-sensitive; MSSA) Sputum isolates from adult patients with cystic fibrosis (CF)	8	0.043	<0.002-0.19
Staphylococcus aureus (methicillin-resistant: MRSA) Hospital-associated (from blood culture)	6	0.147	<0.002 - 0.25
Hospital-associated (zoonotic; canine)	1	0.19	0.19
Community-associated MRSA [CA-MRSA ST35, 5134, 5090, 4526, 4266 & 4388]	6	0.0233	<0.002 - 0.125
Livestock-associated MRSA LA-MRSA (porcine source) CC398 & CC30	2	0.05	0.006 - 0.094

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PERCEPTIONS OF MEDICAL STUDENTS ON UNDERGRADUATE BASIC SURGICAL SKILLS TRAINING

EDITOR,

Applications to surgical training programmes are on the decline[1,2]. This is probably due to a combination of factors, including changes in undergraduate curricula and a gender shift in undergraduates. Despite the introduction of a national undergraduate surgical curriculum, undergraduate training and proficiency in basic surgical skills (BSS) varies widely[3,4]. We explored the impact of structured BSS workshops on undergraduate students' suturing confidence, interest in pursuing a surgical career and their perceptions of the importance of BSS training.

A qualitative analysis was undertaken of 193 medical students (68% female), ranging from years 1 to 5, attending seven standardised surgical skills workshops run by Scrubs student surgical society (Queen's University Belfast) between October 2018 and March 2019. Anonymous, pre-defined, 5-point Likert scale pre- and post-workshop questionnaires were used. The workshops included several basic surgical knots with instrumental and hand ties on both artificial and animal tissue models, as well as basic laparoscopic skills.

70% of students reported increased suturing confidence post-workshop ($p<0.001$) (Fig. 1). Additionally, 74% of students reported that the workshop had increased their interest in pursuing a surgical career.

Analysis of pre-workshop questionnaires of senior students (years 4-5, n=62) revealed that only 53% agreed (or strongly agreed) that they would be confident suturing a wound under direct supervision. 74% of senior students reported that they had no experience suturing in clinical practice.

Looking more broadly at undergraduate basic surgical skills training, 94% of students agreed (or strongly agreed) that BSS were important in the undergraduate curriculum. 97% of students agreed (or strongly agreed) that they would like to receive more BSS training in the future and 83% agreed (or strongly agreed) that this would have an influence on their future career choices.

This study has demonstrated that BSS training can increase student suturing confidence and boost interest in pursuing a surgical career. This is on the background of low levels of pre-workshop confidence and clinical experience of suturing in senior students. The power of these workshops to stimulate interest in surgery is likely due to three key factors. Firstly, gaining positive practical surgical experiences helps attract those interested in a hands-on specialty. Secondly, increased suturing confidence better equips students to participate more fully in surgical placements. Lastly, close interaction between demonstrators and students facilitates the development of role models and mentors, which is thought to be one of the main factors in directing career aspirations[5].

Medical schools and student surgical societies should work together to ensure students receive sufficient high-quality BSS training. Material costs for running such workshops are low, however recruiting surgical demonstrators can be challenging. Better collaboration with surgical trainees could help address this issue. Trainees are motivated to gain teaching experience, have completed surgical skills courses, can provide clinical context to skills and are ideal role models for students.

In summary, simple structured BSS workshops can increase

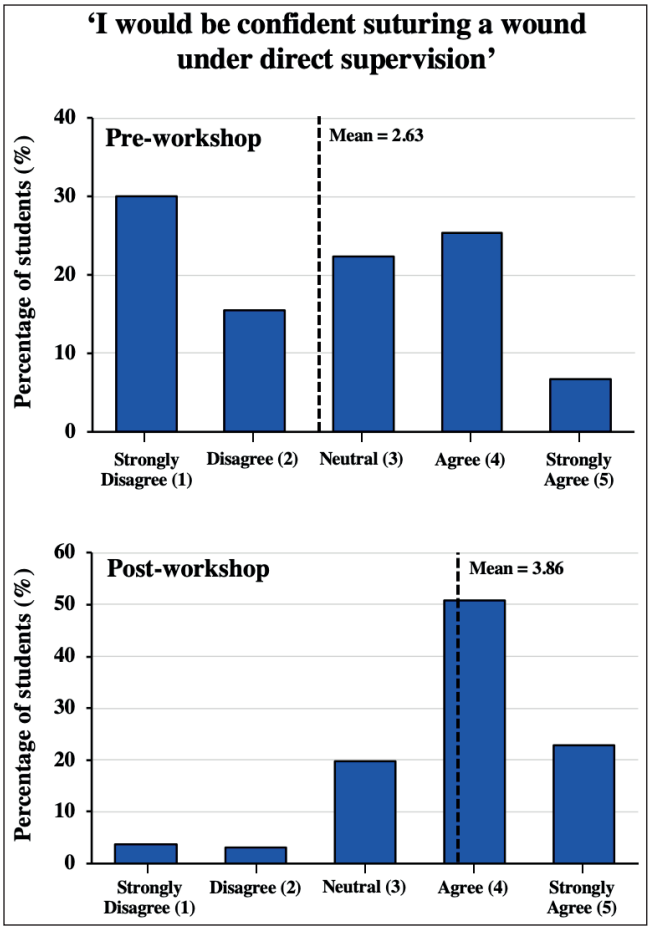

Figure 1. Pre- and post-workshop responses of students (n=193) to the statement 'I would be confident suturing a wound under direct supervision'

student confidence in essential surgical skills acquisition and increase interest in surgery as a career. Medical schools and student surgical societies should work together to improve undergraduate BSS training.

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A CURIOUS CASE OF GRANULOMATOSIS WITH POLYANGITIS

Editor,

A 65-year-old male non-smoker presented with a 2-month history of weight loss, fever and back pain. Bloods noted normocytic anaemia, elevated ESR (130mm/hr) and normal renal indices. To exclude malignancy, a CT chest, abdomen and pelvis was requested. This revealed a paravertebral mass extending from T6-T11 with significant uptake on subsequent CT-PET (Figure 1). CT guided biopsy was not possible due to the location of the mass. Endobronchial ultrasound guided biopsy of the mass was negative for malignancy, yet this

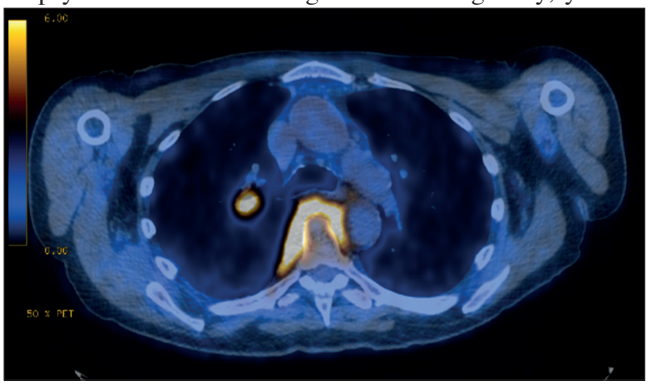

Figure 1: CT-PET showing uptake in the prevertebral and bilateral paravertebral region, (SUV max 11.92), PET avid right hilar nodes (SUX max 6.7) with encasement of the descending aorta, associated with increased uptake.

remained likely. Spinal referral was made for consideration of a biopsy/removal of the mass.

The patient was readmitted with acute kidney injury (urea 16.5mmol/L, creatinine 123µmol/L, eGFR 51ml/min). Presuming pre-renal failure, intravenous fluids were given with no improvement. Renal tract ultrasound was normal. Urine dipstick demonstrated significant blood and protein. Vasculitis screen showed PR3 ANCA of >8.0 and cANCA 20, prompting a presumptive diagnosis of granulomatosis with polyangitis (GPA). On renal biopsy, focal segmental glomerulosclerosis, active crescents and C3 positivity on immunofluorescence confirmed the diagnosis (Figure 2). Patient was pulsed with methylprednisolone before commencing oral cyclophosphamide and prednisolone. At 4 month follow up the patient's renal function had normalised and repeat imaging showed complete resolution of the mass.

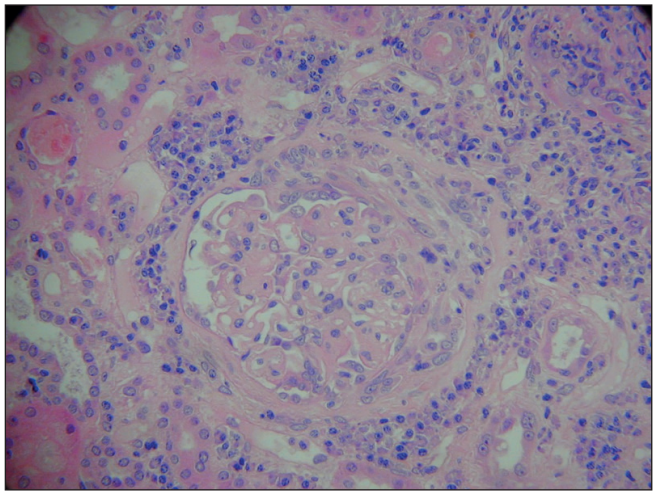

Figure 2: Histology showing rapidly progressive necrotising glomerulonephritis. In the image we can see crescents obliterating the glomerular space and fibrin deposits between proliferated cells. In the centre of the image compressed capillary loops are also seen. These findings are classic for Rapidly progressive glomerulonephritis.

GPA is a potentially lethal multisystem disorder of unknown aetiology which typically presents as a small-vessel vasculitis and necrotising granulomatous inflammation of the kidneys and respiratory tract. Anomalous manifestations exist with cutaneous, ocular, musculoskeletal, neurological and cardiac presentations previously described. GPA presenting as tumour like masses is less well documented. To date, GPA tumour like lesions have been noted in the orbits, nasal passages, lungs and right ventricle with a predilection for breast and renal masses.[1-3] Notably, there appears a close temporal association between GPA and renal cell carcinomas yet the immunopathologic mechanism remains unclear.[4] Within the literature there exists only one previous case of GPA presenting as a paraspinal mass with this patient exhibiting synchronous renal and paraspinal masses.[5] To the authors knowledge, our case represents the only description of a solitary GPA paraspinal mass.

Those with suspected GPA require serum anti-neutrophil cytoplasmic antibody (ANCA) testing. Whilst not wholly pathognomonic, elevated cANCA and PR3 levels strongly support a diagnosis of GPA in patients with moderate/high probability scores. A negative ANCA does not exclude the diagnosis therefore ANCA testing is not advised for monitoring disease activity. Definitive diagnosis requires evidence of necrotising vasculitis on biopsy. Many biopsy sites exist however renal samples are considered superior.

As per the European Renal Association and European Vasculitis Society, management of GPA is in accordance with symptom severity at diagnosis. 'Non organ threatening disease' requires treatment with methotrexate and glucocorticosteroids. Glucocorticoids with either cyclophosphamide or rituximab are recommended in "organ or life threatening disease" which includes tumour like lesions given their potential to compress surrounding structures. Plasma exchange is only required in the event of pulmonary haemorrhage or rapidly progressive renal failure.

This case highlights the diagnostic difficulty surrounding GPA and its ability to present as tumour like masses. In such cases it is imperative to exclude malignancy, yet this may generate diagnostic delays. The authors therefore argue GPA should be considered in any patient with a mass and evidence of multi-system disease.

Patient consent was obtained for the publication of this case.

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THINKING OUTSIDE OF THE LUNGS

Editor,

A 29-year-old female presented to the emergency department with increasing dyspnoea, a productive cough and pleuritic chest pain. She was a known intravenous drug user. On examination she was pyrexic with a temperature of 39.5 degrees and significantly hypoxic with $PA0_2$ of 8.6 kPa on $Fi0_2$ of 0.6.

Admission blood test results showed a raised white cell count of 22.3 (10^9/l), accompanying neutrophilia and raised C-reactive protein of 345.6 (mg/l). Liver function tests were also deranged.

Initial chest x-ray (Figure 1a) reported patchy opacification in the right mid zone, suggestive of infection and subsequent computed tomography (CT) of the chest revealed a patchy distribution of nodules and confluent pseudo-mass showing signs of cavitation with associated evidence of bilateral pleural effusions and reactive nodes in the right hilum and in mediastinum (Figure 1b).

She was commenced on broad spectrum antibiotics with

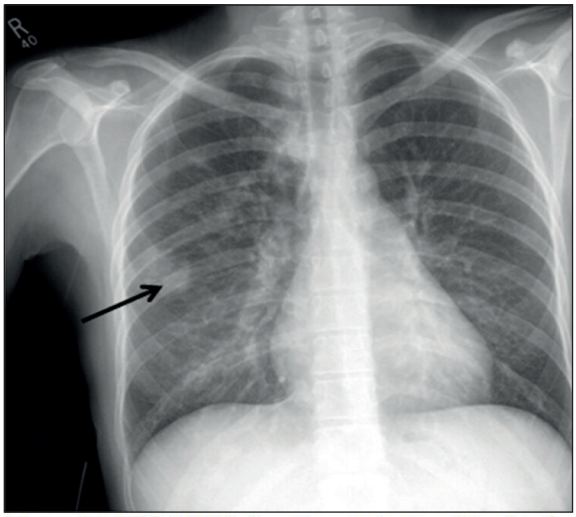

Figure 1a: Initial CXR showing patchy opacification in the right mid-zone (arrow)

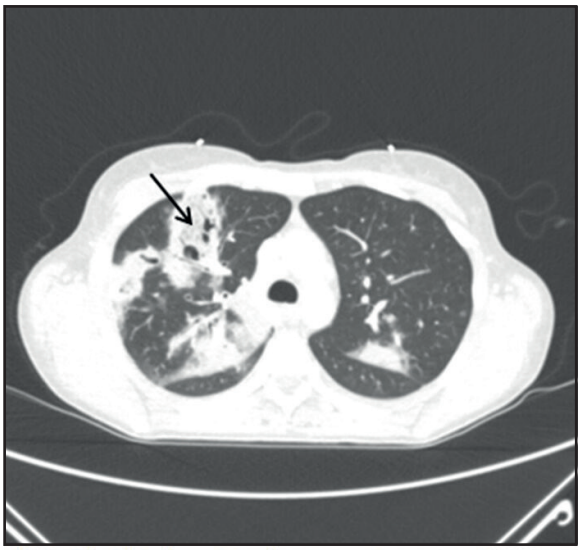

Figure 1b: CT chest showing a confluent pseudo-mass with cavitation (arrow)

minimal clinical improvement. On day 3, blood culture sampling revealed staphylococcus aureus bacteraemia, prompting transthoracic echocardiogram (TTE) which identified an echo bright, mobile structure on the atrial aspect of the tricuspid valve (Figure 2) with associated moderate to severe tricuspid regurgitation (peak flow gradient 47mmHg). A diagnosis of tricuspid valve endocarditis was confirmed.

Six weeks of intravenous antibiotics were completed during which the patient clinically improved and inflammatory markers normalised.

A follow-up trans-oesophageal echocardiogram (TOE) was performed at the end of treatment. There was no obvious vegetation and tricuspid regurgitation had improved to moderate. 2 years after initial presentation there have been no further clinical episodes of endocarditis.

Right sided infective endocarditis (RSIE) is infrequent compared to left sided infective endocarditis (LSIE), accounting for only 5-10% of IE cases.[1] The tricuspid valve is involved in 90% and staphylococcus aureus is the culprit organism in 70%.[2] RSIE is classically associated with IVDU however congenital heart disease and intra-cardiac devices including pacemakers and intravascular catheters are also important risk factors.[1]

The European Society of Cardiology describes the typical presentation of RSIE as fever, bacteraemia, and multiple septic pulmonary emboli, as in the case we have presented.[4] This contrasts the systemic embolic events and vascular phenomenon seen in LSIE.[4] Respiratory symptoms predominate and unless a high index of suspicion exits, this clinical picture could divert physicians towards a primary respiratory disease. Initial misdiagnosis poses a risk of premature antibiotic delivery, firstly potentially concealing a microbiological diagnosis that may prompt a consideration of IE and secondly preventing subsequent sensitivities to assist in antibiotic choice.

Diagnostic delay may also increase complications including valvular destruction, pulmonary abscess and empyema. [2] Damage to pulmonary vasculature increases the risk of pulmonary haemorrhage.[2] On this basis we hope that this case will prompt physicians to consider a diagnosis of RSIE when presented with acute respiratory illness.

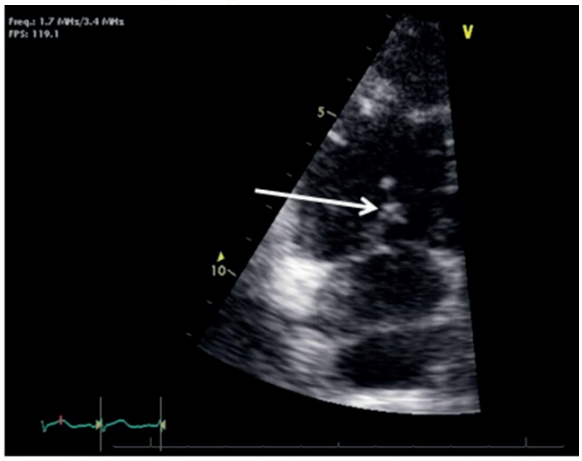

Figure 2: Echocardiogram showing vegetation on the atrial aspect of the tricuspid valve (arrow).

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