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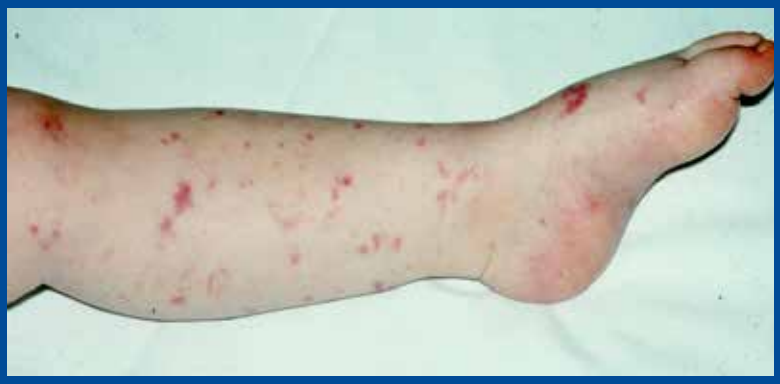

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Guest Editorial

Meningococcal Disease

Andrew J Pollard

Polysaccharide encapsulated bacteria, including *Streptococcus pneumoniae, Haemophilus influenzae* type b (Hib), *Neisseria meningitidis,* Group B Streptococci, and *Salmonella* Typhi drive the use, and over-use of antibiotics globally. Most doctors don't prescribe antibiotics for viral infections, they prescribe them in case it is one of these bacteria that is causing the clinical symptoms displayed in the patient before them, leading to inappropriate antibiotic treatment of viral infections, and contributing to the rise in antimicrobial resistance (AMR). It is not surprising, indeed it is logical, that clinicians should treat these serious bacterial infections with antibiotics since they all have high morbidity and mortality associated with them. The problem of antibiotic over-use is even greater in countries where antibiotics are readily available over the counter and it is left to parents to decide whether a febrile illness should be treated with antibiotics, or not. Even in the most sophisticated settings, it is difficult for a doctor to separate occasional early serious sepsis from the avalanche of viral infections that present to clinical care. We now have access to licensed vaccines that can prevent many of these infections, and can be used to curb antibiotic overuse, but early recognition and rapid diagnostics will be needed for the cases that cannot be prevented.

Of these infections, meningococcal disease is the one which is most feared by the public in the United Kingdom. However, the successful awareness campaigns led by the meningitis charities and vivid images of the disease and its complications shown in the media have led to concern about this disease being prominent among the fears of parents and frontline doctors (**see Section 4 in this issue**). The concerns about this disease are legitimate given the rapid onset of illness among those affected and the high mortality, especially among those with septicaemia, but the probability of infection is very low for any individual child. Despite the low attack rate, meningococcal disease has been consistently the leading infectious cause of death among young children over the past decade.

Diagnostic tests that could determine who does not have a serious bacterial infection (and therefore who does not need antibiotics) could simplify management and reduce antibiotic use and risk of non-treatment. Unfortunately, such a diagnostic does not yet exist for management of febrile children. Indeed, while it seems increasingly possible to develop a better rule-in test, which points to a high likelihood of bacterial infection, a more useful rule-out test to identify those who don't need antibiotics, remains stubbornly elusive. For the rule-in test, promising approaches include molecular pathogen-specific tests, such as those described in **Section 3** for meningococcus, which are exquisitely sensitive and can be useful, unlike bacterial culture, even in the context of prior antibiotic treatment. Clinical decision rules have been widely used in clinical studies and usually include some routine laboratory tests to support decision-making and a new promising approach using RNA sequencing has recently been described[1]. However, none have yet been validated as safe rule-out tests and clinicians are still stuck with the antibiotic dilemma in managing patients.

For patients with serious rare diseases, like meningococcal disease, when it is recognised, it is of great importance that doctors have clear guidelines about optimal management. It has become clear that the optimising the early hours of management can improve outcomes[2]. In **Section 3** approaches to management are outlined, as are excellent resources to aid initial treatment.

Perhaps the optimal solution to tackle the problem of AMR is the use of vaccines, which lead to avoidance of antimicrobial use by preventing the infection in the first place. Hib vaccine, introduced in the UK in 1992 has virtually eliminated Hib and the 1999 introduction of a vaccine against capsular group C *Neisseria meningitidis* (MenC) has had a similar and sustained impact on that disease too (**see Section 2**). Pneumococcal infections in children are also down since the introduction of pneumococcal conjugate vaccines (PCV) in 2006[3]. The MenC vaccine was introduced to control a clonal outbreak of disease during the 1990s, but other capsular groups continued to circulate and cause disease. From 2011 a new outbreak caused by a capsular group W strain, spread to the UK from Latin America[4], and the response was the urgent introduction of a meningococcal vaccine covering capsular groups A, C, Y and W for adolescents in 2015 which will likely control this outbreak once sufficient cohorts have been vaccinated[4]. The commencement of a programme for MenB in 2015 makes the UK the only country in the world to be attempting control of disease caused by all of the major disease-causing capsular groups of meningococcus[5,6].

Unfortunately, not all bacterial infection is preventable at present. New vaccines for Group B Streptococcus are on the horizon, and could be an important step forward in reducing the morbidity and mortality associated with neonatal infection and are likely to be widely deployed.

While, these vaccine programmes, discussed above, are directly driving reductions in disease in the UK caused by polysaccharide encapsulated bacteria (**discussed in Section**

2)[7], vaccine programmes which prevent viral infections may also be important in the prevention of bacterial infections, since the latter may be complications of viral illnesses. For example, influenza has been associated with pneumococcal pneumonia and meningococcal disease, varicella with Group A streptococcal infection. Efforts to develop a respiratory syncytial virus (RSV) vaccine may eventually result in reductions in bacterial complications of viral lower respiratory tract infection (LRTI) in infants. Importantly, vaccines that prevent viral infections, such as influenza, will also reduce use inappropriate use of antimicrobials.

In the context of these vaccination programmes, that now allow policymakers to target all of the main bacterial causes of acute serious sepsis in children in developed countries (with the exception of (GBS) in the neonate), it is very difficult for young clinicians to become experienced in the management of severe sepsis. The problem of identifying the "needle in the growing haystack" of bacterial sepsis among the flood of viral infections is ever more challenging. The work of the meningitis charities (**section 4**) and the sepsis campaign has led to the development of tools to improve education of doctors about the symptom of severe bacterial infection.

We can be optimistic about further reductions in meningococcal disease and other serious bacterial infections, and their complications, in the UK, because we have such a comprehensive programme, which is still expanding to new cohorts. Vaccine programmes have undoubtedly had a huge impact on disease rates and associated mortality/morbidity and the improved focus on treatment guidelines and education about sepsis should better prepare the future clinical work-force for tackling the disease, and reducing inappropriate antibiotic usage.

AJP chairs the UK Department of Health and Social Care's (DHSC) Joint Committee on Vaccination and Immunisation (JCVI) and is a member of the World Health Organization's (WHO) Strategic Advisory Group of Experts. The views expressed in this manuscript are those of the author and do not necessarily reflect the views of the JCVI, DHSC, or WHO

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EDITOR'S NOTES

The Editor wishes to thank Professor Gerry Gormley for his immense contribution to the Journal over the last few years as Sub-Editor of the Curiositas section and for encouraging trainees to become involved in the production of the Journal. Curiositas will continue under the guidance of Drs. Paul Hamilton and Ian Bickle.

The Editor is mindful that his "tour of duty" ends after publication of the December 2019 edition of the Journal and therefore seeks a Deputy Editor to assist with producing the Journal with a view to taking over as Editor from 2020. Please contact the editor via e-mail at john.purvis@btinternet.com if you are interested.

ULSTER MEDICAL SOCIETY LECTURE PROGRAMME 2018-19

Presidential Address by Dr RG Peter Watson BSc MD FRCP FAoME: "What is a Physician?" on Thursday 4 October 2018 at 8 pm - venue to be confirmed

Full details of the UMS Lecture Programme 2018-19 to follow

Ulster Med J 2018;**87(2):**83

Review Article

Meningococcal Disease in Northern Ireland - Past, Present & Future

MeningoNI Forum

Millar BC[1,2], Banks L[3], Bourke TW[4], Cunningham M[5], Dooley JSG[2],Elshibly S[6], Goldsmith CE[1], Fairley D[7], Jackson K[4,8], Lamont S[4], Jessop L[9], McCrudden E[4], McConnell D[10], McAuley K[10], McKenna JP[7], Moore PJA[8], Smithson R[9], Stirling J[1], Shields M[4,8] & Moore JE[1,2,8*]

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ABSTRACT

Meningococcal disease has had devastating consequences in Northern Ireland since its first description locally in 1859. The incidence of this disease has significantly declined in recent years, however it is important to understand reasons for this changing epidemiology and to acknowledge the diagnostic and clinical management developments that have been made locally. This review aims to examine the changing face of this disease in Northern Ireland over the years, with particular reference to local disease prevention, epidemiology, diagnosis, clinical treatment and management, post-disease sequelae and the role of meningitis charities locally, in terms of patient support and research.

BACKGROUND

In 2014, a forum named "*MeningoNI*" was established to bring together stakeholders with a professional interest in meningococcal disease in Northern Ireland. *MeningoNI* offers a forum for education and discussion of matters with a broad interest in meningococcal disease, allowing key local stakeholders, the opportunity to consider recently evolving meningococcal disease in the context of detection and characterisation, microbial pathogenesis, epidemiology, disease prevention and vaccinology**.** Specific objectives of the Forum are:-

(a). To create a local (NI) Forum and meeting place for key stakeholders to consider evolving issues in meningococcal disease,

(b). To independently consider existing and emerging scientific evidence relating to disease management,

(c). To consider the advice of expert National Committees in a devolved NI context,

(d). To consider the jurisdictional aspects of meningococcal disease detection and management on the Island of Ireland, given that NI is the only region of the UK to share a land border with another EU member State (Republic of Ireland),

(e). To issue independent advice/guidance as an expert forum on the strategic development of health systems in NI relating to meningococcal disease management/prevention, including charting a roadmap for optimum patient outcome in NI,

(f). To examine policy relating to meningococcal disease control, including meningococcal disease, between NI/ within the devolved nations of the UK, as well as with our neighbouring EU member State and to explore models of synergy and collaboration with these nations, to minimise the burden of meningococcal disease for all.

The Forum has met on numerous occasions and has involved key speakers from within and outside NI, including Professor Andrew Pollard, Chair, UK Joint Committee on Vaccination & Immunisation (JCVI), Professor Karina Butler, Chair, National Immunisation Advisory Committee, Dublin, as well as local MLAs, Stormont Health Committee, NI MPs and Dr Michael McBride, NI Chief Medical Officer.

This review represents one output from this Forum and the authors trust that this will add value to those readers with an interest in meningococcal disease, locally, nationally and internationally. All authors are members of the Northern Ireland Meningococcal Stakeholders' Forum (MeningoNI).

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Review Article

Meningococcal Disease Section 1: Microbiology And Historical Perspective

MeningoNI Forum (see page **87(2)** 83 for full list of authors)

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INTRODUCTION

There are few infectious diseases than can strike fear into parents, the public and healthcare professionals, as much as meningococcal meningitis. Over the past five years, there has been renewed interest in vaccine prevention of meningococcal meningitis mainly through the development of two new vaccination programmes, namely (i) the 4CMenB vaccine to cover meningococcal serogroupB strains[1] and (ii), the introduction of the MenACWY vaccination, in adolescents and the university population[2]. In 2016, public interest in this disease and its prevention through vaccination was demonstrated by an unprecedented number of petition signatures from the public (> 823,349), calling on the UK government to extend the meningococcal B vaccination programme to those older than 1 year old[3]. In addition, the recently revised National Institute for Health and Care Excellence (NICE) guidelines on Meningitis (bacterial) and meningococcal septicaemia in under 16s: recognition, diagnosis and management[4] coupled with decision making within the devolved Northern Ireland context, make it timely to review meningococcal meningitis. This review examines aspects of epidemiology, laboratory diagnosis, treatment/ management, post-disease complications, vaccination and prevention, as well as exploring the various support structures and resources offered by the meningitis charities to patients and healthcare professionals, currently operating in Northern Ireland.

MICROBIOLOGY OF *NEISERRIA MENINGITIDIS*

Meningitis in its broadest form has a variety of different aetiological causes, including viral[5], bacterial[6,7], fungal[8,9] and parasitic (eosinophilic)[10] and we attach citations to seminal reviews on each of these aetiologies to help guide readers to additional reading resources. Of these, meningococcal infection is the most common cause of bacterial meningitis in the UK and Ireland, accounting for approximately 2,000 cases per year, of which about 1,600 cases have a laboratory confirmation. The common aetiological bacterium is *Neisseria meningitidis* (*N. meningitidis*) – the so-called "meningococcus", which is a major pathogen of meningitis and septicaemia in humans, but not in animals. This Gram-negative bacterium belongs to the genus *Neisseria*, which currently comprises 29 species described within, including *N. meningitidis*. Of the other 28 species, eight including *N. cinerea*[11], *N. flava*[12], *N. flavescens*[13], *N. lactamica*[14], *N. mucosa*[15], *N. perflava*[16], *N. sicca*[17] and *N. subflava*[18] have been reported to occasionally cause meningitis, but not with the same frequency as *N. meningitidis*. In addition, the other major human pathogen within this genus, *N. gonorrhoeae*, has infrequently been associated with disseminated infection from the urogenital tract although there have been 24 reported cases of this species causing meningitis[19]. Both *N. meningitidis* and *N. gonorrhoeae* are human host-restricted pathogens. In the case of meningococcus, the only natural reservoir of this bacterium is due to oropharyngeal "carriage" by otherwise healthy humans. Carriage rates vary dramatically with age – an important factor that affects transmission dynamics and vaccination strategies for meningococcal disease[20]. Most of the other *Neisseria* species are harmless commensals of humans and animals.

Gaspard Vieusseux[21] gave the first clinical description of meningococcal disease in 1805, during an outbreak with 33 deaths in the vicinity of Geneva, Switzerland, however the causative agent was not cultivated and named "*Diplokokkus intracellularis meningitidis*" until approximately 80 years later by Anton Weichselbaum, in the CSF of six of eight patients with bacterial meningitis.[22] It is now known that the Gram-negative *Proteobacterium, N. meningitidis* has twelve capsular serogroups (A, B, C, E, H, I, K, L, W, X, Y and Z), which are characterised by their polysaccharide capsule, which is the organism's principal virulence factor, however six serogroups, namely A, B, C, W, X and Y account for most cases of meningococcal disease worldwide, with different seroprevalance.[23] Meningococci are further classified into type and subtype on the basis of their outer membrane proteins (OMPs), and porins (porB and porA, respectively)[24]. Molecular methods, such as multilocus sequence typing (MLST), in conjunction with eBurst (Based upon related sequence types) software, are used in the classification of meningococci. Sequence types (ST) are based on the variants observed in the nucleotide sequences of 400 - 500bp long

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fragments of seven housekeeping genes. Subsequently, clonal complexes (ccs), which differ substantially in their pathogenic potential, are identified as closely related groups of isolates in which all STs are linked to a single locus variant of at least one other ST[25]. With increasing availability and reducing costs, whole genome sequencing, is currently providing further insights into the characterisation and accurate typing of isolates[26]. Of significance is the "The Meningitis Research Foundation Meningococcus Genome Library (MRF-MGL)", which commenced in 2012 and contains the whole genome sequences of invasive meningococcal isolates, in entire epidemiological years, from England, Wales and Northern Ireland which were received by the Public Health England Meningococcal Reference Unit from July 2010 to June 2013. The MRF-MGL is freely available to researchers worldwide and is an excellent resource of quality data which can be used to study surveillance, outbreaks, epidemiology, evolution, development and evaluation of new vaccines. Additionally, data from the MRF-MGL can be used in conjunction with PubMLST, another open access repository of Neisserial isolate data, in order to compare current data with historical and international cases (http://pubmlst.org/neisseria/)[27].

HISTORICAL PERSPECTIVE

"*Within the last few years a peculiar inflammatory affection has been discovered, attacking the base of the brain and superior part of the spinal cord, to which the name of cerebro-spinal meningitis has been given. This, although an acute inflammation, appears to prevail at times as an epidemic, and did so some years ago in the Belfast Workhouse. It most frequently attacks boys, or young men recently subjected to the vicissitudes of a military life*." Professor Seaton Reid, President, Belfast Clinical and Pathological Society, and taken from the Presidential Opening Address of the 7th Session of the Belfast Clinical and Pathological Society, Saturday 29 October, 1859[28]. This oration was one of the earliest reports of meningococcal disease in Northern Ireland and was given approximately 54 years after its first description by Vieusseux in 1805.[21] Reid's description of the disease was approximately 25 years before the first microbiological description of the aetiological agent of the infection, namely the meningococcus. This was first described as intracellular oval micrococci by the Italian pathologists, Marchiafava and Celli, in a sample of CSF[29].

Reid's early description of meningococcal disease alluded to an important epidemiological component of the disease, namely transmission from person-to-person, exacerbated by infected patients living and working in close proximity to each other and affecting inhabitants of a Belfast Workhouse, as well as in young military recruits. The association between this disease and the military continued with an eloquent report of a meningococcal meningitis outbreak in a military camp in Randalstown, Co. Antrim in the *British Medical Journal*, in December 1916, relating to an on-going outbreak, dating back to 17th February 1915, totalling 129 cases[30]. Of these 129 cases, 44 were from the military, of whom 25 recovered and 19 died. We know from this report by Captain James Wilson, Royal Army Medical Corps and colleagues, that there had been an "extensive" outbreak in the community in Belfast in 1907-1908 and in the surrounding towns and villages, with a few sporadic cases occurring each year after that[30]. This report cites the index case originating from the Randalstown camp, where the 14th Battalion Royal Irish Rifles were training in preparation for deployment to the Somme, after a period of final training in Liphook in Hampshire[30]. These troops would later form part of the 36th (Ulster) Division, in Kitchener's New Volunteer Army. It was believed that meningococci were not transmitted from England or Scotland to the troops, but that these bacteria were the legacy of carriage from the 1907-1908 outbreak in Belfast[30]. Most of the military recruits were volunteers, coming from a variety of backgrounds and their billets in Randalstown was their first experience of communal living. Wilson's paper describes their living conditions in a positive manner, including the state of the huts that the recruits were housed in (Figure 1), but we can see from this photograph, that each hut had a high occupancy rate. Subsequently, in 1918, Captain Glover published his paper in the BMJ entitled "Spacing-out in the prevention of military epidemics of cerebro-spinal fever", whereby he advocated that military personnel should have at least two and a half feet spacing between each bed, in order reduce meningococcal carriage, particularly amongst recruits during the first three months of service[31].

Fig 1. Kit Inspection in Hut.

A slide from lecture derived from Jim Maultsaid's War Book showing soldiers standing to attention in Randalstown hut, kit laid out for inspection; 1915.

Photograph courtesy of the Ulster Museum (BELUM.Y15526)

Paradoxically, 95 years later, replication of the scenario of young people living together and in close proximity with each other for the first time, allows for the transmission of the meningococcus from person-to-person and the recurrence of disease, as was tragically witnessed by the death a fresher business studies student at the University of Ulster, Jordanstown campus in September 2010 (http://www.bbc.co.uk/news/uk-northern-ireland-11418804).

In 1952 in the *Ulster Medical Journal*, Dr Sarah Campbell

described 47 cases of meningococcal meningitis occurring predominantly in neonates and babies (n=24), toddlers and infants (n=17), children [5-10 years] (n=2) and older children/ adolescents/teenagers/young adults (n=4). Treatment options had evolved to using antibiotics as the mainstay of treatment, including i.m. penicillin and i.v. sulphamezathine[32].

In 1974, Dr Maurice Savage described 29 confirmed cases of meningococcal meningitis at the Royal Belfast Hospital for Sick Children and an additional 12 unconfirmed cases based on typical findings consistent with meningococcal disease at post mortem, characterised by presence of a purpuric rash or close contact with a proven case[33]. Savage's paper highlighted the difference in the spectrum of disease presentation, comparing a simple case of meningitis with slow progression and a classical presentation, to a rapidly fatal form of the disease. It is also interesting to note from Savage's paper emerging descriptions of antibiotic resistance with the sulphonamides, which were the mainstay of antibiotic management, 21 years earlier in the Campbell paper[32,33].

From 1995-1998, data on meningococcal disease in Northern Ireland, based on laboratory reports of *N. meningitidis* were published by Public Health officials and data from 1999-present has been based on enhanced surveillance of meningococcal disease notifications validated by laboratory reports. Both "Acute Encephalitis/Meningitis Bacterial" and "Meningococcal septicaemia" are now formally recognised Notifiable Infectious Diseases in Northern Ireland.

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Review Article

Meningococcal Disease Section 2: Epidemiology and Vaccination of Meningococcal Disease in Northern Ireland

MeningoNI Forum (see page **87(2)** 83 for full list of authors)

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As a notifiable disease, the Public Health Agency Northern Ireland are responsible for collecting and collating data on the epidemiology of Invasive Meningococcal Disease (IMD). The epidemiology of IMD has varied considerably over the past two decades in Northern Ireland (Figure 1). The late 1990's saw cases more than double between 1996 and 2000.

Meningococcal Group C vaccine became available that overcame both these problems. This was introduced in late 1999 and had an immediate effect on Group C disease. Following widespread use of the vaccine in 2000, cases of Group C disease fell substantially, so that by 2004 onwards there were very few cases occurring (Figure 1).

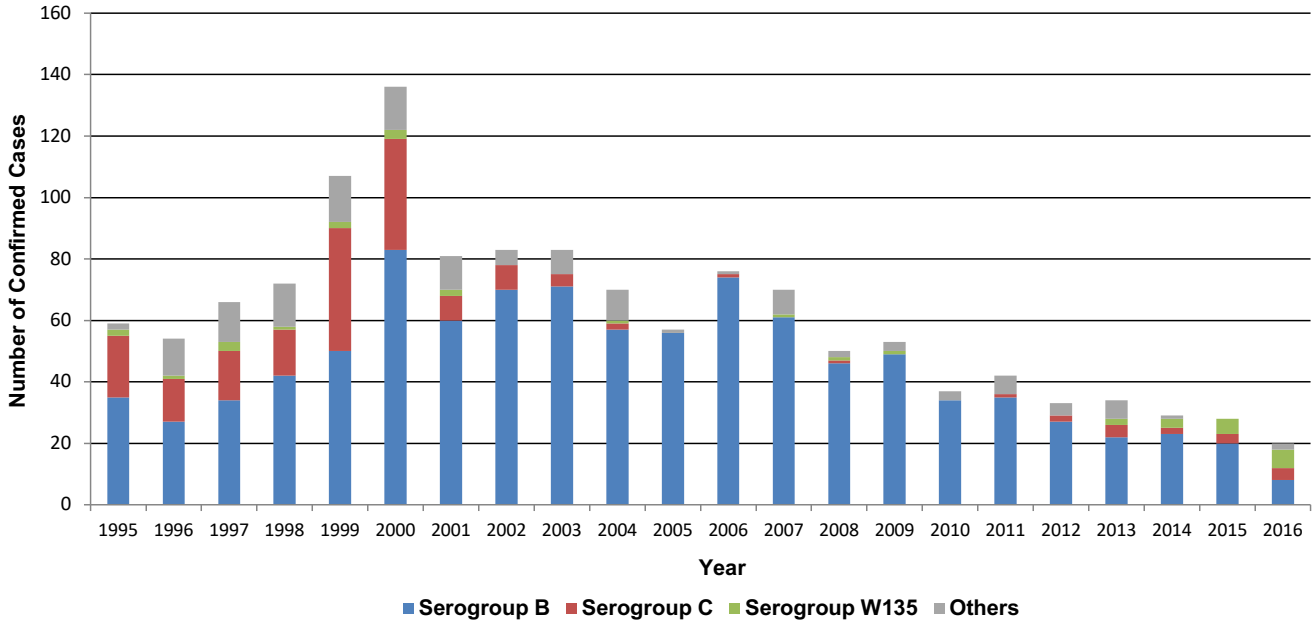

Fig 1. Number of confirmed cases in Northern Ireland of meningococcal disease by serogroup from 1995-2016. (Source of data: Northern Ireland Public Health Agency; http://www.publichealth.hscni.net/directorate-public-health/health-protection/meningococcal-disease)

This was due to an increase in both Group B and Group C disease. Whilst in absolute numbers, Group B disease always remained the most common, Group C disease was increasing at a faster rate and there were serious concerns that it would overtake Group B, as the most common cause of disease.

At that time, there was no vaccine for Meningococcal Group B and although there was a polysaccharide vaccine for Meningococcal Group C, it had a number of significant drawbacks which made it unsuitable for a population-based campaign. It did not stimulate T cells, meaning there was no immunological memory, it produced only short-term protection and it did not work in infants under 18 months of age, who were at highest risk. However, in 1999, a conjugate

Meningococcal Group B disease continued to occur at relatively high levels until around 2007 when its incidence began to fall and for the last five years, the incidence of Meningococcal Group B disease has fallen to its lowest level since epidemiological monitoring began in the mid-1990s. A similar trend has been noted in the rest of the UK.

Figure 2 shows the age distribution of IMD in NI, which demonstrates that this is very much a disease of infants and

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TABLE 1:

A comparison of invasive meningococcal disease (IMD) incidence in 2016 between NI, ROI, England, Scotland and Wales.

	Northern Ireland[a]	Republic of Ireland[b] (2016)	England[c] (Epi Year 2015/16)	Scotland[d] (2016)	Wales[e] (2016)
Incidence (per 100,000 population)	1.1	1.8	1.5	2.0	1.4
No. of laboratory confirmed cases	20	87	805	106	44
Serogroup B (%)	8 (40.0%)	48 (55.2%)	444 (55.2%)	49 (46.2%)	33 (75.0%)
Serogroup C (%)	4 (20.0%)	22 (25.3%)	42 (5.2%)	13 (12.3%)	0 (0%)
Serogroup W (%)	6 (30.0%)	7 (8.0%)	210 (26.1%)	24 (22.6%)	4 (9.1%)
Serogroup Y (5)	Unknown	5 (5.75%)	101 (12.5%)	9 (8.5%)	6 (13.6%)
Others	2 (10.0%)	5 (5.75%)	8 (1.0%)	11 (10.4%)	1 (2.3%)

Sources of data: [a] *Northern Ireland Public Health Agency;* [b] *Health Protection Surveillance Centre, Dublin;* [c] *Public Health England;* [d] *Health Protection Scotland;* [e] *Public Health Wales*

young children, with a second but much smaller peak in late teenage years.

Table 1 details a comparison of IMD incidence in 2016 between NI, ROI, England, Scotland and Wales. The incidence of IMD is lowest in NI (1.1/100,000 population). Meningococcal Group B disease continues to constitute the most common group in NI (40%). An interesting and important phenomenon has developed over the past four years across the UK, which is an increasing number of Meningococcal Group W cases, due to a particular strain: MenW:cc11[1]. In 2016, NI had 30% of its confirmed cases of IMD attributed to Group W, which is the highest level in any of the neighbouring countries and the highest this has ever been in NI. It is particularly virulent and has caused outbreaks in other countries, notably in South America[2]. The situation has similarities to the increase in Men C in the late 1990s and action has therefore been taken (see Meningococcal ACWY vaccine) to tackle this rise in Group W cases[3].

It is also worth mentioning the increase in Group C disease in NI, since 2011, to its current incidence of 20% (Table 1 & Figure 2). It remains unclear what has been the precipitating factor(s) leading to the re-emergence of this disease locally in Northern Ireland. Vaccine uptake rates for Group C have remained high in Northern Ireland since 2011, of greater than 94%[4]. Likewise, there has been a marked increase of Group C disease in the Republic of Ireland[5]. In England, the number of Group C cases reported in 2015/2016 was 45% (n=42) higher than the previous epidemiological year (n=29) and the highest in over a decade[6].

NI VACCINATION

(i) Meningococcal Group C vaccines

Men A&C polysaccharide vaccines have been available since the 1970s, however as outlined above they had significant limitations. In 1999, a Men C conjugate vaccine became available; this was introduced into the primary vaccine schedule, originally being given as a 3-dose schedule at 2, 3 and 4 months of age. During 2000, there was a catch-up programme for those aged up to 18 years and subsequently this was extended to everyone up to 25 years of age. This resulted in herd immunity as well as individual protection and led to the virtual elimination of the disease described above. There have been various changes to the schedule over the years resulting in the current schedule shown in Table 2.

TABLE 2:

Current meningococcal vaccines offered as part of the routine schedule in Northern Ireland as of September 2017.

Vaccine	Age
Meningococcal Group B	8 weeks
Meningococcal Group B	16 weeks
Meningococcal Group C (inc HiB)	1 year
Meningococcal Group B	1 year
Meningococcal ACWY	14 year olds First time university students (up to age of 25y)

PHL England 2015. The green book. Meningococcal, Chapter 22. 2015. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/462629/2904512_Green_Book_Chapter_22_v6_0W. PDF

(ii) Meningococcal Group B vaccine

Meningococcal Group B vaccines were much more difficult to develop due to antigenic variation and commonality to human protein. However, the first vaccine has now been licensed in the UK and from September 2015, has been introduced into the primary immunisation programme. It is given as a three-dose schedule at 2, 4, and 12 months of age.

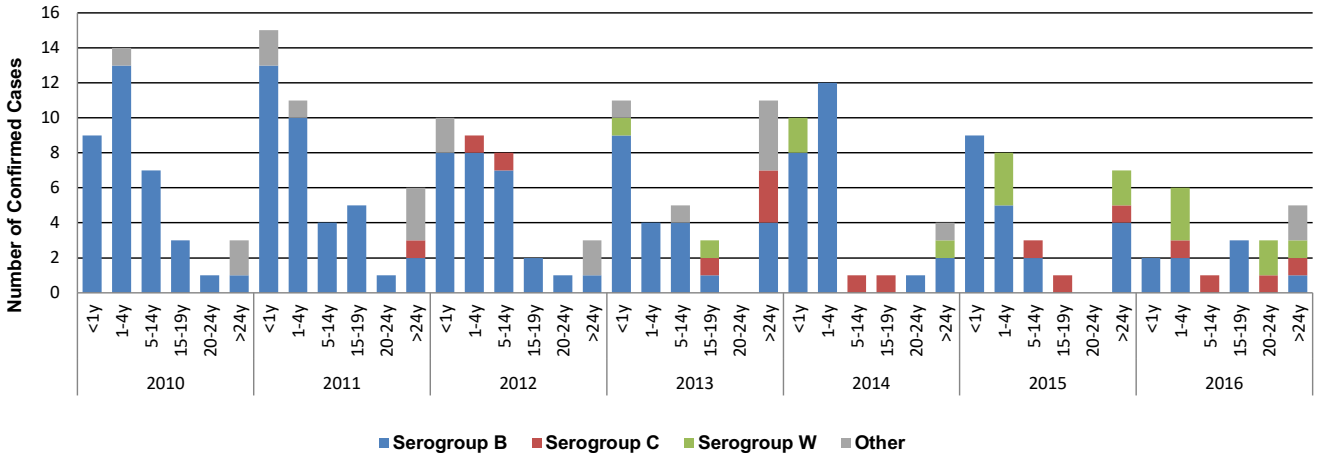

Fig 2. Distribution of confirmed cases of meningococcal disease in Northern Ireland by age and serogroup during the period 2010-2016. (Source of data: Northern Ireland Public Health Agency; http://www.publichealth.hscni.net/directorate-public-health/health-protection/meningococcal-disease)

Recently, a study was undertaken to estimate MenB vaccine coverage of invasive strains in England, Wales and NI, from 2007-8 compared to 2014-15, employing the Meningococcal Antigen Typing System (MATS)[7]. For NI, the MATS 2007-8, coverage was 77.8% (n=18 isolates) and for 2014-15, this was 62.5% (n=8 isolates), although this was not statistically different (p=0.418)[7]. During the same period, the combined England, Wales and NI data showed MATS coverage was 73.1% and 65.7%, respectively[7]. The significance of this data for Northern Ireland is that only 62.5% of culturable NI invasive serogroup B isolates would have been covered by the 4CMenB vaccine[7]. This is an important finding for NI healthcare professionals and parents alike, in that it emphasises the public health message that this new vaccine has not got total coverage for all serogroup B strains, hence prioritising the need for careful local monitoring of clonal types of serogroup B types circulating within NI at any given time. This will allow for the tracking of estimated 4CMenB vaccine efficacy locally.

Clinically, administration of the 4CMenB vaccine in infants has been associated with a high incidence of fever and parents are therefore advised to give three doses of paracetamol after their child has received the vaccine at two and four months of age.[1] Recently, an NI study of infants aged up to 180 days old, and presenting to the Paediatric A&E Department, The Royal Belfast Hospital for Sick Children, from 01 September 2015 through 31 January 2016, showed that 35 infants presented within four days after having received the 4CMenB vaccine[8]. This study estimated that this rate of presentation represented approximately 0.8% of the vaccinated population in the catchment area. Presenting symptoms varied amongst 13 signs, with fever (80%), irritability (71%), reduced feeding (63%) and fever & irritability (57%), being the most common presenting symptoms. All of these infants were given a final diagnosis of a vaccine-related reaction[9].

(iii) Meningococcal ACWY vaccines

Following an increase in cases of Meningococcal Group W disease, the Joint Committee for Vaccination and Immunisation (JCVI) advised an urgent immunisation programme of Meningococcal ACWY vaccine to all teenagers aged 14-18 years old and those starting university for the first time. Initially in 2015, the vaccination implementation was phased, where all those in the age group (date of birth 2/7/96 to 1/7/97) were called by their GP for immunisation and various communication methods were implemented to raise awareness of those up to 25 years old going to university for the first time, to seek the immunisation from their GP[10]. Various data have since been published detailing the MenACWY vaccine uptake rates amongst NI teenagers and first-time university students.[4,11] A comprehensive survey was performed amongst first-time university students, who entered a NI University in September/October 2015 and who were eligible for MenACWY vaccination through the call and re-call GP programme[11]. The survey was completed by 1210 students, including 868 first-time freshers, from Healthcare related, Non-Healthcare related and Engineering/Computing faculties. Vaccine uptake amongst 18y old students was 90.7% and 87.3% in female and male cohorts, respectively, falling to 72.1% and 67.7% (19y cohort) and 32.7% and 39.6 % (20-25y cohort), male and female, respectively[11]. The uptake rate of the MenACWY vaccine in this university cohort was markedly higher than the overall NI uptake rate within this age cohort (54%), with the lowest overall uptake being recorded in the Belfast area (45%)[4].

Students reported that posters, clinics and talks were the preferred methods of communication and not social media[11]. Thirty percent of students falsely believed that administration of the MenACWY vaccine excluded the risk of contracting meningitis. This study concluded that for the successful introduction of any vaccination programme amongst university students, it is fundamental that a multidisciplinary team is established to inform and deliver such a programme in an efficient and timely manner[11].

In 2016, there was a similar catch-up approach, where teenagers born between 2/7/97 and 1/7/99 were called by

their GP to be vaccinated. In addition, in 2016, Year 11 and Year 12 students were vaccinated at school by the NI School Health Service, where vaccine uptake was 79.4% and 78%, respectively[4]. Currently, as the "catch-up cohort" of 14-18-year olds have all been offered MenACWY vaccination, the vaccination of teenagers is now routinely offered by the NI School Health Service in year 11, with a catch-up opportunity in year 12.

Additionally, students aged up to 25 years and starting university for the first time and anyone in the previously eligible cohorts until they turn 25, who have not received the MenACWY vaccine should request this vaccine from their GP[12,13]. Meningococcal vaccines are also offered to patients in certain risk groups in line with recommendations from "Immunisations Against Infectious Disease"[12].

(iv) Changes in NI meningococcal epidemiology following recent modifications in the meningococcal vaccine schedule

Recent changes in the NI meningococcal vaccination schedule, as detailed above, now require careful monitoring of the epidemiology of serogroup variations. It is important to monitor potential variations in serological epidemiology, whenever changes to the vaccination schedule are implemented.

There has been insufficient time to consider the potential effects in NI of the removal of the MenC vaccine at three months of age from July 2016. However, the JCVI has made this recommendation on account of:-

(i) very few cases of invasive MenC disease in infants and young children in the UK, (ii) most cases of MenC disease is in the over 25 years age group, with a history of foreign travel or from persons coming to the UK from abroad, (iii) the MenB vaccine, Bexsero, "provides a degree of protection against invasive MenC disease, dependent on whether the vaccine provided protection against circulating strains", (iv) that vaccination of teenagers should provide good herd immunity, (v) there is a very small risk that removal of the three month MenC vaccine now could increase the risk of exposure to MenC amongst infants in the short term and (vi) there is evidence from other European countries (The Netherlands and Switzerland) that good control of MenC in infancy is through herd protection and not through the employment of the MenC conjugate vaccination in infancy[14].

This situation requires careful monitoring and analysis during the current and future epidemiological years.

To date, it is too premature to evaluate the effectiveness of the MenACWY vaccination in NI in teenagers/adolescents. In NI, cases of MenW since 2015 have been in the 1-4-year-old category (n=6; 54.5%) and in the >20 year old category (n=5; 45.5%) (Figure 2). Therefore, great reliance has been placed in effective herd immunity of our local teenage population and the MenACWY programme, as well as potential cross coverage of other non-Group B serogroups. In a recent study at the University of Nottingham, MenW carriage increased from 0.7% to 8%, from September 2015 through March 2016, in a population of University students, where the MenACWY vaccine uptake was 71%[15]. This study demonstrates that students may act as vehicles for the increased carriage and transmission of MenW even in the presence of the MenACWY vaccine[15].

Other scenarios present in NI, which are unique to NI, namely the sharing of a land border with another EU member state,

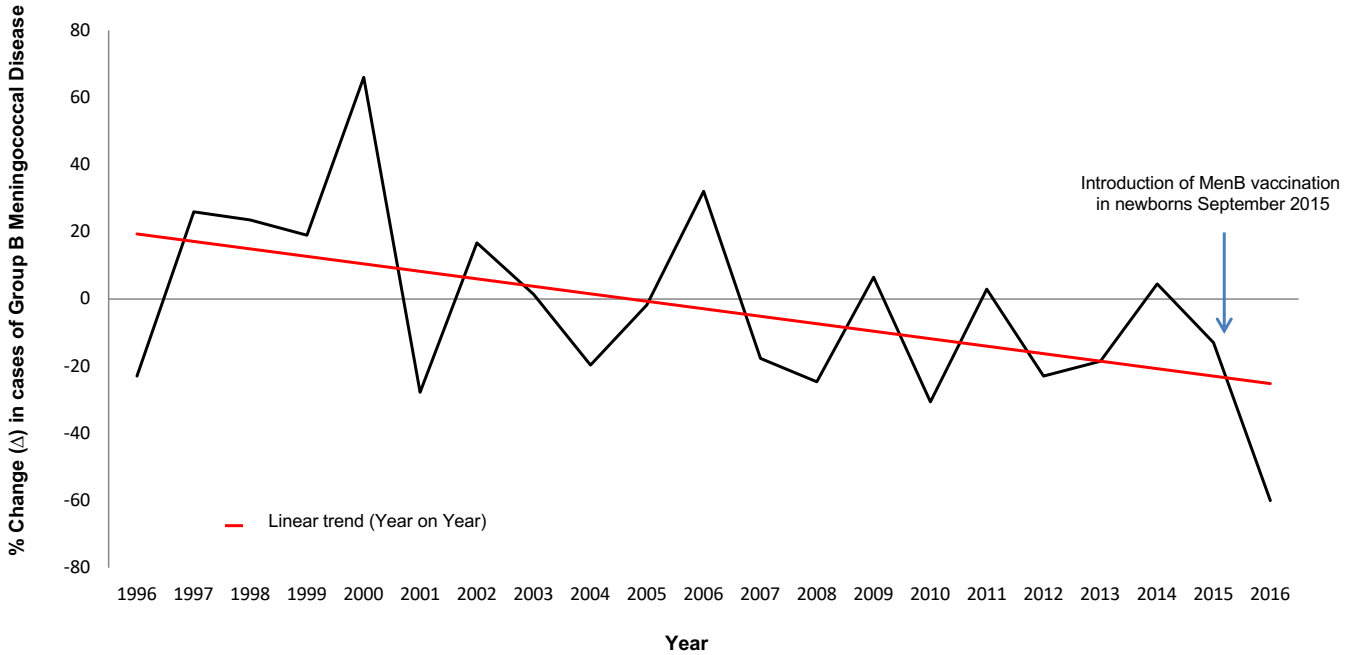

Fig 3. Year-on-year change on serogroup B meningococcal disease in Northern Ireland (1996-2016).
(Source of data: Northern Ireland Public Health Agency; http://www.publichealth.hscni.net/directorate-public-health/health-protection/meningococcal-disease)

with differences in their meningococcal vaccination schedule. The absence of the MenACWY vaccination programme in the Republic of Ireland has led to confusion amongst ROI university students and their parents, regarding access to the NI MenACWY vaccination programme. Operation of different meningococcal vaccination schedules in two jurisdictions on a single island presents a challenge to effective herd immunity and therefore requires careful monitoring.

In contrast to these scenarios, it is interesting to examine the changing epidemiology of MenB disease in NI, alongside the introduction of the MenB vaccine in newborns from September 2015. Figure 3 shows year-on-year changes in the incidence of MenB disease in NI from 1996 – 2016. Overall, there has been a marked reduction in MenB cases even in the absence of a MenB vaccine. However, there has been an unprecedented reduction of 77.8% of MenB cases in the <1 year olds, after the MenB vaccine was introduced in September 2015, which is higher than the 50% incidence rate ratio (IRR) reduction in MenB cases in England[7].

(v) Travel Vaccines

A number of outbreaks of meningococcal disease have been linked to the Muslim Hajj pilgrimage to Mecca in Saudi Arabia, at first due to A strain in 1987[16] and then in 2000/2001 caused by the W135 strain[17]. Similar outbreaks occurred world-wide after pilgrims returned to their home countries. In response to these outbreaks, quadrivalent ACWY vaccination has been a compulsory entry requirement into Saudi Arabia for pilgrims, visitors and seasonal workers planning to travel to Saudi Arabia for Hajj and Umrah or during this period. The vaccine should be given to travellers over two years old, at least two to three weeks before travel, but not less than 10 days. In addition to these vaccine requirements, visitors entering Saudi Arabia from sub-Saharan countries (namely Benin, Burkina Faso, Cameroon, Chad, Central African Republic, Côte d'Ivoire, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Senegal, Sudan and South Sudan, also require antibiotic prophylaxis [ciprofloxacin; 1 x 500mg tablet] at port of entry to Saudi, to lower the rate of carriers among adults and children over 12 years[18]. The Saudi Arabian Embassy requires that visitors and workers submit a certificate of vaccination with the quadrivalent MenACYW135 vaccine against meningitis issued no more than three years and no less than 10 days before arrival in Saudi Arabia[19].

The Muslim Council of Britain (MCB) has set up vaccination clinics in England, Wales and Scotland to facilitate administration of the vaccine at a subsidised cost of £35. This service does not include Northern Ireland. GP practices and Travel Clinics can be contacted for information on vaccination in Northern Ireland. The total population of the Muslim community in Northern Ireland (from the 2011 census) is around 4000 individuals, however, the Belfast Islamic Centre believe that this value is closer to 10,000 individuals drawn from 42 nationalities. It is not possible to give accurate estimation the number of people going to Hajj or Umrah in Northern Ireland, as most travel for Hajj is organised by travel agencies in London and Dublin.

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Review Article

Meningococcal Disease Section 3: Diagnosis and Management

MeningoNI Forum (see page **87(2)** 83 for full list of authors)

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CLINICAL ASPECTS OF THE DISEASE

In a career lifetime, an average GP is likely to see only a handful of cases of meningitis. Despite this, at early presentation, meningococcal disease and in particular, meningitis, can have very non-specific symptoms, especially in children and may not demonstrate the tell-tale signs of non-blanching rash, neck stiffness, bulging fontanelle (in babies) etc. For this reason, GPs see many children with vague symptoms and in order to avoid missing a case, there can be precautionary hospital admissions, following a low threshold for reviewing a young child with symptoms.

Acute illness caused by *N. meningitidis* can result in meningitis and/or septicaemia. A mixed picture of invasive septicaemia and meningitis occurs in approximately 12% of cases, and the remainder include alternative sites of infection, including meningococcal pneumonia, monoarthritis, pharyngitis, as well as relatively mild meningococcaemia[1].

The classical clinical symptoms and signs of meningitis due to meningococcal infection include acute headache, photophobia, neck stiffness, nausea and vomiting and a petechial rash and typically only occur in older children and adults[2]. Elderly patients are less likely to present with neck stiffness and are more likely to present with altered consciousness compared to those aged <30 years[3]. As well as septicaemia, cause of death from meningitis may be related to raised intracranial pressure. When septicaemia is present either at the outset or as a complication the disease may advance very quickly with circulatory shock and reduced level of consciousness.

In infants and young children, who are most commonly affected by meningococcal disease, the features are less classic and meningitis and septicaemia may occur together. Features include fever, poor feeding, vomiting, irritable on handling, drowsiness, staring or vacant expression, bulging fontanelle and seizures. Cases of septicaemia will have increasingly poor circulation with cold mottled peripheries, prolonged capillary refill time, increased work of breathing and eventually unresponsiveness and death. The purpuric rash which aids diagnosis may be present early but often develops as the child is deteriorating.

Early diagnosis of meningococcal disease is very important given that it can lead to death in a healthy person within 6-12 hours of the first appearance of symptoms. Its course typically starts with non-specific vague features with fever but often then rapidly evolves. These early prodromal symptoms are non-specific, such as those typically found in common viral respiratory tract infections, including fever, headache, sore throat and coryza, as well as irritability, loss of appetite, nausea, vomiting. Early warning red alert signs include limb pain, skin discolouration, increased work of breathing and cool peripheries[4]. Because the early prodromal features are non-specific the National Institute for Health and Care Excellence (NICE) Guidance on Fever in under 5s [CG160] strongly recommends that when febrile children are being discharged parents should be given information on when to seek further help[5].

Recently, there have been several seminal publications on the diagnosis, treatment, prevention and control of meningococcal disease. Most notable have been two sets of guidelines published in 2016, namely the "*Global Meningococcal Initiative (GMI) Guidelines for the diagnosis and confirmation of invasive meningococcal disease*"[6] and the "*The UK Joint specialist societies guidelines on the diagnosis and management of acute meningitis and meningococcal sepsis in immunocompetent adults*"[7]. These comprehensive guidelines are an excellent reference resource for clinicians and microbiologists alike.

MICROBIOLOGICAL DIAGNOSIS

Conventional microbiology workup on peripheral blood and/or CSF for the diagnosis of meningococcal disease is performed at the major hospitals in Northern Ireland, as detailed in Table 1. Recently, the UK Standards for Microbiology Investigation issued an update on the investigation of cerebrospinal fluid and this forms the cornerstone for laboratory diagnosis[8].

Gold standard culture methods for meningococcal diagnosis are too slow and frequently compromised by prior antibiotic treatment. The development and application of sensitive quantitative Polymerase Chain Reaction (qPCR) assays has significantly improved laboratory detection rates and has reduced the time required to confirm invasive meningococcal disease[9-11]. Typically, molecular testing protocols follow a

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TABLE 1:

Laboratory microbiology workup on peripheral blood and/or CSF for the diagnosis of meningococcal disease as performed at the major hospitals in Northern Ireland

Site	Primary Culture*				Latex	Sens	ID	PCR
AAH	CBA	35 - 37°C	5 - 10% CO_2	48Hrs	Wellcogen antigen test	ETest	MALDI-TOF	Manchester (Confirmation, typing and sensitivities)
	Choc	35 - 37°C	5 - 10% CO_2	48Hrs	(if adult non blood stained WBC count > 5 /mm^3)			
					(if neonate non blood stained WBC count >30)			
RVH	CBA	34 - 38°C	5 - 10% CO_2	48Hrs	Pastorex Meningitis Kit	ETest	MALDI-TOF or Vitek2	Regional Virus Laboratory (RVL) [Confirmation, serogroup type]**
	Choc	34 - 38°C	5 - 10% CO_2	48Hrs	(if WBC count abnormal)			
CAH	CBA	35.5°C	5 - 10% CO_2	48Hrs	None	Etest	API NH	Manchester (Confirmation, typing)
	Choc	35.5°C	5 - 10% CO_2	48Hrs				RVL Virology if PCR requested on form
UH	CBA	35 - 37°C	5 - 10% CO_2	48Hrs	Pastorex Meningitis Kit	Etest	Vitek2	RVL [Confirmation, serogroup type]
	Choc	35 - 37°C	5 - 10% CO_2	48Hrs	(if WBC count > 50 /mm^3)			

Abbreviations:
AAH=Antrim Area Hospital, CAH=Craigavon Area Hospital, RVH = Royal Victoria Hospital, UH=Ulster Hospital, CBA = Columbia Blood Agar, Choc = Chocolate Agar

* HSC Clinical Microbiology Laboratories in Northern Ireland base their SOPs off the UK Standards for Microbiology Investigations, Investigation of Cerebrospinal Fluid (SMI B27) which is produced in association with several groups including the Northern Ireland Microbiology Forum And Audit Group.

** Current practice is for qPCR testing (ctrA TaqMan) to be performed in Belfast. Positives are all typed by qPCR (siaD TaqMan) with ctrA LAMP also used for confirmation, especially of "discrepant" results

two stage process (i) confirmation of infection using specific qPCR detection of *N. meningitidis ctrA* gene (capsule transport gene) (ii) identification of meningococcal serogroup by qPCR analysis of specific conserved regions within *N. meningitidis* capsular biosynthesis (*cps)* locus[9]. A positive qPCR result for a normally sterile site specimen e.g., blood and/or CSF is regarded as definitive for meningococcal diagnosis[12]. Despite concerns regarding detection of carriage strains, molecular testing of respiratory specimens in clinical context is increasingly recognised as a valuable adjunct[13-15]. NICE acknowledge the proven clinical utility of molecular assays (qPCR) for meningococcal diagnosis, but also note that such assays are not available in most NHS hospitals due to resource limitations[12]. Currently, qPCR remains the preserve of a limited number of centralised reference laboratories who possess the necessary infrastructure, equipment and technical skills to routinely deliver an effective service. The time required to transport samples to centralised laboratories ultimately means that molecular detection of meningococci has little or no impact on patient management, whereby such testing merely confirms an initial clinical diagnosis and provides epidemiological data on circulating strains[16,17]. Recently, the Regional Virus Laboratory at the Royal Victoria Hospital has developed a Loop-Mediated Isothermal Amplification (LAMP) molecular assay, comprising a high activity strand displacing enzyme, nucleotides and Mg^{2+} and a minimum of four or a maximum of six primers targeting a total of six or eight specific regions on target sequence, resulting in an assay with stringent specificity. This assay offers performance equivalent to reference laboratory qPCR testing and this LAMP technology has opened up the ability to perform rapid detection of *N. meningitidis* in any health care setting in less than 60 minutes[15,18,19]. Compared to qPCR, LAMP offers several advantages including simplified methodology, quicker reaction time and lower instrument costs combined with visual detection of positive reactions. LAMP is also highly resilient to inhibition and is capable of being applied to crude specimen preps which increases their potential for use in resource limited environments[20].

Testing of respiratory specimens (i.e. nose, throat or nasopharyngeal swabs) to detect meningococci using conventional culture methods is often discouraged, unless the objective is to detect meningococcal carriage. Indeed, throat and nasopharyngeal swab cultures have been used for decades to recover both pathogenic capsular strains and non-pathogenic non-capsular strains in carriage studies[21]. However, there is growing evidence that direct molecular testing of respiratory specimens is useful for diagnosis of meningococcal disease in children[14,16]. Carriage rates are very low in young children and employment of the sensitive LAMP assay to specifically detect capsular strains has shown very high positive and negative predictive values in a recent clinical study[15]. Rapid molecular testing of non-invasive

respiratory specimens could help clinicians to identify the many children with meningococcal disease who are not diagnosed when they first present to healthcare[4]. In addition to improving diagnosis of disease, molecular testing of respiratory swabs has also been useful to detect carriage in adolescents. Currently a meningococcal carriage study is being undertaken of undergraduate students in Belfast, employing direct molecular testing of self-collected throat swabs using real-time PCR and LAMP to identify carriers of serogroups B, W and Y.

CLINICAL MANAGEMENT

(i) *Paediatric intensive care*

Paediatric intensive care unit (PICU) management of meningococcal disease is extremely challenging. Patients suffering from the same infection differ in host response to the infection ranging from a mild influenza-like illness to fulminant sepsis with multiple organ failure[22]. Children with meningococcal disease usually present to the district general hospital where the initial resuscitation and administration of antibiotics takes place. Thereafter those with evidence of on-going shock will be transferred, usually ventilated, to the PICU. A paediatric retrieval team based in the Royal Belfast Hospital for Sick Children undertakes the majority of these transfers.

Fig 1. Continuous Veno-venous Haemofiltration (CVVH) has been introduced as a treatment option in Northern Ireland and has been available in the PICU, RBHSC since 2013.

Treatment of meningococcal disease follows well defined principles of managing severe sepsis in children[23]. In brief this consists of aggressive intravenous fluid resuscitation with administration of crystalloid boluses of up to 60ml/kg in the first fifteen minutes of presentation, antibiotic therapy and frequent reassessment of response to therapy. This is followed by intubation and controlled ventilation. This requires the administration of anaesthetic drugs and muscle relaxants and is frequently associated with haemodynamic instability. This can be minimised with cautious dosing, fluid loading and use of peripheral intravenous adrenaline as an inotrope. Goals of controlled ventilation include reduced oxygen demand and tighter control of arterial carbon dioxide levels. The latter is important in regulating cerebral blood flow in children with meningitis and raised intracranial pressure. Pragmatically, ventilation also allows easier placement of arterial and central venous lines and may assist in preventing pulmonary oedema, secondary to capillary leak and massive volume resuscitation. Some children with severe sepsis will require in excess of 200ml/kg of resuscitation fluid in the first 24 hours, despite concomitant use of inotropic therapy. To put this in context, this volume is almost three times the circulating blood volume.

Whilst the meningococcal bacterium is usually killed by the administration of a cephalosporin, the inflammatory process triggered by this contributes to the morbidity and mortality associated with this disease. As the sickest children are looked after in the PICU, it is usually here that

TABLE 2:

Definitions of cases requiring public health action[11]

Cases requiring public health action
Confirmed case
Clinical diagnosis of meningitis, septicaemia or other invasive disease (e.g. orbital cellulitis, septic arthritis)
AND at least one of:
• *Neisseria meningitidis* isolated from normally sterile site
• Gram negative diplococci in normally sterile site
• Meningococcal DNA in normally sterile site
• Meningococcal antigen in blood, CSF or urine.
NB: Although not meeting the definition of a confirmed case, meningococcal infection of the conjunctiva is considered an indication for public health action because of the high immediate risk of invasive disease.
Probable case
Clinical diagnosis of meningitis or septicaemia or other invasive disease where the consultant in health protection, in consultation with the physician and microbiologist, considers that meningococcal infection is the most likely diagnosis. Some microbiological tests (e.g. rising antibody levels) that are not considered sufficient to confirm the diagnosis of meningococcal disease may change the case category from 'possible' to 'probable'.
Cases not requiring public health action
Possible case
Clinical diagnosis of meningitis or septicaemia or other invasive disease where the consultant in health protection, in consultation with the clinician and microbiologist, considers that diagnoses other than meningococcal disease are at least as likely. This category includes cases who may have been treated with antibiotics but whose probable diagnosis is viral meningitis. In such cases, prophylaxis for contacts is not indicated, but giving out information about meningococcal disease may be helpful.

the feared complications of limb-loss and brain injury are manifest. Whilst fluid loading is recognised as lifesaving, the development of severe fluid overload with capillary leak syndrome and severe tissue oedema can compromise the blood supply to the limbs. This is compounded by the use of vasoconstrictive agents used in order to maintain an adequate blood pressure and support vital organ perfusion. Early fasciotomies may be needed to relieve compartment pressures in the hope of salvaging the limbs. Fluid overload is increasingly recognised in the intensive care literature as contributing to the morbidity associated with intensive care[24]. This, coupled with acute kidney injury, secondary to sepsis, has led to the use of modified forms of dialysis instituted on the PICU. Recently, Continuous Veno-venous Haemofiltration (CVVH) has been introduced as a treatment option in Northern Ireland and has been available in the PICU, RBHSC since 2013 (Figure 1). This therapy uses a haemofilter to allow precise control of fluid removal from the plasma. Removed ultrafiltrate contains cytokines and starting this therapy often allows a reduction in the vasopressor requirements for that patient. This "dirty" ultrafiltrate is replaced with a balanced electrolyte solution to maintain haemodynamic stability. By not fully replacing small amounts of the ultrafiltrate, very precise fluid balances may be achieved in order to reduce tissue oedema.

(ii) *Local antibiotic management*

Current local antibiotic treatment recommendations for meningitis were consulted through publically available web-based guidelines. Three HSC Trusts, namely Belfast, South Eastern and the Western Trusts utilised the 'Microguide' app and the Northern Trust used the 'RxGuidelines' platform.

All guidelines recommend the use of an IV Cephalosporin as first line treatment for adult meningitis, with the Western Trust recommending Cefotaxime 2g qid IV, the Belfast and South Eastern Trusts both recommending Ceftriaxone 2g bd IV and the Northern Trust recommended either of these two cephalosporins first line. These two antibiotics have been described as' two peas in a pod' as they are third generation cephalosporins with very similar activity against meningococci, pneumococci and *Enterobacteriacae*. All four Trust apps recommend the addition of Amoxicillin 2g four hourly IV, if the patient is immunocompromised or pregnant.

All four guidelines recommend Choramphenicol 25mg/kg qid IV in severe penicillin allergy with the addition of Cotrimoxazole 1.44g bd IV in patients who are immunocompromised, pregnant or aged over 55/50 as previously outlined above. The Northern Trust guideline alone advised that pregnant cases where Co-trimoxazole was been considered should first be discussed with microbiology as treatment choice would then be based on risk benefit and could include Cotrimoxazole, Meropenem and Vancomycin.

Advice on the use of steroids in adult meningitis was outlined by two trusts. The Northern Trust advised that steroid therapy was only indicated for patients with meningitis but not septicaemia and that steroids should not be utilised in those with impaired consciousness level, focal or lateralised neurological signs, markedly raised opening pressure at LP or evidence of cerebral oedema on brain scan. The Belfast Trust guideline advise that steroids should be given when pneumococcal meningitis is suspected, for example in recent ear infection, age over 65 and in people with underlying health problems. This guideline also advises that steroids should be continued if there is frankly purulent CSF with Gram positive cocci on Gram stain or if pneumococcal infection is confirmed, but that steroids may be discontinued if CSF analysis is not consistent with bacterial meningitis, i.e. CSF is not purulent, the WCC is less than 1000, CSF protein is less than 1gm/L. It states that steroids should also be stopped if another pathogen other than pneumococcus is found and that steroids are contraindicated following recent neurosurgery or in immunosuppression.

Full prescribing details for the antibiotic and clinical management of meningococcal disease in adults have recently been published by the UK Joint Specialist Societies, entitled "*The UK Joint Specialist Societies Guidelines on the diagnosis and management of acute meningitis and meningococcal sepsis in immunocompetent adults*"[7]. These may be freely obtained at the following link:-

http://www.journalofinfection.com/article/S0163-4453(16)00024-4/fulltext

Similarly, for children under 16 years, NICE have recently (February 2015) updated their previous Clinical Guideline (CG102) on "*Meningitis (bacterial) and meningococcal septicaemia in under 16s: recognition, diagnosis and management*"[12], which may be found at the following link:-

https://www.nice.org.uk/guidance/cg102

Accurate diagnosis can influence the duration of treatment in children and young people. If meningococcus is identified, e.g. using qPCR or LAMP testing (confirmed meningococcal disease), NICE guidance recommends treatment with IV Ceftriaxone for 7 days[12]. If no specific bacterial pathogen is identified (unconfirmed bacterial meningitis) NICE recommends IV Ceftriaxone for at least 10 days. Duration of IV antibiotic treatment for other (confirmed) causes of bacterial meningitis may be significantly longer; 21 days or more, depending on the pathogen identified[12].

PUBLIC HEALTH MANAGEMENT

Acute bacterial meningitis or meningococcal septicaemia are on the lists of statutory notifiable diseases in Northern Ireland. All doctors have a legal responsibility to notify the Public Health Agency if they suspect that a patient is suffering from one of these diseases. The Public Health Agency duty room (0300 555 0119) should be contacted and the cases assessed and categorised as detailed in Table 2: If a case is categorised as "confirmed" or "probable" meningococcal disease, then the Public Health Agency will arrange for antibiotic prophylaxis to be given to close contacts. These contacts are usually

defined as anyone who had an overnight stay in the same household as the case in the seven days prior to the onset of symptoms. The first line antibiotic choice is now ciprofloxacin in most cases[13].

Although the overall risk to household contacts is low, if prophylaxis is not given, the absolute risk to an individual in the same household, one to 30 days after disease onset in the index case, is about one in 300 of also developing disease. Chemoprophylaxis aims to reduce the risk of invasive disease by eradicating carriage of meningococci in the close household contacts. Chemoprophylaxis acts by eradicating carriage from established carriers who pose a risk of infection to others and also to eradicating carriage in those who have newly acquired the invasive strain and who may themselves be at risk of developing disease.

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Review Article

Meningococcal Disease Section 4: Post Disease Complications, Charity Support and Future Perspectives

MeningoNI Forum (see page **87(2)** 83 for full list of authors)

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POST DISEASE COMPLICATIONS & MANAGEMENT

Advances in the acute identification and management of meningitis have improved substantially over the last number of years. However, studies have suggested that the improvement in acute care has not been paralleled by comparable developments in post-acute management of the cognitive, emotional and behavioural sequelae of the condition. The implications of this are particularly acute in the case of children, where the meningitic process impacts on the child's rapidly developing brain.

Like any condition impacting on the central nervous system, meningitis can result in direct and indirect impacts on affected person's function. Processes linked with the underlying infective process can directly result in focal areas of damage in the central nervous system, the implications of which can take time to emerge. For this reason, it is vital that children and families have the capacity to re-access community-based support, to assist them in assessing, managing and rehabilitating post-condition difficulties. Equally, the indirect impact of a life-threatening condition on the family should not be underestimated. Viner et al (2012), noted that some of the deficits noted in children post-meningitis could possibly be related to the hospitalisation experience, rather than the underlying condition[1]. In the context of a case-control study of meningococcal serogroup B disease (n=537) Viner et al reported that a tenth of their sample had major sequelae resulting in major physical or neurological disability, including major amputations, very low IQ, seizures, moderately severe bilateral hearing loss and major hearing loss[1]. In addition, over a third of survivors had minor deficits, such as psychological disorders, borderline IQ, digit amputations, minor or unilateral hearing loss and minor communication deficits[1]. Sweeney et al (2013) found that following childhood meningitis, parents desired better education and knowledge from health care professionals, improved access to information about short and long-term sequelae and easier access to follow-up support and advice[2]. Recent local service publications by the Regional Acquired Brain Injury Implementation Group (RABIIG)[3] have highlighted the longer-term, post-acute issues that can impact on children and families post-meningitis and place an onus on all services (acute and community based) to better recognise post-illness difficulties and commission services accordingly, thereby allowing easier and better access to post-injury support.

THE CHARITIES PERSPECTIVE

Meningitis Now and the *Meningitis Research Foundation* are the cornerstone with respect to meningitis awareness and information to all stakeholders with an association with the disease. Equally, their remit extends beyond awareness and information, as highlighted below.

Meningitis Now

Meningitis Now (www.meningitisnow.org) was initially established as a local support group based in the South West of England and has grown over the last 32 years, into a national charity covering all of the UK. The charity has been involved in vital research to support the development and introduction of meningitis vaccines, saving lives through awareness campaigns and has supported people as they have rebuilt their lives after meningitis. Their vision is "*…a future where no one in the UK loses their life to meningitis and everyone affected gets the support they need to rebuild their lives*".

In Northern Ireland, *Meningitis Now* has offered practical, emotional and financial support for all those living with the impact of the disease, through a nurse-led helpline, visiting families in their own homes, offering a range of therapies, including counselling and complementary therapies and providing financial assistance for unexpected costs following meningitis. Family days offer a day of fun and give families the opportunity to meet others who have also been affected by meningitis. *Meningitis Now* is committed to various campaigns, which are driven by their stakeholders' needs and expectations. Such campaigns have been UK-wide and have included; *Beat it Now*!, which successfully supported the recent introduction of the MenB vaccine, the awareness campaign, "*Don't wait for a rash*" and the *Education Campaign*, which aimed to get the hidden impact of meningitis recognised, making sure that children affected get the support they need during their education. In addition, more recently, *Meningitis Now* has created the world's first meningitis aware recognition mark (MARM), comprising of a short online course that will educate and provide free materials and ongoing support for pharmacists and universities.

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As a charity, *Meningitis Now* receives no central government funding and as such, relies on communities to help raise the £4 million needed to support people facing meningitis every year. *Meningitis Now* funds high quality research with the ultimate aim of preventing and eradicating all forms of meningitis and associated disease. In the past, such research has been focused on developing new vaccines and increasing the understanding of how vaccines work. This remains a vital part of the charity's research strategy, as there are still disease-causing organisms/strains, which are not covered by current vaccines. In addition, the charity also funds research that is focused on preventing meningitis through other means.

Meningitis Research Foundation (MRF) in Northern Ireland

MRF (www.meningitis.org) has an excellent understanding of the impact of meningitis and septicaemia drawn from members' personal experiences. They support local families affected through their Helpline, website, one-to-one home visits, telephone befriending network, high quality and freely available information leaflets on the diseases and after-effects, online Book of Experience, members' days and Disability Rights and Benefits information. MRF work together with over 400 members and thousands of supporters who reside in NI. MRF's ability to deliver life-saving work for over 25 years has been enhanced through member and supporter fundraising, the signing of petitions for vaccine implementation, sharing personal experiences with media and participation in research projects. The charity works with local communities and supports healthcare professionals in response to incidence of the disease, as well as schools, universities, nurseries, community groups, community healthcare settings and with the NI Public Health Agency. MRF's medical guidelines are endorsed and distributed in A&E departments, critical care and community settings.

The charity receives a DH grant of £14,388 annually for awareness and support activities in NI and supports public awareness media campaigns and provides targeted information talks and information literature for key local health professionals and 'at risk' community groups. Examples include; *#StopTheSpread* (of MenW) campaign for university freshers; *Meningitis BabyWatch* cards, which are distributed to new parents via Council Registrars.

The charity has developed excellent resources to help in the medical training of doctors and nurses in NI, where MRF supports training sessions for QUB Medical and Nursing students. MRF has produced a handbook entitled "*Lessons from research for doctors in training: recognition and early management of meningococcal disease in children and young people*", which has been endorsed by the Royal College of Paediatrics and Child Health and the College of Emergency Medicine. This booklet has been updated in line with NICE guideline CG102 and uses real-life case histories as a learning tool. In addition, there is an interactive e-learning tool version that enables doctors to learn from real cases of meningitis and septicaemia. It is based on a nationwide study, funded by MRF, that highlights where doctors make errors in diagnosis and management. Integrating text, video clips, clinical photos, sound files, charts and illustrations, allows the user to evaluate steps in the diagnosis and management of each case presented. These resources may be accessed at the following link: www.meningitis.org/health-professionals/doctors-in-training

Meningitis Research Foundation's vision is "a world free from meningitis and septicaemia". The charity aims to achieve this by funding research into prevention, detection and treatment of meningitis and associated infections. The research is of the highest merit, in terms of the importance, excellence and probability of success. Since the charity was founded, over £19.1m/Euro24.7m has been invested in 161 research grants in UK, Ireland and globally. Locally, a DNA fingerprinting study at the Northern Ireland Public Health Laboratory, Belfast City Hospital employed partial 16S rDNA PCR and automated sequencing technique to identify non-culturable causal agents of bacterial meningitis from peripheral blood samples and culture-negative CSF specimens in patients with suspected acute meningitis. Overall, this study showed that 16S rRNA broad-range PCR combined with direct DNA sequencing is a valuable molecular tool to aid with the detection as well as identification of non-culturable aetiological agents of acute bacterial meningitis and can augment culture methods in the diagnosis of central nervous system infections in patients who have been treated with antibiotics[4,5]. In addition, MRF has continued to fund further research into improved diagnostics through the development of the rapid diagnostic test, Loop-Mediated Isothermal Amplification (LAMP) molecular assay, in collaboration with BHSCT and QUB[6,7]. There are currently 19 active research projects throughout the UK and overseas, including the MRF-MGL, which was launched in 2012.

CONCLUSIONS

After approximately 160 years since its first report in Northern Ireland, there has been a significant change in the local epidemiology of meningococcal disease, which has been in part due to the development of meningococcal vaccines. Developments in both the diagnosis and management of patients with meningococcal disease have led to a better outcome. However, we must not become complacent, as unlike smallpox, meningococcal disease has not been eradicated and more recently, the evasive nature of this bacterium has allowed for the emergence of new and more aggressive clonal strains (Men cc11). In order to remain vigilant locally in NI to this evolving disease pathophysiology, it is important that we monitor this changing epidemiology, as well as introduce innovations in disease prevention, diagnosis, treatment and management, as highlighted in Table 1. With these aspirations, we look forward to helping to minimise the burden of meningococcal disease in Northern Ireland.

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All authors are members of the Northern Ireland Meningococcal Stakeholders' Forum (MeningoNI). MeningoNI offers a forum for education and discussion of matters with a broad interest to meningococcal disease, allowing key local stakeholders the opportunity to consider recently evolving meningococcal disease in the context of detection and characterisation, microbial pathogenesis, epidemiology, disease prevention and vaccinology. Meningo NI has been supported by an unrestricted educational grant provided by Novartis Vaccines.

TABLE 1:

Future aspirations with respect to meningococcal disease in Northern Ireland, as highlighted by relevant local stakeholders.

Discipline	Future Aspirations
Public Health	In the short term: uptake of Men B vaccine will be as good as other childhood vaccines in NI and a high uptake across NI of all meningococcal vaccines, leading to a fall in the number of cases. In the longer term: a Men B vaccine will be developed that covers all strains of Men B and also protects against carriage of the organism.
Travel vaccination	The establishment of a body, with the help of the Belfast Islamic Centre, to estimate the number of people going to Hajj in order to facilitate the vaccination and other services needed.
General Practice	A future where bacterial meningitis is in the same category of measles or even polio and is so unlikely that parents, families and indeed family doctors could rest assured that a sick loved one is not developing this devastating disease.
Laboratory service	Currently in NI molecular diagnosis of meningococcal disease is fragmented with some local Trusts availing of a 'send away service' provided by Meningococcal Reference Laboratory, Manchester and others employing the services of Belfast Health Trust for meningococcal confirmatory testing and serogroup determination. Ideally in the future, regional microbiology laboratories/ A&E departments/ Health centres should have the option/capacity to rapidly confirm meningococcal disease using appropriate molecular technologies. This would lead to earlier ruling in or out of meningococcal disease cases particularly in early stage disease and increase meningococcal detection in culture negative specimens. Additionally, the facility to type of all meningococcal positives regionally would reduce fragmentation and improve turnaround times for PHA locally. Funding is secured on a rolling basis to ensure that NI meningococcal isolates are analysed via MATS to track local NI coverage of the 4CMenB vaccine against local isolates.
Clinical management team	The host response is extremely complex and variable. Future developments in genomics, proteomics and metabolomics will potentially direct a therapy tailored to the individual.
Antimicrobial therapy	Rapid real time near patient microbiological analysis of CSF, blood and other samples in the coming years will hopefully maximise the currently conflicting outcomes of optimal patient management and antibiotic stewardship.
Research	Ongoing collection of baseline data regarding rates and epidemiology of meningococcal carriage in Northern Ireland would help to inform future decisions about diagnostic testing and vaccination. Enhanced collaboration with public health/clinical microbiology between NI and ROI to tackle meningococcal disease on an "all-island" basis.
Long Term Support Services	Post-acute issues that can impact on children and families post-meningitis place an onus on all services (acute and community based) to better recognise post-illness difficulties and commission services accordingly, thereby allowing easier and better access to post-injury supports.
Charities	Perspectives from Charity Partners: *Meningitis Now*- Our vision for Northern Ireland is a future where no one loses their life to meningitis and everyone affected gets the support they need to rebuild their lives. *Meningitis Research Foundation*- We are pleased to have actively contributed towards the success of current vaccines and continued funding for new research including vaccine research is central to our future plans.

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Presidential Address

Medical Myths and Legends

Presidential Address to the Ulster Medical Society. 6th October 2016

Patrick J Morrison

'I daresay you haven't had much practice', said the Queen. 'When I was your age, I always did it for half-an-hour a day. Why, sometimes I've dispelled as many as six medical myths before breakfast. There goes the shawl again!'

– abridged from, and with apologies, to **Lewis Carroll**.

I have chosen six myths that have been dispelled over my career in genetics during the last 30 years, with six legends to accompany them – all of which I've been involved in.

1. ISN'T GENETICS THAT DNA STUFF THAT STARTED IN THE 1990'S?

In the late 1890's a department of sanitary science was set up by Queen's University. It developed into the university department of Social and Preventative Medicine and out of this grew a series of services including Public Health Medicine, Medical Statistics, General Practice and Medical Genetics. The first proper genetics service was started in Northern Ireland in 1948 by Professor Alan C Stevenson, the Professor of Social and Preventative Medicine at Queens University Belfast (Figure 1). Genetics arose out of the department of Social and Preventative medicine, a natural home for studies of risk and prevention, most members of the department having epidemiological as well as medical training. Having been appointed as Professor and also honorary physician to the Royal Victoria Hospital and the Royal Belfast Hospital for Sick Children in 1948, Stevenson carried out a series of population studies in genetic disorders. Stevenson started his clinics in 1948, a year before JA Fraser Roberts started the first formal genetics counselling clinics at Great Ormond Street. The Belfast clinics started when Stevenson saw patients primarily for his genetic epidemiology studies and were the first attempts to see 'genetic' cases in the UK.

He produced the best ascertainment studies of the time on genetic conditions in Northern Ireland, including the prevalence of achondroplasia, myotonic dystrophy and Marfan syndrome, in a series of seminal papers[1-3] published between 1953-1958. He later moved to Oxford to set up the MRC Population genetics unit in 1958 and published the major clinical textbook on genetics at that time. Several students fondly remember him tinkering with the carburettor in his car engine trying regularly to get it to start so he could return to the Royal Victoria Hospital for his clinics, after giving morning lectures at the university main campus.

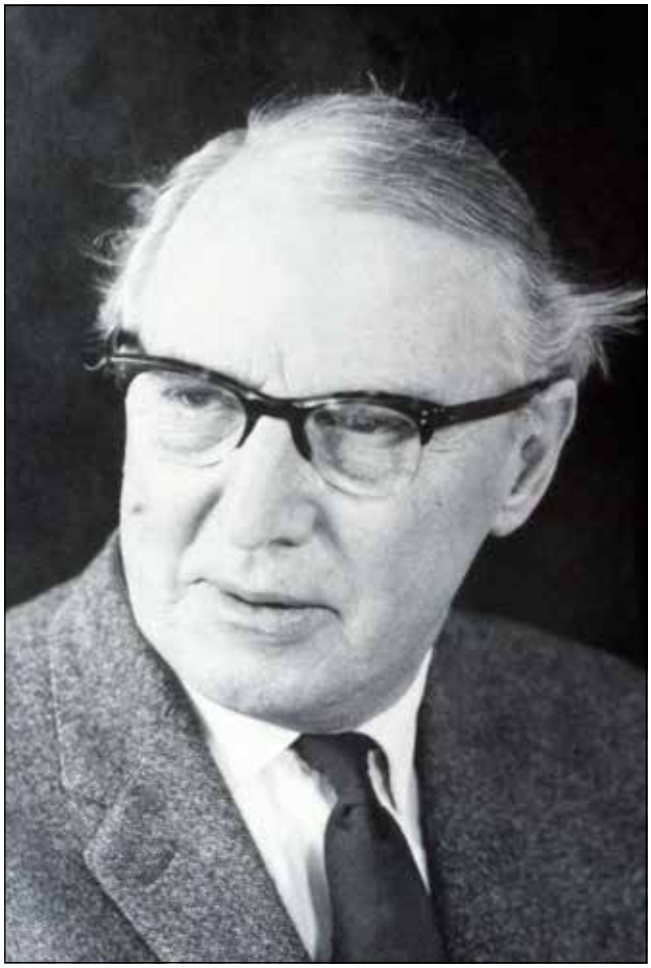

Fig 1. Prof Alan Stevenson, 27.1.1909 -18.9.1995. (Photo courtesy of Prof Alun Evans).

His successor at Queens was Dr (later Professor Sir) Peter Froggatt. Froggatt was appointed as a Professor of Epidemiology in 1968 and later became Vice-Chancellor of Queens University from 1976-1986 (figure 2). He submitted his doctor of Medicine thesis on albinism in Northern Ireland in 1957[4], establishing how common it was in the province, and was appointed a lecturer in community medicine in 1959. He

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worked with the famous Dutch ophthalmologist and Professor of genetics, Petrus Waardenburg[5]. [Waardenburg suggested that Down's syndrome might be a chromosomal disorder as early as 1932, and the syndrome named after him, in 1951, includes the association of deafness, iris heterochromia and a white forelock].

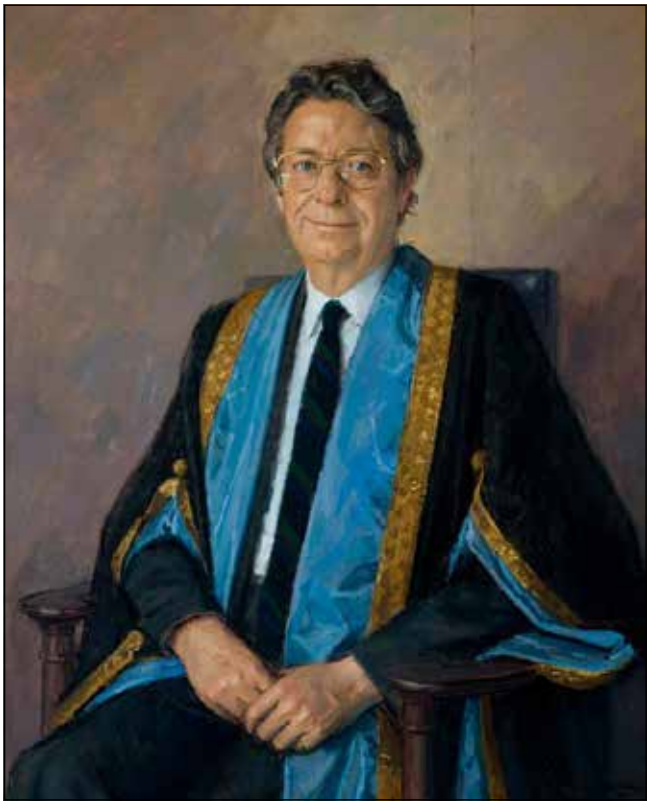

Fig 2. Prof Sir Peter Froggatt b.1928. (Photo courtesy of Queens University Belfast).

Froggatt appointed Norman C Nevin to a lectureship in Human Genetics in 1967. Dr Nevin spent 1965-1966 as an MRC fellow in the Oxford MRC genetics unit and did genetic research on the condition tuberous sclerosis under the supervision of Alan Stevenson. Norman later became a Senior lecturer and honorary Consultant in Human Genetics based in the Royal Victoria hospital in 1968. He was appointed to a personal chair in Medical genetics in 1975 and then as the first full Professor of Medical Genetics in 1978 at Queens University when the university established a series of departmental chairs, one of which was a new department of Medical Genetics (figure 3). Genetic clinics were still provided in the Royal Belfast Hospital for Sick Children and also in the Mulhouse building in the Royal where the department of medical genetics was based until 1987. With the building of the new City Hospital tower block, services transferred to Belfast City Hospital when the tower block opened in 1987. The Regional Medical Genetics Centre has been located on A floor on the 'West podium extension' ever since (figure 4). Norman's wife Jean ran the prenatal genetics laboratory until 2001 when they both retired. Norman was awarded the OBE in the Queen's birthday honours in June 2003 for services to gene therapy research having chaired the Gene Therapy Advisory Committee in London for a time. Norman was a gifted teacher and his lectures to medical students were fascinating for their apparent simplicity, and he inspired a generation of doctors, several of whom went on to gain an MD or PhD in genetic aspects of their own subject. He had a great warmth and kindness when dealing with patients with difficult genetic disorders. He would often draw out the complex genetics in a diagram on a page for them and could write upside down – several patients marvelled at this skill, often only surpassed when mothers of children with Down syndrome found out he too had bilateral simian creases on both palms (as had Tony Blair and some other prominent people) and some remarked that their child might too grow up to be a Professor. He always encouraged hope in difficult cases and dealt with a wide remit of cases from early pregnancy, paediatrics and complex late onset adult genetic diseases.

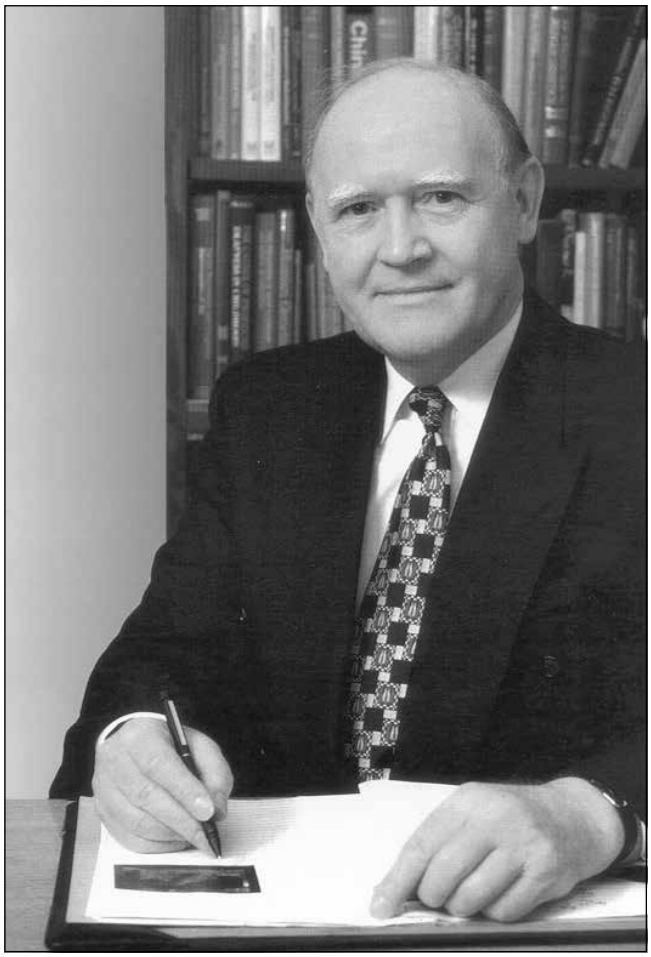

Fig 3. Prof Norman Nevin, 10.6.1935 - 28.6.2014.

Clinical Geneticists

Dr Fiona J Stewart MBE was appointed as a second consultant in medical genetics in 1995. She has special interests in paediatric genetics and lysosomal storage disorders and has established clinics and treatment for patients with enzyme defects in the province.

I was appointed as a consultant in clinical genetics with a

Fig 4. The completion of the West Podium Extension in 1984 (bottom right of picture just visible behind the black pipework).

special interest in cancer families on 1st January 2000. I was awarded honorary professorial chairs of Human genetics from the University of Ulster (2002), Nottingham Trent (2005) and Queens Belfast (2007). These helped partially replace the academic void left by Norman Nevins' retirement and then subsuming of his academic post and funding into other areas of the university. My main task on appointment was to set up the cancer genetics section of the Regional Genetics Service, and I extended cancer genetics clinics to the cancer centre and cancer units in Northern Ireland, establishing clinics in Antrim, Altnagelvin, Craigavon, Erne and Ulster hospitals, to supplement the general genetics clinics already taking place in those hospitals. Start-up funding for my post and laboratory staff was obtained from the charity Action Cancer led at the time by Peter Quigley – a man with great foresight who could see that genetic screening could be a key part of cancer prevention and diagnosis. Cancer genetics referrals quickly became a large part of the service accounting for over two-thirds of referrals in 2001 and soon further expansion was needed with more genetic counsellor appointments and a series of consultants with a special interest in cancer genetics were appointed in the same decade. Funding was secured for these after a series of business cases which allowed the appointment of new consultants now called clinical geneticists, having changed the name from medical geneticists in 1999. The appointments included Alex C Magee (2002), Shane A McKee (2005), Vivienne PM McConnell (2007), Tabib A Dabir (2009) and Deirdre E Donnelly (2014). Dr Gillian Rea was appointed in 2016 replacing Alex Magee following her retirement earlier that year – figure 5).

Fig 5. Genetic Medicine team 2016 (left to right: V McConnell, D Donnelly, P Morrison, A Magee, T Dabir, F Stewart, S McKee).

The future.

Genetics as a specialty has had a rapid development. The next step may be its demise as a separate specialty as genetics integrates into the mainstream of medicine. Most disorders appear to have some genetic component – if not a physical or familial genetic diagnosis, then often a laboratory assisted one. In the next few years, most medical professionals will be looking at personalised genome testing in their patients and will need to interpret the results and target therapies accordingly. The cost of genetic testing has started to decrease with tests that once were expensive and time consuming, now costing much less with more rapid turnaround times. In the next couple of years, the cost of analysing the entire genome of each patient will drop to less than £500. This will allow personalised genome testing and tailored treatments. Medical geneticists having changed their name to clinical geneticists in 1999 more recently changed again and became consultants in genetic medicine. Further expansion will depend on whether geneticists are needed to assess patients in a separate specialty or whether 'mainstreaming' of the specialty integrates it directly into medicine as a whole. The specialty of clinical genetics has gone from a single-handed consultant to pervading all areas of medicine.

2. MAMMOGRAMS ARE A WASTE OF TIME.

In 1995 I wrote to the editor of the Lancet suggesting routine mammograms were probably a waste of time[6] and suggested that women with a family history should be targeted instead (figure 6). At that time there was considerable debate on the utility of mammography, and cancer genetics was just in its early stages. I had returned from Nottingham, UK and had started to set up cancer genetic clinics as pilots for hereditary breast cancer. BRCA1 testing started in

An approach to breast cancer screening (perhaps better called surveillance) would be to restrict the screening group in the cancer prevention strategy. It is difficult to estimate what proportion of detected breast cancer cases have a familial basis, but gene-targeted screening would allow increased detection of cases in a higher-risk group; thus the predictive value should increase and the false-positive rate should decrease. Women with a family history of cancer are often doubly anxious (because of their history as well as concerns over the screening procedures). They may have most to gain with both reassurance and early detection. Over 60% of women offered a *BRCA1* test will accept.[3] Positive results will soon identify a large cohort of women at very high risk of developing cancer during their lifetime.

Since all cancer is genetically determined, public money may be better used in targeted screening programmes only, abandoning general population screening. Genetic advances allow for increased refinement of high-risk groups.

**P J Morrison, J A Raeburn*

Fig 6. Letter to The Lancet 1995 (from reference 6).

Cancer referrals to the Northern Ireland regional genetics service for 1997

Type of cancer	Number of referrals
Breast	86 (60%)
Breast and Ovarian	20 (15%)
HNPCC	15 (10%)
Multiple endocrine (MEN 1, 2A, 2B, FMTC)	6 (5%)
FAP	5 (1%)
Li-Fraumeni	3 (1%)
Others	6 (5%)*
Total	141

* Includes VHL RB, NF2, WT, Ataxia telangiectasia, Cowden syndrome, juvenile polyposis, Peutz-Jeghers syndrome and other rare dominant cancer syndromes.

Fig 7. Early Referrals to the cancer genetics service in 1997 (from reference 7).

1997 and figure 7 shows the early referral pattern with a predominance of breast cancer cases followed by ovarian and bowel, and then rare cancer syndromes[7]. Clinics were set up following the Calman-Hine model with a 'hub and spoke' pattern aligned with the cancer centre and cancer units, and a consultant led service. I managed to get funding from various research sources including a large EU Biomed-II grant, and this allowed clinical and laboratory staff to be appointed and kick-start service developments. A rapid rise in referrals meant that by 2001, over 70% of referrals were cancer –related, and eventually genetic counsellors took over the main referral triage. The rapid number of referrals and our careful system of evidence gathering meant that we were major UK contributors to the evidence base in this area with over 200 papers on cancer genetics, new genes and genetic counselling processes produced[8-11]. Some major clinical evidence included the recognition of the inability of mammograms to detect BRCA1-related cancers, and this lead to the national screening programme in the UK adopting a combined digital mammographic and Magnetic resonance imaging approach in 2012 and within 6 months we had the largest number of patients enrolled in a screening programme in the UK[12]. The benefits of preventative surgery and careful counselling and teamwork with psychology, breast surgery and oncology teams has paid dividends. The 'Angela Jolie effect' when Angelina Jolie and her then husband Brad Pitt went public with risk reducing breast cancer surgery caused a

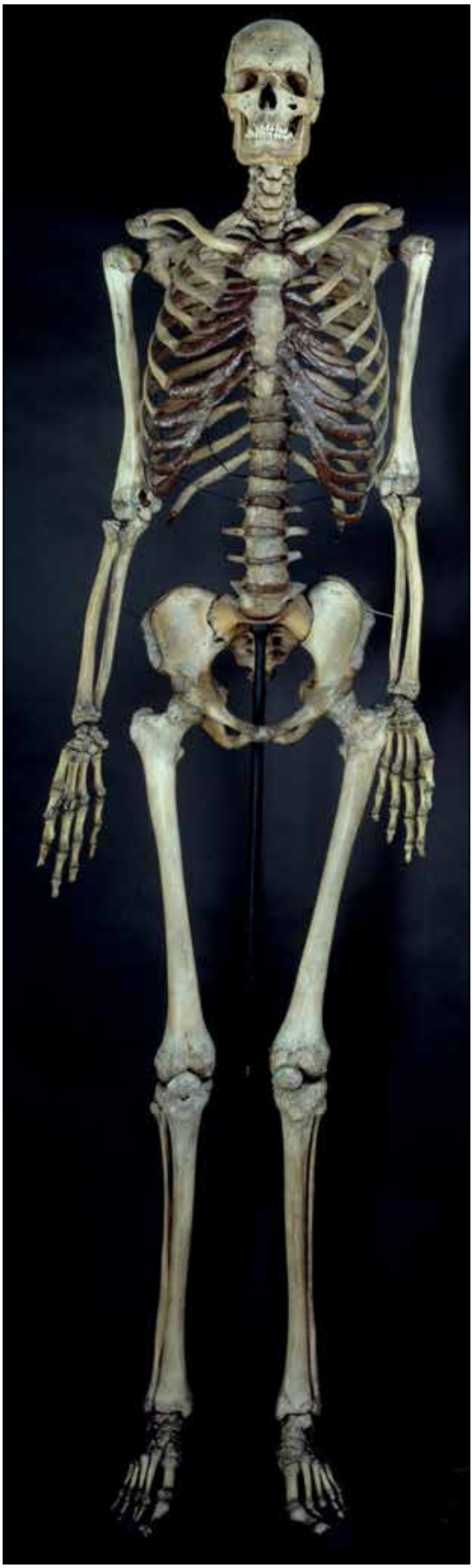

Fig 8. The skeleton of Charles Byrne.

huge increase in referrals to our service and a further surge in referrals to the breast surgeons. In 2017, a Cambridge group published a risk stratification[13] of mammographic screening groups based on family history – largely what I suggested might be good to happen in 1995, so it is great that technology and progress have been able to allow this to happen in my lifetime.

3. FINN MCCOOL WAS A MYTHICAL GIANT.

In 2007, Professor Brew Atkinson in the Royal Victoria hospital in Belfast sent me two cases of early onset acromegaly. Family studies confirmed probable autosomal dominant inheritance and further families were identified. We were able to show that a large number of Northern Ireland families had a common mutation, R304X in a recently isolated gene called AIP[14]. All the families were from west Tyrone and in a series of collaborative studies, the families were shown not only to be related to each other, but also to the famous Irish giant Charles Byrne whose skeleton is in the Hunterian museum in Lincoln's Inn Fields in London (figure 8). DNA from two of Byrne's teeth confirmed he also had the mutation, and more recently the mutation was traced back to the iron age – clearly Northern Ireland is the land of giants with various notable giants having been documented some of whom may well have had Acromegaly. Finn McCool is likely to have existed and there are some links to his Scottish cousins – hence the legend of the Giant's Causeway extending up to Staffa and the home of Scottish giants[15]. We also showed that Giants in biblical times also were likely to be a form of hereditary acromegaly[16].

To take the giant research further, and to see how common they were in the population, we obtained funding for a population study. We carried out population testing using saliva samples taken from the general public who were visiting Tesco super markets in Dungannon in two consecutive weekends (figure 9). Results showed around 1 in 156 people in West Tyrone may carry the 'giant' gene and our work now allows early detection and prevention of gigantism – a fairly unpleasant disorder with multiple complications and early death[17-18]. Our motto is 'no more giants'. The work was shortlisted for the Times Higher Education award in 2013 and we just lost out to the work identifying Richard III buried in a carpark in Leicester. Both projects put the study of ancient DNA to the forefront and such studies are now routine.

Fig 9. Genetic field trip to Tesco Dungannon 2013. Patrick Morrison (second right) and Marta Korbonits (Right) were the field team co-ordinators. Brendan Holland, a local giant and relation of Charles Byrne, can be seen very clearly in the very back row.

4. PARKINSON'S DISEASE ISN'T FAMILIAL.

I identified a three-generation family with Parkinson's disease (PD) in 1995 and published this, suggesting that 10% of PD cases probably had a genetic component and devised a genetic classification of the common suspected likely PD types[19,20]. At the time few people thought a genetic basis was likely, but the latest genetic testing panel now includes 96 genes for PD and the genetic classification is widely used[21]. Motor neurone disease and a series of other neurological disorders previously thought to be sporadic have now also been shown to have a genetic basis.

5. IS IT A BOY OR A GIRL?

Geneticists have long recognised gender identity, gender expression, biological sex and sexual orientation to be on a continuum. More recently we have recognised that male sexual orientation has a strong genetic basis. My genetics colleague Cecile Janssens in Rotterdam estimates that 30% of homosexuality is heritable[22]. My own experience in clinics over the last three decades is that around 10% of cases have a strong genetic basis. Male homosexuality is a bit like where PD and breast cancer were in the early 1990's – with no clear recognition of a genetic basis and few studies to back up the science. Recent studies confirm male gender genes on the X-chromosome and on chromosome 8q[23,24]. More studies are needed and are already in progress in areas of the world where homosexuality has acceptance and no stigma or is not still illegal. There may be several genetic advantages to carrying an X-linked gay gene, as there may be increased reproductive fitness and attractiveness in female gene carriers and gene carriers for either of the identified high penetrance genes may have increased stamina and increased achievement. My feeling is that like PD and also Huntington disease (HD) the genetic component will be increasingly recognised and the stigma steadily decrease so that the attitude of society to homosexuality will change as it has for HD, slavery and other taboos that have been generated out of lack of understanding. Also like breast cancer, lots of low penetrance genes will give an additive effect and lower penetrance genes are more susceptible to environmental interactions, factors that now explain lifestyle interactions and genetics in the contributions to breast cancer. I have shown how 20 years ago there was virtually no genetic interest in breast cancer or Parkinson disease and this is now completely changed. Recently I was tossing some dying petunia plants into my compost heap and noticed that the stems looked and smelt like potato and tomato plants. On looking into the genetics of their origins I found that recent DNA analysis has shown how the same genes in the same species – *Solanaceae* – can produce tomato,

pepper, aubergine, tobacco and petunia plants – all completely different shapes but from the same genome[25], whereas at the other end of the genetic spectrum, a recent paper has shown that there are four Giraffe species rather than one, all with different DNA but a similar external appearance[26]. This is a clear demonstration on why we need to be careful about ignoring genetic effects or having perceived bias about phenotypes and conditions until the evidence can show how wrong we were!

6. HUMANS STOPPED EVOLVING SEVERAL MILLENNIA AGO.

Fig 10. Three GAIN annual meeting delegates, 2008, including Dr Michael McBride (left), Dr Tom Trinnick (centre) and Prof Patrick Morrison (right).

Figure 10 shows a typical group of 'intellectuals' the person on the left has the biggest skull and the person on the right, the least hair. These are markers of recent evolutionary advantage. A (fictional) DNA analysis might find that the person on the left might have 3.1% (above normal) Neanderthal DNA and the person on the right might have 2.7% (normal) Neanderthal DNA. Neanderthal DNA incorporated into human DNA in recent millennia, has allowed development of a bigger skull size and prominent nose and larger nasal chambers. This has allowed the evolution of a bigger brain within the larger skull vault with a better breathing control in colder climates – clearly advantageous adaptations welcome in the job of a Chief Medical Officer. What about the person on the right? Even with 'normal' Neanderthal DNA there are adaptations – modern humans have evolved a higher brow and narrower shoulders and that person has a thinner amount of hair on his forehead – thus increasing the amount of vitamin D that he can metabolise, thus the erect posture and better bone structure confer recent evolutionary advantage. A recent study has confirmed an association between intracranial volume and intelligence, so we can conclude humans are also continually evolving and a small amount of Neanderthal DNA and adaptations to reduce sunlight have both allowed us to flourish in more northerly climates[27].

CONCLUSION.

I acknowledge six legends to complement the myths, whose personalities were clearly deserving of note and who have influenced me in various positive ways in various stages of my career. In order of myths, these include Norman Nevin (every taxi-driver reminisces about him fondly when they find out I'm a geneticist); Angelina Jolie (she made risk reducing breast surgery an acceptable choice for patients); Charles Byrne (technically the oldest patient whose DNA I've helped test); Dr Richard Godwin-Austin (changed the menu from beef to duck at the last moment at the 1996 association of British neurologists annual dinner so that the pre-dinner speaker just after my presentation on hereditary Parkinson disease - Dr Bob Will - with his breaking science on a new disorder human Bovine Spongiform encephalopathy - wouldn't cause a dietary scene); Elton John (gay, talented, amazing stamina); Dr Michael McBride – a man with many talents and a colossal work-ethic.

The author has no conflict of interest to declare.

DEDICATION

Fig 11. Liam Murray deciding not to be a surgeon, ENT student attachment, autumn semester 1984.

To the memory of Professor Liam J Murray (9th January1963 – 12th January 2018), clinical epidemiologist, true gentleman, and medical school ward round partner (figure 11).

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Medical History

The History of the Ulster Medical Protective Association

J I Logan

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Provenance: Internally peer-reviewed

SUMMARY

The Ulster Medical Protective Association was founded in 1859 to protect the interests of the profession and was one of the 3 predecessors of the Ulster Medical Society.

All unreferenced quotations are from the transcribed records of the Association[1] in which will be found notes of the original sources.

INTRODUCTION

Although it is commonly said that two societies, the Belfast Medical Society and the Belfast Clinical and Pathological Society, were amalgamated in 1862 to form the Ulster Medical Society, there were in fact three, the third being the Ulster Medical Protective Association. The evidence for this lies in Professor J. C. Ferguson's presidential address to the Ulster Medical Society on 1 November 1862 where he refers to 'the amalgamation of the three previously existing societies, to form the Ulster Medical Society'[2], and in the newspaper report of that same meeting which more specifically records that 'this important provincial association of medical practitioners—being an amalgamation of the parent "Belfast Medical Society" (founded in 1822), the "Belfast Clinical and Pathological Society", and the "Ulster Medical Protective Association"—was inaugurated'.

BACKGROUND

The Ulster Medical Protective Association came into being in 1859. Unlike a modern body such as the Canadian Medical Protective Association, it did not offer indemnity to the individual practitioner but rather was set up with the objects 'to protect the interests of the profession, in the admission of its members, to sustain the status of qualified Practitioners, and to watch over, and, if desirable, to promote such legislative measures as may seem generally beneficial.' The Belfast Medical Society had taken an interest in wider professional matters and in the 7 sessions up to April 1859 had considered the reform of the profession, the Medical Charities Act, the standard of professional education for the medical officers of the Navy, and the activities of the Irish Medical Association. It had joined the Irish Medical Association in October 1855 and paid the annual subscription of one guinea for at least that year and the following. That it was the Society's intention to continue in these activities is shown by Surgeon Browne's remarks in his presidential address in June 1857 in which he said 'Should the necessity again arise, as it likely will, this association will still take the lead in contending for our common interests, and in arousing the spirit of our brethren to the assertion of our inalienable rights.'[3] Despite this, only 2 years later Browne was taking the lead in setting up the Ulster Medical Protective Association and it is likely that he and his fellow-promoters could see that having a separate body with the potential for a wider membership would allow them greater freedom of action.

INITIAL STEPS

The original records of the Ulster Medical Protective Association are not available but the proceedings of many of the early meetings were recorded in the newspapers of the day. These have been transcribed and placed on the Ulster Medical Society's website[1]. Plans for the association must have been well advanced if not complete in June 1859 as a circular entitled 'Address to the Medical Profession of Ulster' issued by John C. Ferguson and Samuel Browne, Chairman and Secretary respectively of the Provisional Committee, was dated the 30th of that month. The 'Address' and the 'Rules' of the proposed Association were published in the *Dublin Medical Press* for 20 July 1859. On 26 July 1859, an interesting editorial, perhaps inspired or written by Surgeon Samuel Browne himself, appeared in the *Belfast Daily Mercury* condemning the 'great number of unauthorised practitioners, who drive a profitable trade by butchering, and poisoning, and drugging to death the unfortunate people who are imposed upon by their pretensions.' This allowed Browne to reply the following day 'I am happy to inform you that a Medical Protection Association for Ulster has been organised, and will soon be in a position to deal with the gentry in question'. A public notice inserted by the Provisional Committee of the Ulster Medical Protective Association on 18 August 1859 begged 'to remind practitioners who have received the "Address to the Medical Profession of Ulster" that they should send their names and subscriptions to the Acting Treasurer … before Thursday, the 1st of September on which day the first meeting of the Society will take place.'

INAUGURAL MEETING

Thirty-six medical practitioners attended that meeting and a total of 112 were said to have signed up and to have paid

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the subscription of 5 shillings. While the majority of the members were, as might be expected, from counties Antrim and Down (65 and 18 respectively, the greater number in county Antrim included those from Belfast), 8 were from counties Monaghan, Cavan and Donegal. Only one had joined from Fermanagh but this was probably because Fermanagh already had its own protective association. Dr. M'Gee, Surgeon Browne, and Dr. Patterson were appointed Chairman, Secretary, and Treasurer, respectively, with 12 members from Belfast and 3 from each of the participating counties being appointed to form the governing committee. Surgeon Browne pointed out that protective societies had existed for some years in Great Britain (the Medical Association of Great Britain) and Ireland (the Irish Medical Association). The latter was made up of a number of local organisations (including the one in Fermanagh) and he had found that its members were 'most anxious that we in the North should fraternise more than we had hitherto done'.

RELATIONS WITH OTHERS

The promoters were keen not to upset the 2 main local societies nor the public. With regard to the former the 'Address' stated 'And here it may be necessary to explain, that, while this association is quite independent of the Belfast Medical and Pathological Societies, it cannot in any measure, be antagonistic to them'; while with regard to the latter, Surgeon Browne said 'I believe that this is not only protective of ourselves, but protective of the community, because it is quite clear if we prevent a large number of men from going on through the various districts around us practising in our profession, who have no right to assume the name of medical men, and who have no education for the claim, that we are not only protecting ourselves, but doing a vast amount of good to the community, who are suffering from the interference of these uneducated persons who assume to themselves the name and dignity of doctors.' The suggestion that what was good for the medical profession was good for the community was one which was repeated regularly at the Association's meetings but it was not altogether accepted as on 1 February 1861, the *Belfast Daily Mercury* said 'We have in Belfast a Society that is called the "Ulster Medical Protective Association." Such a body, we admit, is greatly needed, and if it only discharged its duties independently and fearlessly, it would confer vast benefits on the Profession, and also on the public. But we observe that while every exertion is made to serve the Profession, no attention whatever appears to be bestowed on the interests of the public.… But what we object to is, that this Association appears to think the poor were made for its profit—that there is no interest to be consulted but the Medical. We could point to many cases not unworthy of the Association's attention, assuming that in their "Protective" character they desire to maintain the honour and dignity of the Profession.'

UNQUALIFIED PRACTITIONERS

The business of the committee fell into 3 main groups; dealing with unqualified practitioners, communicating with various bodies, and co-operating with the Irish Medical Association. By the time of the first committee meeting in October 1859 the services of a counsel, J. M. Thompson, Esq., Barrister-at-Law, had been retained. Members of the Association were asked to send in the names of those who were falsely setting themselves up as qualified practitioners but the publicity in the newspapers must have worried some of the latter as it was reported in November 1859 that 'a good many of them had taken to flight from Belfast, and others were trying through subterfuge to escape the observation of the society.' Those who continued to practice were sent a letter requesting that copies of their medical qualifications be forwarded to the Association and threatening action if satisfactory replies were not received. This lead some to apply for registration but others resisted. Three men were summonsed by Surgeon Browne (on behalf of the Ulster Medical Protective Association) to appear before the Petty Sessions Court in May 1860, 'for having on the 3rd May inst. at Belfast, wilfully and falsely pretended to be practitioners in medicine and physicians, and that they did supply and prescribe medicine contrary to the 21st and 22nd Vic., cap. 90.' The cases were postponed on a legal point until early June by which time one had left town. The first to appear in the witness stand was found to be un-registered but when after some argument he produced a diploma from the Apothecaries' Hall, Dublin, judgement was postponed for a month to give him time to register properly (which he did). The cases against the other two were then withdrawn but the following year one of them was summonsed again after attending a woman who died. Owing to some difficulty in proving that he had attended 'as a medical man' judgement was postponed for three months. The final outcome is unknown.

The reluctance with which the diploma was produced is reminiscent of a story told by Dr. Axel Munthe of a time when the police in Paris were taking steps to suppress unqualified practitioners. One man proved that he was qualified but begged that this be kept secret as he owed his enormous practice to the circumstance that he was considered by everybody to be a quack.[4] Dr. John M. McCloy referred to a similar instance in his presidential address to the Ulster Medical Society in November 1938 saying 'A young man [in Hungary] practising as a quack … was really a qualified doctor who had failed to attract patients, so he had moved to another address and, while continuing to use his medical knowledge quite properly, had built up a successful practice on the prestige that comes from being non-academic and non-scientific.'[5]

COMMUNICATIONS

Sir Hugh Cairns, M.P. for Belfast, presented at least 2 petitions from the Association to Parliament. The first, in March 1860, had been signed by over 200 Ulster practitioners, and may have related to the Poor Relief Amendment Bill, while the second, in June 1860, had related to the Birth, &c., Registration (Ireland) Bill. After the Limerick Junction meeting (see below) the Ulster Medical Protective Association

wrote to the General Council for Medical Education urging the separate publication of a Medical Register for Ireland as it would be cheaper and more readily available; to the Chief Secretary for Ireland and the Poor-Law Commissioners opposing the proposed use of non-medical inspectors under the Medical Charities Act; to the Branch Medical Council for Ireland suggesting that the failings of the Vaccination Act could be remedied by passing an Act for the compulsory registration of births and deaths; and to the Apothecaries' Hall, Dublin, regarding the preparation and sale by unqualified persons of medicines including opiates. The sense from the answers was that nothing was likely to change. No direct reply was received from the General Council but the Branch Medical Council for Ireland said that they had proposed the previous year that separate Registers should be published, and that they would forward the suggestion of compulsory birth and death registration to the General Council; the Chief Secretary said that the question of medical inspectors would receive full consideration; the Poor-law Commissioners only acknowledged receipt; and the Apothecaries' Hall agreed that the problem existed but said that they lacked the legal power to intervene.

THE LIMERICK JUNCTION MEETING

Surgeon Browne had met with the Irish Medical Association previously while representing the Belfast Medical Society and continued to keep in touch with them in his new position. One matter over which they co-operated was that of the treatment of Dr Wall, a dispensary doctor in the Dunmanway Union who would have been appointed originally by the local District Dispensary Committee.[6] Dr. Wall had attended a man who refused amputation after a severe leg fracture and who, with his friends, insisted against Dr. Wall's advice on going to hospital in Cork where he died. The Poor-law Commissioners, based in Dublin, rebuked Dr. Wall for not having the leg amputated and for not stopping the transfer, and asked him to resign, which he did. The reason for the censure is unknown. The District Dispensary Committee must then have advertised the post as it is reported that Dr Wall put his name forward and was re-appointed unopposed. The Poor-law Commissioners did not accept this and asked him to resign for a second time. Again he complied, after which the Board of Guardians, the tier between the Poor-law Commissioners and the District Dispensary Committee, asked him to fill the post on a temporary basis until a permanent replacement could be found. (The Guardians seem to have been sympathetic to Dr. Wall as they wrote to the Commissioners in his support and organized a subscription for him.) The injustice in the case gave rise to much indignation and the Irish Medical Association arranged an 'aggregate meeting of the medical profession in Ireland' in the Limerick Junction Hotel on 15 December 1859. The Ulster Medical Protective Association sent as representatives Dr. M'Gee and Surgeon Browne and in his opening remarks the chairman drew particular attention to 'the attendance at that meeting of a deputation from the Ulster Medical Protective Association, a society which was doing much to advance the position and maintain the high character of the medical profession'. Both Dr. M'Gee and Surgeon Browne spoke and were well received. A number of resolutions were passed in support of Dr. Wall and further action in the form of a petition to Parliament was planned. Before the meeting separated a 'Dr Brown' proposed and a 'Dr Magee' seconded that a committee should be set up to consider petitioning Parliament with regard to compulsory vaccination, compulsory birth and death registration, and reform of the sale of medicines. It is probable that the reporter meant 'Surgeon Browne' and 'Dr. M'Gee'.

FINAL PHASE

At the Annual Meeting in May 1861 the Ulster Medical Protective Association seemed to have confidence in the future and had over 200 members but the newspaper reports of the proceedings stop at that point so that nothing is known now about the last eleven months of its existence. Despite the initial enthusiasm and activity, it cannot be said that the Association achieved great things but it did make a stand for the profession alongside the Irish Medical Association and others, and amalgamation into the Ulster Medical Society at least offered a dignified ending to the shortest-lived and least significant of the three founding societies.

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Medical Education

Helping doctors in training to STEP-UP

A leadership and quality improvement programme in the Belfast Health and Social Care Trust

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ABSTRACT

Introduction Medical engagement in healthcare organisations can improve service development and patient experience. Doctors in training have limited opportunities to engage in service improvement work and develop leadership skills.

Method We describe the **Specialist Trainees Engaged in Leadership Programme (STEP)**, a programme developed to introduce concepts of medical leadership and quality improvement skills in the Belfast Trust. STEP started in 2013 and over 140 trainees have now participated in the programme.

Results Over 42 quality improvement projects have been completed with the support of the programme. Evaluation of STEP has demonstrated an improvement across all domains explored throughout the duration of the programme, with benefits for the individual trainee and the wider organisation.

Discussion We describe the programme in detail. The STEP curriculum can easily be adapted to meet the needs of NHS trainees, allowing them to understand the objectives and strategy of their employers and improve their ability to plan and deliver safe, effective, patient-centred care.

Keywords: Medical, Leadership, Quality Improvement, Education

INTRODUCTION

Medical engagement in healthcare organisations can improve service development and patient experience. Doctors in training have limited opportunities to engage in service improvement work and develop leadership skills.

We saw an opportunity to address this need with the primary goal of improving clinical engagement through teaching the foundations of modern medical leadership and introducing improvement methodology. Our secondary goal was to increase engagement with corporate management and business support colleagues through improvement projects. Our hope was that this would help our future medical leaders build a learning and supportive culture as highlighted in 'A promise to learn, a commitment to act'[1].

Belfast Trust is one of the largest NHS employers in the UK, employing 800 permanent members of medical staff and supporting approximately 600 doctors in training every year. The programme was introduced in 2013. Over 140 trainees have now participated in the **Specialist Trainees Engaged in Leadership Programme (STEP)**, ranging from ST3-8 from a variety of specialty backgrounds.

LEADERSHIP AND QUALITY IMPROVEMENT PROGRAMME DEVELOPMENT

The aim of STEP is to ensure that specialist trainees are aware of the opportunities to develop skills in medical leadership during their rotational clinical training. The STEP curriculum also offers basic training in QI, with the goal of each trainee becoming actively involved in a QI or patient safety initiative in their clinical area. The programme follows the academic year, commencing in September and ending in June.

The STEP curriculum was developed by a core group of clinicians, in conjunction with non-clinical managers and the team from Learning and Development department. The partnership between medical and managerial staff was essential in developing a relevant curriculum and encouraged the participation of managerial colleagues from a range of Directorates. The programme is also supported by the Medical Director and Directors of Specialist Services and Acute services providing senior management sponsorship.

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CURRICULUM DEVELOPMENT

The curriculum was based around the NHS Medical Leadership and Competency Framework[2]. Another key resource was the Institute for Healthcare Improvement (IHI) Open School [3], which all trainees were encouraged to access. The new NHS Leadership framework [4], published during the pilot year in 2013, also influenced the teaching. We recognised that many consultants are involved in service developments that require an awareness of project planning therefore we sought the support of the Trust Leadership and Innovation Academy team, who provided a bespoke session on Project Management.

A list of sessions currently included in STEP is shown in Table 1.

TABLE 1:

List of STEP sessions from 2015-6 Programme

Session
Introduction and Medical Leadership
Project Management for Beginners
Patient Safety & Quality Improvement (QI) Methodology
Overview of Trust and Patient Client Experience
High Performing Teams
Human Factors
Interview Preparation
Clinical Networks
Commissioning
STEP Project Workshop x 4
End of year presentations

STAFF INVOLVEMENT AND RESOURCES

Each session has at least two facilitators: one medical and one from a management background. This helps deliver a holistic view of how clinical teams work within the wider context of the organisation and interact at other levels, for example with commissioners, patient representatives and politicians.

Trainees are provided with reading material via email links to relevant articles and the IHI Open School material to prepare for each session. The facilitators provide an overview of each topic for approximately 30 minutes to open the session. The remainder of the time is spent in discussion and reflection on the trainees' own experiences, allowing them to identify opportunities for further development. Speakers are invited to deliver some more formal sessions. The trainees agreed that evenings provided the best opportunity for attendance. Each session lasts around 90mins, however some sessions required up to 120 minutes.

STEP-UP

Delivering a basic understanding of QI methodology is led by faculty members using material from IHI Open School and the Scottish Patient Safety Programme. Supporting reading material is also provided [1, 2, 4 - 25].

Trainees are offered the opportunity to take part in a QI or patient safety project. STEP programme facilitators offer suggestions and guidance on developing their project further, and experienced mentors provide guidance and support. There are several STEP-UP project workshops, where trainees deliver a short presentation followed by discussion on strategies to develop the project. A project presentation event is held at the end of the academic year in conjunction with the Trust Quality Forum. A panel including the Postgraduate Dean of Medicine, the Chief Medical Officer (NI) and the Clinical Director of the Health and Social Care Safety Forum provide feedback on the project presentations supported by the Medical Director and the Centre Director for the School of Medicine, Dentistry and Biomedical Sciences at QUB.

DEVELOPMENT OF STEP

STEP is now into its fourth year. The 2014/5 participant cohort completed an online survey to record their views on the programme and suggestions for improvement. Twenty-six trainees responded and indicated that the most beneficial aspects of STEP included:

- Quality Improvement (*how to drive a project forward, learning the vocabulary, learning from others' experience, motivated me to effect change within my organisation*)
- Teamwork and Networking (*breaking down barriers*)
- Interview Preparation and CV advice and planning

96% of respondents felt that STEP provided them with knowledge not available elsewhere in their training, and 100% said they would recommend STEP to a friend.

Following review of the feedback, three main themes were identified for improvement: adjusting the programme structure to improve its flow, changing the timing of the sessions and enhancing the supporting resources available. These changes were implemented for the 2015/6 programme and a STEP information guide was produced.

STEP EVALUATION

An evaluation of the 2015/6 programme was performed using a model based on Kirkpatrick's Four Level Model [26]. Questionnaires were developed to facilitate self-assessment of knowledge and skills pre- and post-participation. The post programme questionnaire also assessed the trainees' experience of the programme and its perceived benefits, as well as changes to their behaviours and results both for themselves and for the organisation. In addition, trainees were also asked to complete Level One and Two of the Quality 2020 'Attributes Competence Assessment Tool' [27].

STEP EVALUATION RESULTS

The response rate was 52% for the pre- and 40% for the post-programme questionnaire. 54% of trainees had no previous

leadership or QI training. Trainees came from training levels ST4 – ST8. Those who had had previous experience (46%), indicated this was quite varied e.g. one day leadership and management courses, modules as part of an MSc and online learning modules. Twenty-five percent of this cohort had no previous involvement in an improvement project.

PRE AND POST PROGRAMME QUESTIONNAIRES

Trainees were asked to rate their knowledge of a range of subject areas using a scale of 1-4, as detailed below.

1 No knowledge

2 Some knowledge

3 Good level of knowledge

4 Excellent level of knowledge and could teach others about this

All areas showed an improvement following participation in STEP. Figure 1.

Trainees were asked to score their response to the statements below using a scale of 1 - 5, ranging from 1 = 'strongly agree' and 5 = 'strongly disagree'. The mean score obtained from trainees for each statement is shown in Table 2 – with all statements scoring between agree (=2) and strongly agree (=1).

TABLE 2:

Mean trainee scores regarding their STEP experience

Statements	Mean Score
Overall, I was satisfied with the quality of STEP	1.4
Overall, I feel the trainers were knowledgeable	1.2
Overall, I feel the trainers were approachable	1.2
I learnt new knowledge and skills through STEP	1.4
I will apply the knowledge and skills learnt through STEP in my future practice	1.4
I feel STEP will play a substantial role in the improvement of the quality and safety of patient care	1.2
I feel STEP will play a substantial role in the improvement of the patient experience in our healthcare system	1.5
STEP was a worthwhile investment for my own professional development	1.4
STEP was a worthwhile investment for ... Trust	1.3

Some examples of comments from trainees regarding their experience of participating in STEP included:

- *"STEP has changed the way I think"*
- *"QI is vital to improve patient safety and team functioning"*
- *"Appreciate time to concentrate on non-medical side of training"*

QUALITY 2020 'ATTRIBUTES COMPETENCE ASSESSMENT TOOL'

The Northern Ireland Quality 2020 (Q2020) 'Attributes Competence Assessment Tool' [27] provides a tool for trainees to self-assess against the knowledge, skills and attitudes required at their current level in relation to quality improvement and safety.

Statements are rated with the following rating scale:

- LD – 'I need a lot of development'
- SD – 'I need some development'
- WD – 'I feel I am well developed'

The response rate was 52% for the pre-programme self-assessment. The post-programme completion rate, however, was disappointingly low at 14%.

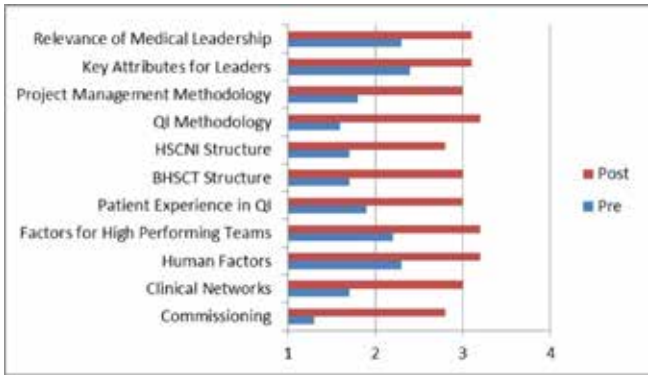

Fig 1. Graph showing mean respondent scores for pre- and post-programme self-assessment questionnaire.

An overview of the pre-STEP self assessments at Level One of the Attributes Tool revealed that 43% of respondents felt their skills in improvement methodology needed "*lots of development*". Following participation in STEP, 50% of respondents now felt that their skills in improvement methodology were well developed.

Prior to STEP, trainees reported a need for development in the following areas:

1. Improving care and services for patients/service users (86%)
2. Understanding quality improvement and collecting information to aid improvement in patient/service user care and services (76%)
3. Understanding the benefits of small steps to improve care and services (76%)
4. Understanding what contributes to the safety of patients/service users and working with colleagues to identify problems and reduce risk (71%)

All domains demonstrated improvement post participation

with 100% of respondents assessing themselves as well developed in the first 3 areas, and 67% as well developed in the fourth domain.

When self-assessing against Level Two of the Attributes Tool; 38% assessed themselves as needing a lot of development in the domain of explaining and using PDSA cycles to make small-step change to improve care and services, with 57% needing some development. This domain demonstrated an improvement post STEP, with 67% assessing themselves as well developed and only 33% needing some development.

Prior to STEP, some areas were marked as needing development:

1. Understanding how the culture in my workplace influences the quality and safety of care and services (81%)
2. Being able to work with a team to achieve small-step change (76%)
3. Identifying where teamwork can be more effective and I can work with others to improve team performance (76%)

All domains demonstrated an improvement post participation with 100% of respondents now assessing themselves as well developed in the first domain, 67% as well developed in the second and 50% as well developed in the third.

QUALITY IMPROVEMENT PROJECTS

Forty-two quality improvement projects have been formally presented by STEP trainees since the beginning. These projects have focused on improving the safety and quality of patient care or enhancing patient experience. Recent projects have included the development of a cognitive aid for emergency intubation, improving time to CT Scan for major trauma patients in the emergency department, improving the quality of clinical handover and improving thermoregulation in neonates.

DISCUSSION

Throughout the development of the STEP programme, we have seen benefits for the individual trainees and for the wider organisation.

As a healthcare provider, the Trust's aim is to improve patient and client experience through the delivery of safe, high quality care. Trainees rotate through the various hospitals in Northern Ireland and have many opportunities to see and share good practice.

On a personal level, trainees who participated in the programme have learnt how to effect change. They have built will for improvement in their clinical teams and beyond, networking effectively with managers and support teams in ICT and patient experience to deliver projects. This corporate sponsorship has allowed them to feel part of the wider organisation and develop a better understanding of strategic health priorities. To successfully develop and deliver their STEP-UP projects, they have developed skills in QI methodology, project planning and management that will be of future value. Several projects involved patient/client experience work. For many of the trainees, this was their first experience of this kind of engagement with patients and carers and resulted in a rethink of their approach, not only to their project, but also how they engage and interact with the patients they care for.

From the evaluation, we can see that trainees find STEP useful and worthwhile, and recognise the role it plays in improving the quality and safety of patient care. STEP has been shown to be effective in improving trainee skills and knowledge in the subject areas covered by the programme.

From a corporate perspective, STEP has yielded benefits in terms of the individual projects completed. There are other benefits emerging with the improved engagement of clinicians. It has allowed our organisation to look at issues obvious to those working at the 'coal face' and utilise the enthusiasm of a 'volunteer army' to help work within their clinical teams to find solutions and improvement ideas which, are more likely to be successful. This improved awareness of solutions generated by frontline staff fits well with the 'dual-operating system' model [14]. It allows any organisation to maximise the use of existing expertise to deliver the goals of improving quality of care and safety as well as improving efficiency. The flattened hierarchy experienced by trainees participating in the programme who are interacting regularly with members of the Trust senior team will develop both clinicians and managers' awareness of the benefits of a culture of engagement, respect and trust. The partnership approach of clinical and managerial colleagues is key to the successful delivery of the programme aims and completion of the quality and safety projects.

There are of course, risks in a programme that focusses solely on ideas generated by front-line teams. For success in the future, we need to ensure that the QI aspect of STEP is linked to Trust corporate improvement priorities and that appropriate resources are allocated to support STEP-UP projects. At present, we are developing improvement capability and capacity through various training programmes and stronger linkages with data management and information technology colleagues at a regional level. There are also opportunities to work directly with Northern Ireland-wide Quality Improvement collaboratives, organisations such as the Institute of Healthcare Improvement (via the Practicum programme), and through training such as that provided by the Scottish Quality and Safety Fellowship Programme.

Each NHS organisation will have their individual ethos and unique vision for the delivery of high quality, safe care. The STEP curriculum could be easily adapted to meet the needs of trainees in any NHS organisation, allowing them to better understand their employers and improve their ability to lead the future delivery of safe, effective, patient-centred care.

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Medical Leadership

Developing leadership as a trainee- opportunities, barriers and potential improvements

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ABSTRACT

The General Medical Council explicitly state that doctors completing training should demonstrate capabilities in leadership and teamwork.[1] However, most trainees receive little formal training in leadership. In March 2017, at the Faculty of Medical Leadership and Management (FMLM) Northern Ireland Regional Conference, a workshop on developing leadership skills as a trainee was hosted and the views of doctors in training regarding current opportunities, potential barriers and improvements were sought.

In Northern Ireland presently there are a number of opportunities available for trainees to gain experience in leadership – both by learning through observation and learning through experience. These range from informal activities which do not require significant time commitment to focused, immersive leadership experiences such as ADEPT (Achieve Develop Explore Programme for Trainees) [2,] and the Royal College of Physicians' Chief Registrar scheme. [3]

Several barriers to developing leadership have been identified, including limited understanding of what constitutes leadership, a lack of senior support and little formal recognition for trainees leading teams. Time pressures, frequently rotating jobs, limited resources and difficulty upscaling can also undermine the sustainability of improvement and other leadership projects.

Incorporating awareness of and training in leadership skills, as well as greater engagement with senior leaders and managers, at an early stage in training could promote understanding and encourage trainees. Formalising leadership roles within training posts may improve experience. Deaneries and Trusts can also enable leadership opportunities by facilitating study leave, raising awareness amongst supervisors, and providing career enhancing incentives for interested trainees.

INTRODUCTION

Active involvement of doctors in clinical leadership saves lives. There is now an established evidence base showing that high levels of medical engagement in care providers, where all doctors are actively involved in management, leadership and service improvement, leads to better outcomes. [4] This includes lower patient mortality, higher patient satisfaction and quality of care, and raised levels of staff wellbeing and engagement.[4]

With a few exceptions, medical students and medical trainees have little training in management, leadership and service improvement. Yet from the moment they graduate, doctors in training require a range of such competencies, which become more important as they progress to become consultants and general practitioners.[5] However, the leadership capability of doctors in training remains an undervalued resource in the NHS.

A recent General Medical Council (GMC) report found that 1 in 10 graduates felt inadequately prepared for practice, with key areas of concern, being core leadership and management competencies such as self-management, resilience, patient safety, effective communication and inter-professional team working.[6]

Early exposure to management and leadership should provide the foundation for an NHS in which doctors appreciate their responsibilities to others within the multi-professional team, the organisation and local health community as well as to their patients and themselves.

Trainees are uniquely placed to assist in leading the improvements needed in healthcare. In his report on the Mid Staffordshire NHS Foundation Trust, Sir Robert Francis QC highlighted a lack of medical leadership as a fundamental

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contributor to the failures in care within the Trust.[7] The report also reiterated the importance of leadership at all levels, describing medical trainees as the '*eyes and ears*' of the hospital.

There is evidence that organisations led by doctors in formal leadership roles perform better.[8] The NHS therefore needs to provide more doctors in training with leadership development and experience as an investment for the future.

At the annual Faculty of Medical Leadership and Management (FMLM) Northern Ireland Regional Conference in March 2017, a workshop on developing leadership skills was hosted by clinical fellows in the Achieve, Develop, Explore Programme for Trainees (ADEPT) in Northern Ireland.[2,9] At this event, the views of medial trainees about current opportunities to develop leadership capabilities along with potential barriers that may be encountered, and how to improve those opportunities, were sought. This article reports the trainee perspective on these issues.

CURRENT OPPORTUNITIES TO GAIN LEADERSHIP TRAINING AND EXPERIENCE

There are a number of programmes providing training in leadership within postgraduate training in NI. NIMDTA's Foundation Generic Skills and iQuest (Improving Quality and Understanding to Enhance Specialty Training) programmes provides modules focused on leadership and teamwork, whilst ENGAGE, a new clinical leadership and improvement programme for final year trainees, was launched in December 2016.[10,11] EQUIP (Educating for QUality ImProvement for GP trainees) provides final year GP trainees with the opportunity to learn about quality improvement and leadership with mentorship from local leaders using the ECHO collaborative training model.[12] STEP (Specialist Trainees Engaged in leadership Programme) provides leadership training and an introduction to QI and has been running for five years in Belfast HSC Trust for final and penultimate year trainees. STEP-WEST is running its inaugural programme in the Western HSC Trust. First Steps to Leadership provides a basic introduction to leadership and QI for foundation doctors in Belfast HSC Trust.

In addition to these formal training courses, there are a number of opportunities available for trainees in Northern Ireland to gain experience in leadership – both by learning through observation and learning through experience. These opportunities range from informal activities that do not require significant time commitment through to focused, immersive leadership experiences.

Trainees can gain leadership experience by seeking out opportunities to shadow those in formal leadership roles. This can be within a HSC Trust – for example by shadowing a clinical director or a service manager, or within the Northern Ireland Medical and Dental Training Agency (NIMDTA). It may also be useful to take the opportunity to learn from high performance organisations outside of healthcare, which can be a valuable means of learning new skills and approaches (e.g. aviation).

The most obvious leadership activities that trainees can take part in are through their clinical role. Caring for patients requires teamwork, which works best when a team is led effectively. Team leadership is required at all levels of training. There are a number of non-clinical activities trainees can become involved with that enables them to develop their leadership capabilities – through rota management, organisation of teaching, planning and undertaking research, quality improvement (QI) audit, and service development. These tasks require good organisational, time management and communication skills – all of which are essential in order to be able to lead effectively.

There are a number of opportunities for trainees to apply for formal roles which further enable leadership development – for example as a programme trainee representative, on the Trainee Forum, as a trainee representative on a management committee, through a mentorship role, or through involvement in a NIMDTA or RQIA visit or review. NIMDTA set up ADEPT in August 2015 in collaboration with the HSC Leadership Centre and a number of host organisations.[2,9] This programme provides 8 specialty (GP or hospital specialty) trainees the opportunity to take a year out of programme to acquire knowledge and develop skills and experience in leadership and management through formal training, insight visits, coaching, mentoring and working in an apprenticeship model with senior leaders. During this programme, Fellows work towards a Level 7 Certificate in Leadership and Management through the Institute of Leadership and Management. The Chief Registrar Scheme set up by the Royal College of Physicians allows final year trainees in higher medical specialties involved in acute medicine to spend 40-50% of their working week as a 'Chief Registrar', where they are involved in healthcare leadership and management development.[3] Trainees in Northern Ireland can also apply to the National Medical Director's Clinical Fellows Scheme, and there are a number of clinical leadership fellow programmes available to trainees in other regions of the UK.[13,14]

BARRIERS TO LEADERSHIP

Perhaps one of the most subtle, but important, barriers to engaging in leadership activities, identified by trainees, is actually recognising what constitutes leadership. The traditional heroic model of the leader as an all-knowing, charismatic, born for the role, figure holds less weight in this modern era. However the idea of collective leadership, and leadership being about creating a vision and enabling others around you to work towards that, is still in relative infancy.

Many trainees display leadership on a regular basis in their day - to - day roles on call, managing multidisciplinary teams, teaching other junior medical colleagues, students and other staff. Often, they do not identify themselves as being a leader or realise the influence and impact that they may have on others. As a consequence, they can be hesitant to nominate themselves for more formal leadership opportunities, feeling relatively inexperienced. The lack of formal recognition

or defined roles for trainees who regularly lead teams can perpetuate this.

A fear of going to 'the dark side', where they use 'a different language', and are perceived to have a less directly clinically facing focus, can also dissuade trainees. Time pressure is cited as another hurdle. With busy clinical commitments, postgraduate post applications, examinations and continuing professional development there are many competing demands on time. Frequently rotating jobs, limited funding and difficulty upscaling can also undermine the continuity and sustainability of improvement and other leadership projects.

Another barrier to developing leadership skills, described by trainees, is lack of senior support. This may at times be more of a perceived barrier. However, unfortunately there also exists a degree of scepticism amongst some seniors regarding more formal leadership opportunities, such as novel leadership programmes, for those at a relatively junior stage in their careers. Sadly, this view ignores the reality that the trainees of today are the senior leaders of tomorrow. It also fails to recognise that broadening experience and perspective throughout all career stages will better enable clinicians to successfully work across boundaries and systems establishing networks for the benefit of all.

IMPROVING OPPORTUNITIES

Opportunities to develop how leadership could be improved was also explored. The resulting ideas can be summarised into themes of improving awareness, formalising roles and facilitating opportunities.

Initially when asked to discuss leadership, trainees tend to recall a clinical situation. Following some discussion there seemed to be a greater awareness of the breadth of leadership experience acquired during training. It was suggested that to further raise awareness, the section of the NIMDTA website devoted to leadership opportunities could be better promoted, for example, via specialty schools and referencing in trainee newsletters. Ensuring that trainees and trainers are fully aware that study leave may be used for opportunities to develop leadership skills as well as programme-specific activities was felt to be important and something practical that could be done.

NIMDTA has begun the process of developing formal leadership programmes such as ADEPT and ENGAGE. [2,9,11] To improve leadership opportunities trainees felt that there was a role for incorporating awareness of and training in leadership skills from an early stage e.g. Foundation Generic Skills.

Formalising trainee roles within posts and attachments, e.g. Quality Improvement Lead or Teaching Lead, may also allow trainees to better understand the leadership and managerial roles they are demonstrating when for example they are organising a teaching rota. In order for these roles to be effective there would need to be a robust governance structure regarding appointment to and support for the role.

Delays in obtaining approval for study leave were highlighted by trainees. These delays could be due to factors within training locations, processing through NIMDTA, or a combination of both. However, it is clear that if the process is difficult it could discourage trainees from availing of useful opportunities. NIMDTA is keen to engage with trainees for suggestions on how to improve this system. The opportunity to meet people in senior leadership roles was identified by trainees as being valuable. Allowing you to put a 'face to a name', and understand the leadership journeys that these individuals have undergone, can offer encouragement and promote confidence.

CONCLUSION

Given that there is now significant evidence supporting the importance of strong engagement of doctors in healthcare leadership at all levels in our system, it is vital that the leadership capabilities of postgraduate medical trainees are developed. It is accepted that leadership development has not traditionally been perceived as an integral component of medical training to date. However, this is changing.

As awareness of the value of medical leadership rises, there has been a wealth of new opportunities for trainees. Each of the 4 UK nations now has strong postgraduate, focused, leadership fellowships open to high calibre applicants. There is increasing understanding of the need to 'label' formal and informal experiences and opportunities as leadership and management skill development.

In Northern Ireland, there are now numerous development programmes open to trainees in all specialties which require varying levels of time, input and commitment to cater for a range of levels of interest and enthusiasm. These programmes are raising awareness and contributing towards a 'critical mass' of trainees and future consultants with the insight, knowledge and skills to support colleagues undertaking leadership roles, even if they choose not to take that path themselves.

However, there is an acknowledgement that barriers to leadership development remain. Trainees require support and encouragement to appreciate their existing leadership experience and to nominate themselves for more formal leadership opportunities.

Greater engagement with senior leaders and managers is required at an early stage in training to promote understanding and empathy and remove perceived barriers to collaboration. The realisation that there is a fundamental shared goal and the development of a common language may aid progress to a culture change in relationships with medical management. Signposting and support by deaneries regarding the range of leadership opportunities open to trainees may aid engagement. Deaneries can enable leadership opportunities by facilitating study leave, raising awareness with trainers, supervisors and senior colleagues, providing career enhancing incentives and encouragement for interested trainees.

The innovation and transformation of the healthcare system which is essential to ensure a safe and efficient service will require unprecedented engagement of doctors in healthcare leadership. This engagement in clinical leadership must be systematically and urgently promoted at all levels. National leadership development at scale is pivotal to future progress to develop a sustainable model of care.

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Curiositas

HISTORICAL QUIZ

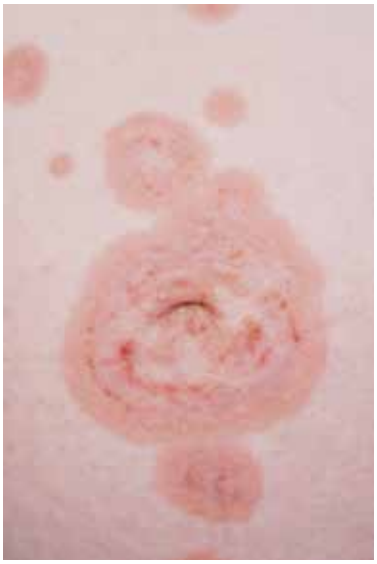
The Belfast Medical Students' Association (BMSA) was established in 1886 and is one of the oldest and largest student societies at Queen's University Belfast (QUB). Below is an image of the front cover of the 'menu' from their 1958 annual Presidential dinner.

1. Who was the BMSA staff president that year?
2. Who gave the 'toasts' on the evening?
3. What was provided to attendees that would be frowned upon in today's medical world?

Dr B Donnelly, (Consultant Anaesthetist), Craigavon Area Hosptial.

DERMATOLOGY QUIZ

A 33-year-old female who was 27 weeks pregnant presented with a two week history of an itchy rash that began in the peri-umbilical area and gradually spread to involve her trunk and limbs.



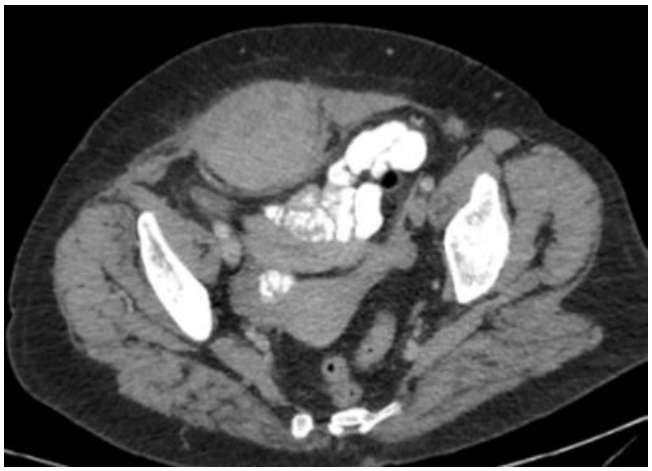
1. What is the diagnosis?
2. What investigations are necessary?
3. How should this be managed?

J Moradzadeh (Medical student, Queen's University Belfast), Dr W Abdelrahman (Specialty registrar) and Dr D O'Kane (Consultant Dermatologist), Department of Dermatology, Royal Victoria Hospital, Belfast, Northern Ireland.

SURGICAL QUIZ

A 56-year-old female presented to the Emergency Department with a two-week history of increasing right iliac fossa pain. The pain was constant, localised and described as 10/10 in severity. She has a background of hypertension and was being treated for an acute exacerbation of chronic obstructive pulmonary disease. Abdominal examination revealed a 6 cm tender, superficial mass in the right iliac fossa with associated bruising in suprapubic region. She was systemically well.

A CT scan of abdomen was performed.



1. What is the diagnosis?
2. What is the treatment?
3. What is the pathophysiology of this condition?

M Kerr (Medical student, Queen's University Belfast) and Mr B Clements (Consultant Surgeon and Director of Emergency Surgical Unit, Royal Victoria Hospital, Belfast).

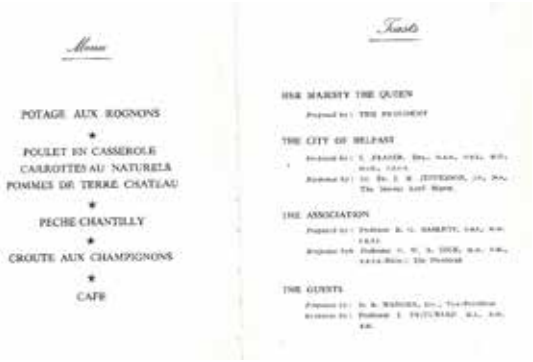
ANSWERS See overleaf

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

Curiositas: Answers

HISTORICAL QUIZ

The BMSA staff president in 1958 was Professor George Dick. Professor Dick was appointed to the Chair of Microbiology at Queen's University Belfast in 1955. The menu that evening, and toasts, is shown below. As can be seen, quite a number of notable Northern Irish doctors were present that evening 60 years ago. I wonder what the current BMSA annual Presidential menu is like and will there be any *notable* doctors of the future present?



Menu

POTAGE AUX HOGNONS

★

POULET EN CASSEROLE
CAROTTES AU NATURELS
POMMES DE TERRE CHATEAU

★

PECHE CHANTILLY

★

CROUTE AUX CHAMPIGNONS

★

CAFE

Toasts

HER MAJESTY THE QUEEN

THE CITY OF BELFAST

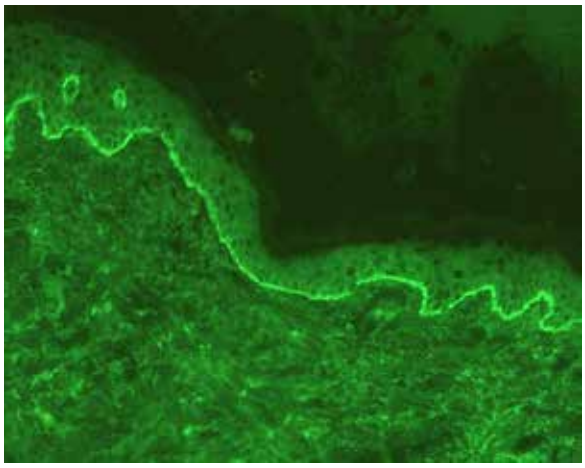
THE ASSOCIATION

THE GUESTS

Finally, attendees where provided with cigarettes! At this time the dangers of smoking were simply not known and is so far removed from what happens today.

DERMATOLOGY QUIZ

1. The appearance of a pruritic, urticated rash during pregnancy that involves peri-umbilical skin is suggestive of pemphigoid gestationis. Foetal complications include premature delivery and transient blistering of the newborn.



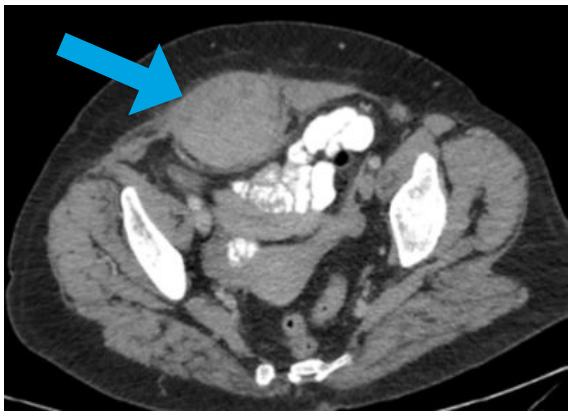
Skin biopsy for direct immunofluorescence: linear deposition of C3 along basement membrane which lies between epidermis and dermis.

2. Skin biopsy for histology and direct immunofluorescence are essential to confirm the diagnosis, along with serum testing for indirect immunofluorescence.

3. Topical corticosteroids and antihistamines are first-line agents to treat pemphigoid gestationis. For recalcitrant disease, systemic corticosteroids or steroid-sparing agents such as azathioprine or ciclosporin may be required. The choice will depend on whether the pregnancy is ongoing, since potential teratogenicity may limit the use of certain agents.

SURGICAL QUIZ

1. Rectus sheath haematoma – there is a large collection of organised blood in the right lower rectus abdominis muscle.



2. Analgesia combined with correction of any bleeding tendency. When the haematoma is expanding, interventional radiology should be considered to embolise the offending inferior epigastric vessels.

3. This usually occurs in elderly people when there is a background of chronic cough and use of anti-platelet or anti-coagulant drugs.

FURTHER READING:

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Book Case

This feature is normally about favourite books but instead the editor has allowed me to pick my favourite music festivals, acts and tracks. This has proved to be quite difficult as its like asking one to pick one's favourite child! So I have gone for the most memorable festivals, acts and tracks that I have come across this year. Dr Tony Tham

GLASTONBURY FESTIVAL OF CONTEMPORARY PERFORMING ARTS, Worthy Farm, Pilton, Somerset. Held every June except for a fallow year every 6 years. http://www.glastonburyfestivals.co.uk/

The full name of this festival is a mouthful but everyone knows it as Glastonbury which is the most famous and iconic music festival in the world. People will have their own impression of what Glastonbury is like based on what they have read and seen on TV. It is all that and much more. I have been to four Glastonbury's so far and love it so much that I will keep going as long as possible. The music is what everyone associates Glastonbury with and quite right too. The top acts will aspire to play at this festival because of its heritage and iconic nature. I have had the privilege of seeing acts like the Rolling Stones, U2, Coldplay and the Killers (more about this later), amongst others perform their headline sets on the main Pyramid Stage. There is also the pleasure of discovering new acts like Dua Lipa who played to relatively small crowds years ago and now has a huge following.

The festival is more than just about the music. Its spirit encompasses themes such as being at one with nature, sustainability, the environment and feeling like belonging to one big community. Water Aid and Greenpeace are regulars and have a large presence. This is a very friendly festival and everyone is chilled and out for a good time. Once, my wellies got stuck in the mud and before I could blink, several obliging festival goers came to pull me out.

Like the music, there is an eclectic range of food from all round the world. I have managed to spend the whole weekend eating nothing but eastern cuisine.

You can also indulge your inner clubbing instinct by dancing all night to the many DJs around the site. One area is called Block 9 and is built like a movie set of a post-apocalyptic world, albeit with party goers having a good time.

If you feel like reliving your youth or if you are youthful and just want to live and have fun, then this is the festival for you. Camping is a great way of being one with nature. The toilet facilities are infamous but have improved considerably and are now acceptable. If it rains and becomes muddy, then you have to be pretty resilient but just imagine all the stories about the mud you can regale your friends with. If it is sunny and dry, then you have struck the jackpot and Glastonbury is what I imagine utopia would be like.

Fig 1. Glamping in Glastonbury; a pop up hotel room in a field in Glastonbury 2017

BELFAST VITAL FESTIVAL. In the past few years, have been held in August at the Boucher Playing Fields in Belfast. https://www.facebook.com/BelfastVital/

This is normally a two day city music festival. The focus is entirely on music with a reasonably good selection of local food vendors and hostelry. This being a city festival, there is no camping. The acts that have played over the past several years are arena filling artists such as Foo Fighters, Kings of Leon, Calvin Harris, Muse, The Killers (more about them later) and Snow Patrol. They are ably supported by other A list acts such as Clean Bandit and Duke Dumont (more later). The crowds and the atmosphere at this festival depend on the headline act. A DJ set such as Tiesto last year will attract a younger crowd while a (slightly) older crowd will go to see the Undertones or Snow Patrol. The crowd is friendly and chilled and there is good security without being too oppressive. You are likely to bump into someone you know, typical Northern Ireland, which adds to the fun. There is a chance of being able to blag your way into the mosh pit (an area in the front of the stage where the dancing is energetic) which surprisingly has a lot of space and you can get close and intimate with your favourite act. The advantage of a city festival is that the transport infrastructure is good and the likelihood is that after a day and night of fun, you will be able to go back to the comfort of your own bed and a hot shower.

THE KILLERS, http://www.thekillersmusic.com/

The Killers are one of the biggest rock bands in the world and have headlined many major festivals including Glastonbury and Electric Picnic in Ireland and have played sold out arena shows like Wembley. They stormed into our consciousness with their mega selling debut album, Hot Fuss. The stand out single from the album, Mr Brightside, is so infectious, I defy anyone not to break into dance and punch the

air whenever it comes on. Their genre is indie rock, alternative rock and synth pop. The band come from Las Vegas, Nevada and are the most successful rock band to come from Nevada, having sold 22 million records worldwide.

Their live shows are outstanding and the lead singer, Brandon Flowers, is a very charismatic frontman. Other members of the band are David Keunig, Mark Stoermer and Ronnie Vannuci. Their songs tell tales of androgynous girlfriends, illicit affairs and Las Vegas. One of their songs *Human* is famous for the obtuse lyric "are you human, or are you dancer". Another favourite goes like this "I've got soul but I'm not a soldier". Their influences range from Bruce Springsteen to Dire Straits. They played a version of the latter's *Romeo and Juliet* and have included it in some of their live shows. Their latest concert in the SSE Arena in Belfast in November 2017 was one of the best I have ever been to, especially when they played the populist local anthem, *Teenage Kicks*. I have been to six of their concerts since they formed in 2001 and want to go to more.

WOLF ALICE, http://wolfalice.co.uk/

Spotify sum up this band very well as an "evocative North London alt-rock outfit led by vocalist Ellie Rowsell. Wolf Alice deftly mixes folk, rock, grunge, and electronic elements with vintage 90's indie rock". The other members of the band are Joff Oddie, Theo Ellis and Joel Amey. The band is in their 20s. They formed in 2010 and their first single "*Fluffy*" was released in 2013. Their song "*Silk*" was in the soundtrack of the film T2: Trainspotting.

Their live shows are characterized by great energy and rawness. Their frontwoman Ellie is the very definition of a rock chick with a mix of aggression and vulnerability. They have played Glastonbury on several occasions and Electric Picnic. Their audience range from late teens to more mature adults. I think they will become even more famous and it will be wonderful seeing them play in small venues and hopefully

Fig 2. Bumping into celebrities in Glastonbury 2017; with the band Haim

progressing to arenas in the future. If you like grunge, indie rock, electronic and want to see a band at the start of their career, this is one you may want to follow.

***I GOT U* BY DUKE DUMONT**, https://www.youtube.com/watch?v=FHCYHldJi_g

This track reached number one in the UK in 2014. The most memorable association of this track is its music video and with summer. The video was filmed in Thailand which is one of my favourite holiday destinations. GQ magazine praised the video saying that it had "all the tropical trimmings: turquoise waters, infinity pools, freshly sliced watermelon, a beachside rave, bungee jumps, inquisitive monkeys " and noted that its only drawback is that it caused cravings for coconut drinks, an extended holiday and a game of beach volleyball. Jamieson Cox of *Pitchfork* magazine called the song, "a blast of sunlight and warm, humid air, flecks of steel drum, vocal samples, and a joyous, radiant vocal take." This track was nominated for Best Dance Recording at the 2015 Grammy's.

Duke Dumont is an English DJ and record producer. He is known for his other number one record "*Won't Look Back*". He has performed at the Electric Picnic festival in Ireland where the tent he was performing in was so packed that many revelers (including me) couldn't get in. I managed to see him however at Belfast Vital in 2016, so that ambition was achieved!

If you want to imagine yourself being in a tropical paradise, then listen to this track and watch the video at https://www.youtube.com/watch?v=FHCYHldJi_g. Enjoy!

***SYMPHONY*, BY CLEAN BANDIT (featuring Zara Larsson)**, https://www.youtube.com/watch?v=aatr_2MstrI

Symphony is a classical pop song featuring strings and electronica. The song is also accompanied by a memorable video. It features the band, Clean Bandit, and Zara Larsson performing this song with an orchestra, while an emotional story plays out. It shows a loving couple doing every day activities. One of them is killed in an accident. The surviving man is seen grieving and visiting places they went as a couple together. He then writes music again and we discover that he is the composer in the orchestra that Clean Bandit are playing with, and has composed a symphony in memory of his partner. The video ends with him looking into the crowd and sees his deceased partner looking proudly from the audience.

Clean Bandit is an electronic and classical music group from Cambridge. Their music combines dance music with strings. They have collaborated with other famous artists such as Jess Glynne on the track "*Rather Be*" which has been a hit in the charts and has had a lot of air play including as a sound track for commercials. Their songs have characteristically infectious hooks and they are an awesome live act. I have seen them at various festivals including Electric Picnic and Belfast Vital.

And so I end this piece with an emotional track that shows that out of devastating loss something good can arise.

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Game Changers

TOTAL ANKLE REPLACEMENT: AN ALTERNATIVE TO ANKLE ARTHRODESIS

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Ankle arthritis is a disease as debilitating as end-stage hip arthritis with equally severe mental and physical disability scores. Traditionally, ankle arthrodesis (AA) was considered the gold standard for ankle arthritis. More recently, total ankle replacement (TAR) has gained significant grounds as a valuable alternative. In Ireland, the STAR (Scandinavian Total Ankle Replacement) and Hintegra ankle prosthesis have been implanted for over 15 years.

Following ankle arthrodesis, osteoarthritis ensues at the subtalar joint in 50% of cases at 8 years and in 100% at 22 years. On the other hand, TAR preserves motion at the ankle, thereby protecting adjacent hindfoot joints from future arthritis. To avoid gross gait disturbance, TAR is preferable in patients with contralateral ankle arthrodesis. The aim is to provide a stable, balanced, mobile and painless ankle. Absolute contraindications include infection, peripheral vascular disease, neuropathy and significant avascular necrosis. Improved implant design and acceleration of surgeons' learning curve have reduced surgical complications and increased implant survivorship to 75-90% at 10 years.[1] Surgeons performing 21 TARs or more a year have fewer complications.[2]

Both TAR and AA are effective treatments for ankle arthritis. Careful patient selection is essential for optimal results.

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THE MANAGEMENT OF MODERATE TO SEVERE PSORIASIS: A BIOLOGIC REVOLUTION

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Psoriasis is a chronic immune mediated skin disease affecting 1-2% of the UK population and has associated co-morbidities including Psoriatic Arthritis(PsA), metabolic syndrome and depression.[1,2] Psoriasis patients suffer from impaired quality of life due to social stigmatisation and often require lifelong treatment. Prior to the early 2000's treatments available included phototherapy and conventional drug therapies including Methotrexate, Ciclosporin and Acitretin which are not without risk and require regular blood monitoring and outpatient dermatology review.

Since the introduction of anti-TNF drugs, the last 8 years has seen the introduction of a number of new biologic drugs targeting different pathways and receptors. Currently there are 6 biologic drugs licensed for treatment of psoriasis in the UK. These drugs have revolutionised patient care and the most recent anti IL-17 antagonists can now achieve a 90% reduction in the Psoriasis Area and Severity Index in up to 70% of patients. Concerns regarding safety of these drugs are largely unfounded and the British Association of Dermatology has initiated a registry to monitor these drugs (BADBIR) to measure long term safety data.

The main problems facing the modern dermatologist include treatment failures and patient expectations. Patients who have struggled for years using topical therapies and conventional systemic drugs, once clear or significantly improved on biologics often become intolerant to very limited clinical recurrence. Managing expectations relies heavily on the doctor patient relationship and patient education. Secondly, a small subset of patients initially respond but lose efficacy and can often move through biologic drugs quickly. These brittle patients ensure that our modern day struggle with Psoriasis is not over but their future remains bright with the introduction of novel biologic agents on the horizon.

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'MOBILISE TO LIVE': A PARADIGM SHIFT IN THE TREATMENT OF ELDERLY OSTEOPOROTIC ACETABULAR FRACTURES.

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'Mobilise to live' is the overarching principle behind the management of neck of femur patients. Immediate weight bearing mobilisation is essential to a successful outcome. There is an equivalent, growing patient cohort who sustain complex acetabular fractures with osteoporotic bone.[1] Traditional fixation methods require extended surgical approaches, several hours in theatre, and a prolonged period of compromised weight bearing. This effectively confines the patient to bed and puts them at complications associated with recumbency. Innovative thinking is required to optimise their outcome.

Tumour prostheses have been successfully used in distal femur fractures with poor bone quality and large defects.[2] We have translated this to the acetabulum, using an 'ice

Fig 1. The METS Coned hemi-pelvis implant system, Image Courtesy of Stanmore Implants, Elstree, UK

cream cone' (figure 1) hemipelvic reconstruction to bypass the fracture and provide a stable construct (figure 2). This has not previously been described. It is inserted via a minimally extended posterior approach to the hip, with a mean operative time of 94 minutes. Patients are allowed to fully weight bear day one post operatively. This is now the treatment of choice for these patients at the Royal Victoria Hospital, Belfast. Early results have demonstrated a reduced length of stay, minimal complications, reduced mortality and improved mobility in this challenging cohort.

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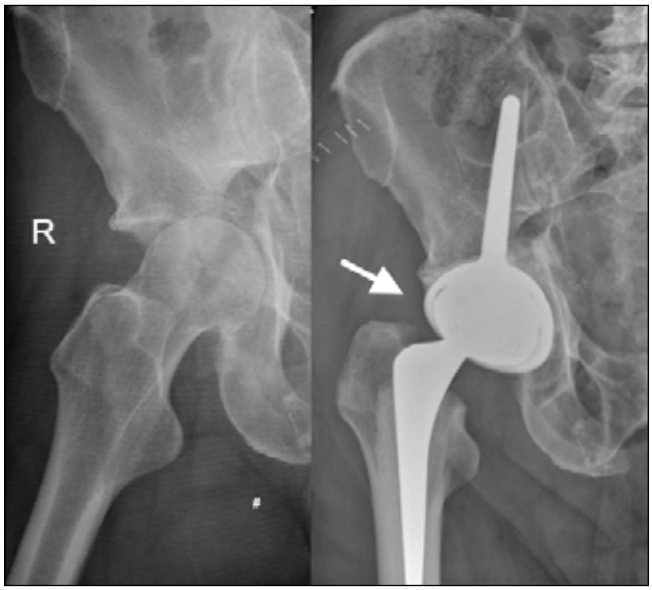

Fig 2.

Ulster Med J 2018;**87(2):**127-128

So you want to be a **Medical Education Fellow**

Sarah Campbell, Paramita Cifelli

Dr Sarah Campbell, Undergraduate Medical Education Fellow, Dr Paramita Cifelli, Associate Undergraduate Dean.

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INTRODUCTION

General Medical Council (GMC) Good Medical Practice (2013) advises doctors should be willing to teach and train both postgraduates and undergraduates[1]. In reality for most specialties this has always been a significant part of the practitioner's role. What is unclear is how many have formal training in education. Whether applying for Core Training, Specialty Training or a Consultant post, evidence of involvement and training in teaching is becoming more and more desirable. There are also points to be gained from a formal education qualification and it is used as a discriminatory tool at interview[2].

With some doctors taking a break from climbing the training ladder, either between Foundation and Core, Core and Higher training or as an Out of Programme Experience (OOPE) year, Education Fellowships are becoming a useful and career enhancing option.

FELLOWSHIPS

Medical Education Fellowships are widely varied and are offered across the country. They can range in duration from six months to over two years. Most are based in NHS hospitals but there are a number in medical schools including Barts and The London School of Medicine and Dentistry and University College London[3].

Whipps Cross University Hospital runs several year-long medical education fellowships including a fulltime undergraduate fellow, postgraduate fellow, who spends fifty per cent of their time working in acute medicine, and a senior anaesthetics fellow (OOPE) who spends fifty per cent of their time in clinical anaesthetics.

There is cross over in activity between all three roles but their responsibilities mostly are linked to their job title.

Each fellow is offered a Barts Health NHS 'Art of Debriefing' train the trainer course. They are then trained on-site as simulation faculty, with the opportunity to work across sites on courses aimed at a wide range of specialties and disciplines including acute care, crisis resource management and leadership skills. The fellows provide clinical skills training for undergraduate and postgraduates in the medical education suite and through Barts and the London School of Medicine and Dentistry. They facilitate problem based learning seminars and design and deliver multidisciplinary in-situ simulation. They are an invaluable resource in postgraduate and undergraduate local teaching programmes.

Innovation is actively encouraged and supported in the form of new course design and provision, with previous fellows presenting their projects at national and international conferences. There is also support for pursuing a formal educational qualification.

BENEFITS

The main role of the fellowship is to improve and practise teaching skills, aiming to enable the fellow to teach more effectively back in their clinical role. It allows a dedicated period of time to concentrate on these skills in a structured environment providing supervision and feedback.

The experience will add evidence and support to future clinical job applications as well as helping fellows identify roles within medical education for their future career path.

The experience also benefits from reduced or no on-call work with evenings and weekends free. Many fellows enjoy knowing they will be working in one location and having a year-long 'rota' from the beginning of the job.

CHALLENGES

The change in pace in education roles following clinical medicine takes adjusting to. Most doctors are used to being overstretched, fellows who may be more familiar with typing up teaching sessions and presentations at home in between shifts now have time set aside to prepare their sessions. These roles have less regimented or dictated schedules than clinical ones and initially may feel directionless however innovation and new projects quickly fill this space.

For some not having any clinical work may lead to anxiety about deskilling and some may miss the challenges and diversity of clinical work. The lack of on-call will also mean a drop in salary for those previously 'banded' although there is invariable the opportunity to pick up additional locum shifts in most large NHS trusts.

CONCLUSION

Historically trainees in all disciplines would be able to develop their teaching and training skills while in their training posts however in the current climate clinical commitments mean that this can often not be guaranteed or relied upon and a trainee can find themselves ready to take on a consultant role without having offered any meaningful contribution despite the GMC advise that teaching undergraduates and postgraduates is an important part of our role as doctors. Medical Education Fellowships provide an opportunity

to focus solely on the skills needed to do this effectively. Fellowships are varied in how they provide this training and therefore with a bit of research it is possible to find the right one for your skills and stage in training. For those considering taking 'time out' of clinical training education fellowships are an excellent option.

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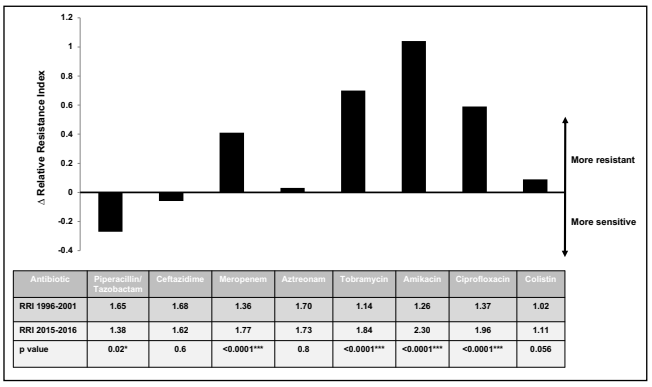
Letters

INCREASING BURDEN OF ANTIMICROBIAL RESISTANCE IN *PSEUDOMONAS AERUGINOSA* FROM ADULT PATIENTS WITH CYSTIC FIBROSIS (CF) IN NORTHERN IRELAND: THEN AND NOW

Editor,

Cystic fibrosis (CF) is characterised by defective mucociliary clearance and chronic airway infection.[1] The most commonly isolated pathogen from CF airways is a Gram-negative bacterium, *Pseudomonas aeruginosa* (PA).[2] Chronic PA infection is associated with significant morbidity and mortality in CF patients[3] and necessitates multiple antibiotic courses.[2] Antimicrobial resistance (AMR) in PA may be driven by the exposure of bacterium to antibiotic, either in the acute setting or during anti-pseudomonal chronic suppressive therapy. We examined AMR from PA isolates from a single adult CF centre, by comparing antibiotic susceptibility from contemporary isolates with a collection from 13 years ago.



Antibiotic	Piperacillin/ Tazobactam	Ceftazidime	Meropenem	Aztreonam	Tobramycin	Amikacin	Ciprofloxacin	Colistin
RRI 1996-2001	1.65	1.68	1.36	1.70	1.14	1.26	1.37	1.02
RRI 2015-2016	1.38	1.62	1.77	1.73	1.84	2.30	1.96	1.11
p value	0.02*	0.6	<0.0001***	0.8	<0.0001***	<0.0001***	<0.0001***	0.056

Fig 1. Change in mean Relative Resistance Index [RRI] over a 13 year period with respect to Pseudomonas aeruginosa isolates (n=200) from the sputum of adult CF patients

Two collections of PA isolates were examined, each consisting of 100 non-duplicated organisms, which had isolated from the sputum of adult CF patients attending the Northern Ireland Adult Cystic Fibrosis Centre, Belfast City Hospital. Collection A was isolated during the period 1996-2001 and Collection B (2015-2016). Microbiological isolation of PA was performed from freshly expectorated sputum, by employment of selective culture for 24-48h, followed by biochemical confirmation with API20NE identication strips (Biomerieux Ltd, UK). Antibiotic susceptibility was performed on each isolate by standard disk diffusion assay and resulting zone sizes were interpreted against published CLSI criteria. Eight antibiotics from three classes of antibiotics were examined, including beta-lactams, fluoroquinolone and polymyxin, as detailed in Figure 1. Antibiotic susceptibility was quantified by employment of a novel marker, Relative Resistance Index [RRI], as recently described.[4] Briefly, qualitative "sensitive", "moderately resistant" and "resistant" data were converted into a quantitative RRI value, through employment of an algorithm.[4] An unpaired two-tailed t-test was used for comparison of trends between these two periods and a probability (p) value of less than 5% ($p<0.5$) was considered statistically significant. There were no differences in the microbiological isolation methodology nor with the antibiotic susceptibility methodology between these two collection periods.

A comparison of RRI scores between the two collection periods is shown (Figure 1). RRI and AMR increased significantly for ciprofloxacin ($p<0.0001$)***, aminoglycosides (both amikacin and tobramycin, $p<0.0001$)*** and meropenem ($p<0.0001$)*** for PA isolates from 1996-2001 to 2015-2016. There was reduction in AMR during this period with piperacillin/tazobactam and ceftazidime.

Overall, this study showed markedly greater resistance in the 2015-2016 PA cohort. Increase in AMR may reflect chronic exposure of PA to several classes of antibiotics used in the management of CF airways infection. Until now, it has been relatively difficult to perform comparative studies on AMR in CF, due to the reliance on generating largely qualitative data (S, I &R) from disk diffusion assay. However, RRI may help tracking changes in resistance patterns either at a population level or at an individual patient level, either with a single antibiotic agent, several agents within a single class or collectively between antibiotic classes.

This approach may be useful in helping to track emergence in AMR epidemiologically, those agents which display the greatest shift in AMR, as well as helping to guide antimicrobial stewardship practices and policies in CF.

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'DISCHARGE LETTER QUALITY; HOW TO HELP BOTH JUNIOR DOCTORS AND GPS?'

Editor,

Discharge letters are an important communication enabling the safe transfer of a patient from secondary to primary care. Research has shown that many junior doctors feel inadequately trained in the process of writing discharge letters[1]. The authors of this work noted a wide variation in how long it took junior doctors to complete letters. A survey of UK GPs noted that they too are unhappy with the standard of letters they receive. They highlight accuracy, clarity and timeliness of receiving letters as causes for concern [2]. This team has completed a quality improvement project aiming to reduce time spent writing discharge letters and improve their clarity.

METHODS

Baseline data was collected on how long it took 4 junior doctors to complete 1 weeks-worth of discharge letters working across 4 medical wards of the Ulster Hospital, Northern Ireland in January 2017. Two complete Deming 'plan-do-study-act' (PDSA) cycles were then performed. In cycle 1 (March 2017) an educational intervention was introduced to the 4 junior doctors. This consisted of a 1-hour teaching session by medical consultants, with GP input on how to write an efficient and effective discharge letter. In cycle 2 (August-October 2017), an educational intervention was delivered by one of the original junior doctors to all incoming junior doctors to Northern Ireland at their regional induction day.

RESULTS

Baseline data showed that the mean time taken to complete 31 discharge letters was 25.9 minutes, with a range of 58 minutes (*Table 1*). After cycle 1, mean time spent completing 43 discharge letters fell by 43.2% ($p<0.001$) to 14.7 minutes, with a range of 25 minutes. GP and consultant feedback indicated that letters written after education had increased clarity. After cycle 2, mean time completing 34 letters was 21 minutes, with a range of 31 minutes. This is a 19% reduction relative to baseline ($p<0.05$).

TABLE 1.

Time taken to complete discharge letters over a one-week period by four junior doctors at baseline and after PDSA cycle one and two educational interventions.

	Baseline Data	PDSA 1	PDSA 2
Mean Time (min)	25.9	14.7	21
Median Time (min)	24	15	21
Range (min)	58	25	31

DISCUSSION

Over the course of a typical week, the change brought about through PDSA cycle 1 could save a junior doctor 2 hours and 45 minutes. This could free doctors to increase exposure to other facets of healthcare provision and training opportunities. Despite our findings and evidence showing that small group based teaching sessions provided to junior doctors can improve the speed of completion and quality of discharge letters, many medical schools do not incorporate extensive teaching[3]. Cycle 2, which increases the scale and sustainability of our project reduced time spent completing discharge letters, but was not as effective as cycle 1.

Discussion with local GPs revealed that they receive large volumes of letters and examination results from secondary and tertiary care centres each day. This team proposes the introduction of educational sessions to junior doctors focussing on how to complete efficient and effective discharge letters to improve clarity of communication and decrease time spent on letter composition.

David Johnston, Owen McMurray, Michael McKee, Michael McConville, Niall Leonard

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POINT OF DECISION PROMPTS AND SIGNPOSTING FOOTPRINTS IMPROVE STAIR USE IN A UK CITY CENTRE OFFICE

Editor,

Physical inactivity is a public health priority, with sedentary behaviour and lack of physical movement major contributory factors to serious illness, including coronary heart disease (CHD), stroke, Type 2 diabetes and breast and bowel cancer

(1). Small bouts of physical activity may be an effective way to reach recommended physical activity levels (2). Stair use is easily integrated into daily activities and associated with health benefits (3). We compared upward and downward stair and elevator journeys before and after the introduction of a multicomponent intervention consisting of point-of-decision prompts (PODPs) and signposting footprints at a city centre office in Northern Ireland.

Fig 1. Example of Point of Decision Prompt (PODP) used above elevator call buttons.

Using a before-and-after study design, measurement of people using the elevator and stairs originating or terminating on the ground floor were made for a period of a working day (9 hours 10 minutes) over three days (Monday 8am-1pm, Thursday 1pm-3pm and Tuesday 3pm-5.10pm) during a typical working week prior to the intervention. Measurements were repeated under identical circumstances four weeks and six months after introduction of the intervention. The setting was a six-story office building in the city centre of Belfast, Northern Ireland. Seven PODPs with simple messages, bright colours and bold text were designed and placed 10cm above the two elevator call buttons on each floor (Figure 1). Green footprints with a "Take the Stairs" message were stuck to the floor and stairwell entry door to increase visibility of the stairs and direct staff to take the stairs (Figure 2). Absolute and relative differences between pre-and post-intervention elevator and stair use were determined and chi-squared tests used to test for significant differences.

There were 6383 total observations, 2205 prior to intervention and 2179 four weeks post-intervention and 1999 six months post-intervention. Total stair journeys increased significantly from 16.6% to 30.2% (82% relative, 14% absolute increase, $p<0.0001$) four weeks post-intervention and remained significantly higher at 29.2% six months post intervention (77% relative, 13% absolute increase, $p<0.0001$). There was no significant reduction in total stair journeys between four weeks (30.2%) and six months post intervention (29.2%) ($p = 0.49$). Staff were over twice as likely to use the stairs four weeks after the intervention (Odds Ratio total journeys 2.2 [1.9 -2.5]) and six months after the intervention (Odds Ratio total journeys 2.1 [1.8 - 2.4]) compared to pre-intervention.

Fig 2. Signposting footprints used on the floor and stairwell door.

Most previous studies on interventions to increase stair use in workplaces involve PODPs alone with stair climbing increasing between 0.3% and 10.6% following introduction

(4). There are few studies of multicomponent interventions involving motivational POPDs and directional signs (e.g. footprints) in UK workplaces. We found a simple, inexpensive multicomponent intervention comprising motivational PODPs and floor-based directional footprints produced significant increases in stair use in a UK office building. The relative increase (82%) was much greater, and the absolute increase similar (11.8%), to previous studies (2). Journeys were over twice as likely to be taken using the stairs post-intervention. This simple effective intervention has potential for use in other buildings.

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Competing interests: None.

Ethical Approval: This study did not require Research Ethics Committee approval as it was an evaluation of a service change. We reached this decision using the Health Research Authority decision aid (http://www.hra-decisiontools.org.uk/research/). We assessed that we did not need to obtain informed consent because we did not collect any identifiable information about individuals. The study was approved by the Public Health Agency Staff Health and Wellbeing Group and the Public Health Agency Management Team, which provided corporate oversight and governance.

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PATIENT SAFETY INCIDENTS AMONG FOUNDATION DOCTORS

Editor,

Unfortunately, patient safety incidents (PSI) occur in our complex health care systems. These can have a negative effect both on the patient and the doctor involved. [1,2] Apart from the usual feeling of guilt, doctors also experience problems with job satisfaction, their relationship with colleagues, depression, inability to sleep, fear of going to work and low self-esteem. [3,4] There is limited data on the extent of this problem, especially among junior doctors. Getting support after errors may be difficult for senior physicians, let alone for junior ones. There is data to suggest that discussing such events with supervisors giving constructive criticism leads to better doctor outcomes. [5]

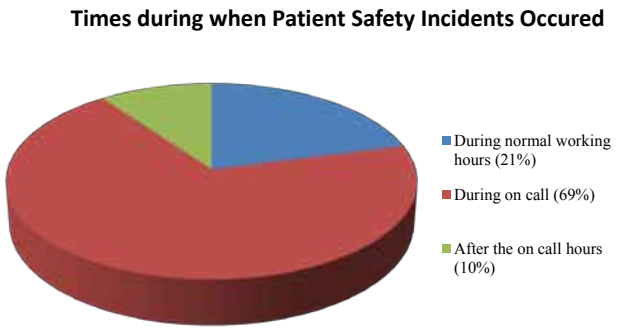

Fig 1. Time of PSI occurrence

The aims of our study were to determine how often foundation doctors are involved in PSIs and which are the most common incidents. An anonymous online questionnaire was distributed amongst Foundation Doctors working within the Malta and Severn (UK) Foundation schools, and 140 doctors completed the survey. There were no differences in the results between the 2 schools. Involvement in at least 1 PSI occurred in 58.5% of doctors. The remainder, (41.5%) claimed that they were never involved in such an event.

In most cases (48.9%), the PSI was identified by the doctor performing it. Doctors expressed different reactions after such events including; concern about the patient's health (25.6%), need for self-improvement (24.2%), disappointment (17%), shame (13.5%), guilt (12.5%) and desire to quit (4.9%). Only 1.35% did not demonstrate any apparent concern. The time of occurrence (Figure 1) and the type of PSI`s (Figure 1) are demonstrated below.

In terms of learning events, 31.2% noted the importance of good communication between doctors and patients, re-confirming patient identity prior to any intervention (27.7%), the need to give more attention to clinical practice guidelines (22%), re-check drug allergies (9.9%) and check blood results thoroughly (9.2%).

In 80.8% of PSI`s, doctors claimed there were no patient consequences. The rest did not give any answer. They considered fatigue (57.7%), time restriction (49%), doctor

–doctor (12.5%) and doctor to other healthcare professional miscommunication (22.1%) as possible reasons for such events. Furthermore, 86.1% of those involved in a PSI, thought that it was avoidable.

The majority of doctors (67%) claimed that they had not been trained in how to communicate effectively when it comes to apologising. The remainder (33%) claimed that they feel confident to communicate effectively when it comes to apologising.

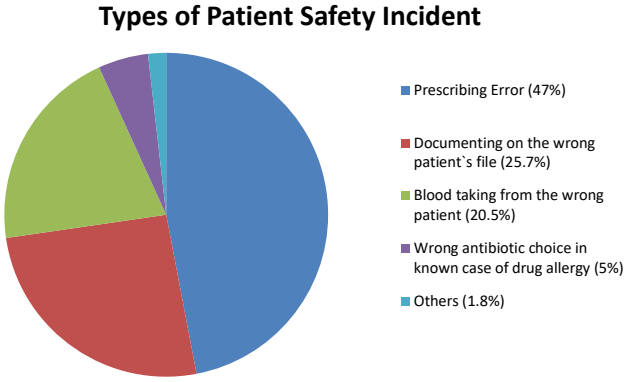

Fig 2. Types of Patient Safety Incident

Support and advice from a more experienced person was required in 74.2% of cases, with 26.7% of them mentioning that they would benefit from psychological support after a PSI.

This data demonstrates that most junior doctors experience emotional distress following PSI`s. Formal training in communication skills, disclosure of information and the offer of counseling with therapists and physicians (including Lead Physicians) with personal experiences of medical errors could be provided to help doctors understand how to cope well after such events. Ineffective coping strategies may be adopted if doctors are provided with inadequate support and thus become the "secondary victims" of such events.

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VOLAR DISLOCATION OF THE FIFTH CARPOMETACARPAL JOINT

Editor,

A 25-year-old right-handed housewife presented with severe left hand pain resulting from a fall from standing height. Tenderness and swelling was present over the ulnar side of the injured hand and the little finger appeared foreshortened. No neurological deficit was noted. Radiographs of the injured hand demonstrated a volar–ulnar dislocation of the 5th metacarpal base (Figure 1 panels a and b). Under general anaesthesia, closed reduction and percutaneous wire fixation restored congruence and stability to the dislocated 5th carpometacarpal (CMC) joint (Figure 2). Six weeks post-surgery the wires were removed and hand therapy initiated. Clinically, the patients left 5th CMC joint was stable and radiographs demonstrated joint congruency. The patient regained full function of her injured hand within 6 months.

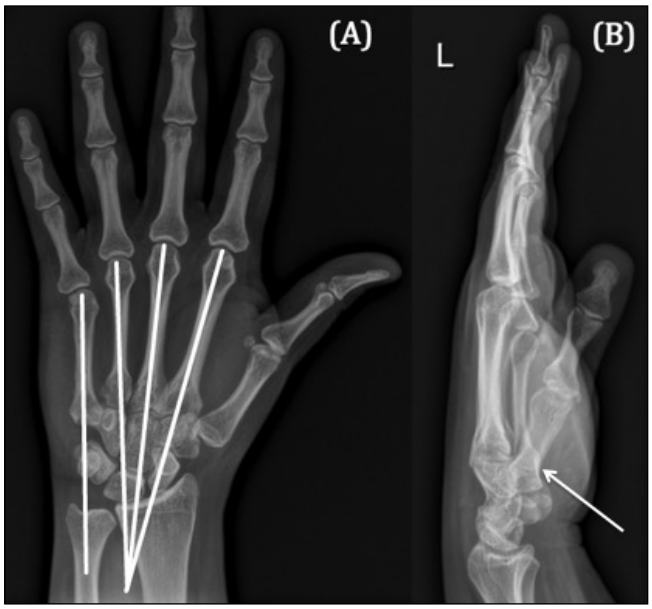

Fig 1. (panels A&B): Posteroanterior radiograph (a) demonstrating dislocation of the 5th CMC joint with loss of convergence of the metacarpal cascade lines (4 white lines – only 3 converge); true lateral radiograph (b) demonstrating anterior displacement of the 5th metacarpal base (white arrow).

CMC joint dislocations most commonly involve the 5th CMC joint and are usually dorsal.[1] Isolated volar dislocation of the 5th CMC joint is a rare injury with sporadic cases reported in the literature.[1] The injury is thought to result from a direct blow transmitted to the dorso-ulnar aspect of the 5th metacarpal base resulting in disruption of the supporting peri-articular soft tissues.[2] The deep motor branch of the ulnar nerve lies volar to the 5th CMC joint as it courses around the hook of the hamate and is vulnerable to injury in volar dislocations.[3] A careful neurological assessment of the injured hand is therefore essential.

CMC joint dislocations can be easily missed and failure to diagnose this injury may predispose the patient to pain and weakness of grip.1 Careful radiographic evaluation is paramount. Postero-anterior (PA), oblique and true lateral views of the injured hand should be obtained. Loss of convergence of the metacarpal cascade lines on the PA view is a key radiographic sign (see Figure 1a). The intermetacarpal angle, i.e. the angle between best-fit lines drawn down the medullary canals of the 2nd, 3rd and 5th metacarpals, is normal in volar dislocations and should not be used in isolation to exclude these injuries.[1] If clinically suspicious, additional views should be obtained with the forearm rotated to identify any displacement of the 5th metacarpal base obscured by superimposition of the central metacarpals.[4]

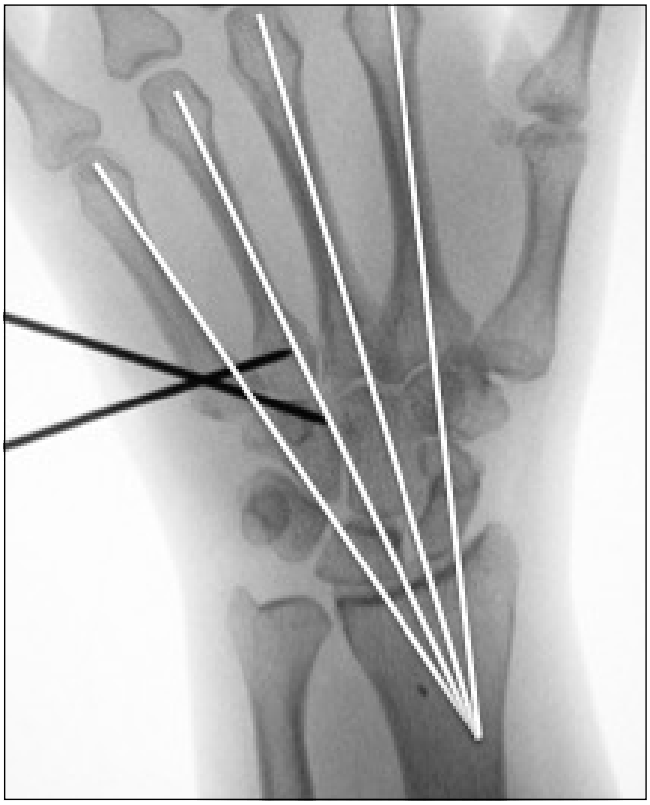

Fig 2. Intra-operative screening image demonstrating reduction and wire fixation of the 5th CMC joint with restoration of convergence of the metacarpal cascade lines (4 converging white lines).

Closed reduction of the dislocated 5th CMC joint and cast immobilisation is an option, however due to the degree of soft tissue disruption the injured joint is often unstable, as in our case, and temporary percutaneous wire fixation is required to restore joint stability and facilitate soft tissue healing.[1,2,5] Open reduction may be required where there is soft tissue interposition preventing closed reduction of the dislocated joint or in cases of delayed diagnosis.

In summary, isolated volar dislocation of the 5th CMC joint is a rare injury. Careful analysis of the injury radiographs and further views of the injured hand can reduce the risk of a missed dislocation. Reduction and temporary wire stabilisation of the injured joint is recommended.

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DO ALL PATIENTS WITH SALMONELLA INFECTIONS REQUIRE A 'PET' SCAN?

Editor,

A 70-year-old gentleman with Diffuse Large B Cell Lymphoma (DLBCL) was admitted to the haematology unit with neutropenic sepsis. He had a background of Benign Prostatic Hyperplasia, IHD, Duodenal Ulcers and previous cataract surgery. He was diagnosed with DLCBL 3 months previously and had undergone 3 cycles of RCHOP and one course of intrathecal methotrexate. The patient felt warm and sweaty at home, but had no other infective symptoms. On arrival the patient had a temperature of 38.0 °c. His clinical examination was normal, chest X-ray and urinalysis were also normal. The patient's bloods were was follows; HB 90, WCC 0.3, Plts 116, Neuts 0.1, CRP 123. The patient was diagnosed as having neutropenic sepsis and treated with IV Tazocin and given a STAT dose of IV Gentamicin. This was the patients second admission in three weeks with neutropenic sepsis. Initially during his first admission blood cultures were positive for Salmonella enteritidis and the patient had a 7 day course of IV Meropenem, and with clinical improvement he went home on an oral course of amoxicillin.

On this occasion, the patient's peripheral blood cultures once again grew Salmonella enteriditis. The Microbiology team advised to stop IV Tazocin and instead give a six week course of Intravenous Ceftriaxone. He continued to have temperatures for the first 10 days of his admission, however these subsequently settled. They also advised imaging of his aortic arch to endure that there was no endovascular origin of the infection. He had a CT scan of his chest, abdomen and pelvis and this had no evidence of mycotic aneurysm

or any other source of infection. An Echocardiogram did not reveal any vegetations. The patient had not been on any recent holidays and he had not been in contact with anyone who was unwell. It was unclear as to why this immunocompromised patient had two episodes of Salmonella associated neutropenic sepsis.

The patient's daughter, had been doing some research into Salmonella infections and noted a link with reptiles. It transpired that the patient had been living with his son, who kept pet snakes. Salmonella can be found in the gut of reptiles, and they 'shed the bacteria in their droppings'.[1] The bacteria, via the droppings can 'spread over the reptile's skin' and therefore contaminate any surface or person coming into contact with it.[2] Furthermore snakes (as in this case) are often fed frozen rats, another source of salmonella.

The patient finished his course of Ceftriaxone and recovered well. His interim PET scan showed an excellent response and he went on to complete therapy - 6 cycles of RCHOP, 4 cycles of intrathecal methotrexate followed by radiotherapy to the contralateral testes. All the snakes have been moved from his house and it has received a 'deep clean'. Furthermore his son has promised to ensure good hand hygiene and to change his clothes after contact with the snakes and their food. This fascinating case highlights a rare but important cause of recurrent infections in an immunocompromised patient. We propose that medical staff should remember to carry out a 'PET scan' when coming across Salmonella infections.

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Ulster Med J 2018;**87(2):**136-148

Abstracts

Junior Members Forum & Annual RBHSC Lecture

13th February 2014, Royal Victoria Hospital, Belfast

PRESENTATIONS

TEN YEARS ON – HAS DIABETIC KETOACIDOSIS IN CHILDREN CHANGED?

JS Woodside, ECA Stewart, J Dixon

Aims: To compare and contrast diabetic ketoacidosis (DKA) admissions in children to Antrim Hospital in 2000 with 2010. To determine which parameters have changed over 10 years since paediatric diabetes nurses were introduced (post 2000).

Methods: Retrospective analysis of case notes of all children with Type 1 diabetes under 18 years admitted with DKA from 1st January to 31st December in 2000 and 2010.

Results: Attendance at the paediatric diabetic clinic increased by 54% from 107 patients in 2000 to 165 patients in 2010. The percentage attending this clinic admitted with DKA decreased from 12% in 2000 to 6% in 2010. In 2000 there were 44 episodes DKA in 10 existing patients and 3 newly diagnosed patients compared with 23 episodes in 12 existing patients and 2 newly diagnosed patients in 2010. Recurrent DKA occurred in 5 patients in 2000 and 4 patients in 2010 with a total of 36 and 13 episodes respectively. The average HbA1c in existing patients with DKA was 9.9% in 2000, compared with 12% in 2010 with an average overall HbA1c of 8.8% in 2000 and 8.2% in 2010.

Conclusions: Over 10 years, patient numbers have increased, control overall has improved, incidence of DKA has decreased and there are fewer episodes of recurrent DKA. The patients admitted with DKA remain poorly controlled and highlight need for intensive management. The additional support provided by paediatric diabetes nurses has been highly beneficial in preventing DKA. Future structured education programmes and improved public awareness will hopefully lead to a continued reduction in DKA.

RETROSPECTIVE AUDIT: HAS THE USE OF NASAL CPAP IN TERM INFANTS LEAD TO AN INCREASED INCIDENCE OF PNEUMOTHORACES?

Dr J Courtney, Dr S Callaghan, Dr A Verner

Introduction: Spontaneous pneumothoraces can cause respiratory distress in term neonates; incidence 1-2%. The risk increases with resuscitation, CPAP or mechanical ventilation. In RJMH, term infants with respiratory distress are increasingly managed with CPAP. This audit determined the incidence rate and trend of pneumothorax over 6 years.

Objective: To examine whether nasal CPAP in term infants with respiratory distress causes increased rates of pneumothoraces.

Method: The 113 admissions to RJMH coded with 'pneumothorax' between 1/1/2006 and 31/8/2012 were included. Exclusion criteria were gestation <37 weeks, congenital and pulmonary abnormalities including congenital diaphragmatic hernia and pulmonary hypoplasia. 36 patients remained.

Results: Delivery; 47% elective caesarean section, 19% emergency c/s and 17% instrumental delivery. 75% no resuscitation at birth, 28% respiratory distress following delivery. 50% birth weight >3.5kg. 25% NCPAP prior to developing a pneumothorax. 50% urgent needle thoracocentesis; 39% chest drain insertion. Incidence of term admissions with respiratory distress who subsequently developed a pneumothorax was unchanged between 50/1000 – 150/1000. From 2006-2011 1-2 patients/year who developed a pneumothorax had received CPAP prior to diagnosis. However, in 2012 80% (4) had received prior CPAP. Incidence of RDS and TTN were unchanged. Outcomes; 78% home, 22% transferred.

Conclusion: The incidence rate of pneumothoraces is unchanged. However, use of CPAP was higher in 2012 and the 2012 incidence of pneumothorax was at the upper end of the range. This may explain the anecdotal evidence forming the hypothesis. Notably 66% delivered via c/s. This may be explained by the increased risk of TTN with c/s.

PAEDIATRIC ATTENDANCE AT DELIVERIES – WHEN AND WHY?

Lyndsey Thompson, ST3 Paediatrics (now ST5)

OBJECTIVES: The primary objective of this study is to determine the indications for paediatric attendance at deliveries, and the resuscitation required at all deliveries currently attended. Following the results of this, an updated guideline for paediatric attendance at deliveries will be devised.

STUDY DESIGN: This was a prospective observational study of 100 births, attended by paediatric trainees, in a tertiary care hospital for a three month period between November 2012 and January 2013. A questionnaire was completed by the trainees for each delivery attended, detailing the indication for paediatric presence and resuscitation required.

RESULTS: Information was collected for 100 births attended by paediatric trainees during this period. There was a range of indications for paediatric presence at delivery, with fetal distress being the most frequent (49%). Overall 75% of these deliveries required no intervention by the trainee. Of note, there was a significant difference in the resuscitation required at deliveries of infants with fetal distress present (34% deliveries requiring some form of medical intervention) and those without fetal distress present (0% requiring medical intervention). By using a guideline for paediatric presence at deliveries, attendance at these deliveries would have been reduced by 29%, with none of those deliveries requiring any form of medical intervention.

CONCLUSION: Many deliveries are currently being attended by paediatric trainees, with no intervention being required in the majority of these deliveries. This results in increased paediatric trainee workload, at the detriment of midwifery resuscitation skills and the natural birth process. Through formulation of an updated guideline regarding indications for paediatric presence at deliveries, this could reduce paediatric attendance at deliveries, without compromising patient safety.

POSTNATAL RADIOLOGICAL INVESTIGATIONS IN A DISTRICT GENERAL HOSPITAL – A QUALITY AND SAFETY STUDY

D Leemon , R Verma, K Courtenay, S Mugilan, M Anandarajan

Background & Aims: Follow up, management and communication of results of postnatal ward radiological investigations can have it's difficulties, particularly in district general hospitals. Approximately 1000-1200 radiological investigations are requested per year in our hospital. We noticed that there was a delay in communication of scan results and there was also no mechanism of identifying workload and whether normal scan results have been communicated to the parents or the GP of the patient

We implemented the following changes

- Introduction of Postnatal Radiological investigation register
- Neonatal Outreach team reviewed scan results (specific time allocated as part of job)
- All printed normal scan results to named Consultant – and letters sent to GP and parents
- Abnormal scan results shown to SpR / Consultant on same day and results acted upon and included in Patient center and ECR

We then audited the process to see if we had improved our communication of results.

Methods: A retrospective study of all the radiological investigation requests was carried out. It looked at the requesting process, documentation, review and communication of results before and after implementation of process changes.

Results: All the normal scan results were communicated to parents and GP within 4 weeks. All abnormal results acted upon within a day of the result.

Conclusions: The strategies implemented have resulted in effective communication, accountability and delivery of safe and high quality care to babies requiring postnatal radiological investigations. These strategies can be implemented in other DGH's with modifications to suit the individual units risks and priorities.

Abstracts

Junior Members Forum & Annual RBHSC Lecture

26th February 2015, Riddell Hall, Belfast

PRESENTATIONS

LUMBAR PUNCTURES IN POSTNATAL WARDS - A QUALITY IMPROVEMENT ACTIVITY

Dr. N.Thompson, Dr. Christine Mcfeely, Rosie Kelly, Dr. Damhnait Cassidy, Dr.Cathy Campbell, Dr. Niamh Lo, Dr. Mugilan Anandarajan

Background : Lumbar puncture (LP) and CSF analysis is a recommended investigation for evaluation of suspected sepsis in neonates (NICE guideline-CG149 August2012).

Prior to January 2014, process mapping for LP in a district general hospital, included clinical evaluation by a senior doctor, transfer from the postnatal to neonatal unit with monitoring for 1-hour post procedure. Documentation is recorded by both clinical teams, with two handovers of information.

Service review was performed following multidisciplinary meetings and a reorganisation plan was devised, aiming to minimise transfer of neonates, thus improving safety and documentation.

3 of the 4 regional neonatal units in NI perform LPs by the same method. Length of admission ranges from 2 to > 12 hours.

Methods: A 'Plan, Do Study Act' (PDSA) cycle was used. The planning stage involved meetings with stakeholders and risk assessment of the proposed change of having LP performed on the postnatal ward. A process map for the new method was trialled. Postnatal staff training was updated in post LP care. Equipment was checked and patient groups advised of parental preferences. When the new system was in place, incident reporting revealed no evidence of adverse outcomes. Rapid cycle audits proved patient safety was not compromised and parent satisfaction improved.

Results: The total number of LPs performed from 1/7/14 to 1/1/15 was 16. No incident reports, significant events, or contamination of CSF was reported. Ongoing service review identified areas of improvement, including patient information leaflets and documentation.

Conclusions : This project proposes that LP can be safely carried out on the postnatal ward, under observation by transitional care nurses. Information leaflets and stickers for clinical notes have been implemented with planned continuous evaluation.

LEARNING FROM ADVERSE INCIDENTS - QUALITY IMPROVEMENT FOLLOWING AN ADVERSE INCIDENT – INTRODUCTION OF POSTNATAL WARD INFORMATION LEAFLETS

Dr C.Campbell, Dr D.Cassidy, Dr S.Lawson, Dr N.Thompson Dr M.Anandarajan

Background: The Ulster Hospital has approximately 4000 deliveries/year with postnatal checks completed in the postnatal ward by midwifes and paediatric team prior to discharge. Verbal advice is routine and had been custom and practice. Following a category 2 adverse incident, the paediatric team reviewed practice after process mapping postnatal infant discharges. Patient families were approached to provide input regarding what advice they would have preferred to have received prior to discharge. Among the suggestions were "general" and "infant with suspected cardiac disorder" discharge leaflets.

Aim: To learn from adverse events locally using clinical leadership, cultural change and standardisation, to make service improvements that enhance the safety of our systems.

The Review Process: Initial review led to meetings with parents and service mangers as part of incident reporting and complaints processes. Process mapping then enabled risk and prevention assessment with implementation of immediate operational actions supporting recurrence risk reduction. Establishment of the Working Group with multidisciplinary team input facilitated improvement planning with the design and introduction of information leaflets.

Discussion & conclusion: Adverse incident review and input from The Paediatric Working Group facilitated insight into an area requiring system improvement. This allowed utilisation of the learning potential from the event and resulted in discharge information leaflets, which could be modified for use in other postnatal wards across Northern Ireland.

IMPROVING PATIENT SAFETY BY DEVELOPING A STANDARD PAEDIATRIC AND NEONATAL IN SITU SIMULATION PROGRAMME IN THE ULSTER HOSPITAL AND ACROSS NORTHERN IRELAND

Dr Natalie Thompson, Dr Christine Mc Feely, Dr Laura Mc Conaghey, Dr Danielle Leemon, Dr Carl Harris, Dr Mugilan Anandarajan.

Background and Aims: Resuscitation of the acutely unwell neonate is an important role of the multidisciplinary team.[1]

Simulation can bridge the gap between teaching and clinical practice, by improving both technical and non-technical skills.[2-8] The aims are; to embed twice monthly in situ simulations in the Ulster Hospital by June 2016; to improve staff confidence in resuscitation skills by 10% over 6 months; and to improve patient safety by a reduction in critical incidents. Secondary aims are to embed a simulation culture across Northern Ireland (NI) with collaboration between trusts to enable shared learning.

Methods: Simulation leads were identified and a training programme for instructors implemented. Multidisciplinary staff participated in the in situ simulation sessions.

A questionnaire was devised, adapted from recent studies and approved by local stakeholders and ethics committee.[4,8-11] Participants completed the questionnaire before and after each simulation. The 20 questions are a subjective assessment of simulation experience, clinical and team-working skills. An online simulation network was created to allow for universal access to scenarios, a database of facilities and an online discussion forum.

Results: Results showed significant improvement in multiple domains. For example, in neonatal airway management, participants reported significantly improved self reported confidence scores, measured on a 5-point likert scale (Pre-simulation mean= 2.471, post-simulation mean= 3.57 p=0.0039). Communication with team members also showed significant improvement (pre simulation mean= 3.647, post-simulation mean=4.15, p=0.0177).

Conclusions: Multidisciplinary simulation is an effective method of improving clinical and teamwork skills. Development of a simulation network across NI allows transfer of skills when doctors move trusts and has allowed simulation leaders to emerge. Using an incident reporting system during simulation, allows for improvements in the actual clinical environment, limiting future errors during real resuscitation.[7-9,12]

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Abstracts

Annual Out of Town Conference

25th - 26th September 2015, Ballymascanlon House Hotel, Carlingford

PRESENTATIONS

CONTINUOUS SUBCUTANEOUS INSULIN INFUSION (CSII) PUMP THERAPY AUDIT

V. Vasi, N Flanagan

Background and Aims: Studies have shown that CSII produces consistent glycaemic control over time with an improvement of 5mmol/mol (0.5%) in HbA1c. Bolus insulin doses are given via the CSII with the pump's bolus wizard facilitating accurate variable boluses. CSII gives variable insulin background (basal) infusion rates maintaining a smooth glucose profile. Fewer injections and flexibility brings improved quality of life. We aimed to look at the efficiency of CSII pump in glycaemic control and cost effectiveness by comparing the HbA1c, hypo and hyperglycaemic episodes before and after CSII.

Methods: Data was collected using the web based TWINKLE system and case notes. Online tool csiiaudit.co.uk was used to interpret the results. 50 patients on CSII in the South Eastern trust were included (performed May 2014).

Results: An improvement in HbA1c of 5mmol/mol (0.64%) was noted in patients on CSII pumps. The average HbA1c was 64mmol/mol (8.05%). An increase in admissions with hypoglycaemia was noted with CSII, but all with intercurrent illnesses (viral gastroenteritis). A 21% drop in admissions with hyperglycaemic episodes was noted.

Conclusions: There was improved glycaemic control in patients on CSII pump therapy as illustrated by reduction in HbA1c and admissions with hyperglycaemia. CSII pump therapy proved to be cost-effective. Family education and training should be ongoing and resourced to ensure continued benefits.

AUDIT OF THE MANAGEMENT OF BURNS IN A PAEDIATRIC EMERGENCY DEPARTMENT

Dr Andrea Stobo, Dr Elizabeth Dalzell, Dr Danielle Leemon

Background & aims: Burns are a common cause of attendance to the Emergency Department (ED) and they can have life-long implications. It became apparent during attendance at the British Burns Association's Emergency Management of Severe Burns (EMSB) Course that our management of burns deviated from course guidelines. We aimed to identify variation in order to improve our management.

Methods: A retrospective audit of all cases coded as a burn or scald in the 6 month period 01/02/2011-31/07/2011 and 01/02/2012-31/07/2012 was carried out using the ED Symphony clinical data system. A gold standard was agreed using the EMSB course teaching and r plastic surgery team recommendations. Standards identified included cooling methods, de-roofing of blisters, dressings, documentation, involvement of the plastic surgeons, follow-up and antibiotic prescription.

Results: There were 107 patients identified in both time periods. 57% (2011) and 46% (2012) had documented cooling of the wound. 29 patients had wounds de-roofed in both time periods. 66% (2011) and 59% (2012) had a description and drawing, 16% (2011) and 29% (2012) had a description and no drawing and 16% (2011) and 8% (2012) used a burns chart. 14% (2011) and 17% (2012) had % Total Body Surface Area (%TBSA) documented. 7.5% (2011) and 8.4% (2012) of patients were admitted. 13% (2011) and 23% (2012) received antibiotics.

Conclusions: Practice is variable and documentation is poor. A planned revision of the department algorithm will highlight the importance of cooling, deroofing and documentation. The introduction of a burns specific flimsy should improve documentation.

PERFORMANCE OF SUPINE SPIROMETRY IN CHILDREN WITH NEUROMUSCULAR DISORDERS- A FEASIBILITY STUDY

Kathryn C.A Ferris, Dara B O'Donoghue, Isobel Douglas, Janine McVeigh, Barbara Maxwell, Michael D Shields

Background and aims: Children with neuromuscular disorders such as spinal muscular atrophy type 2 and Duchenne Muscular Dystrophy develop progressive weakness that can result in nocturnal hypoventilation and need for ventilatory support. We hypothesise that supine spirometry more accurately reflects sleeping ventilatory function than traditional sitting/standing and hence could be a predictor of nocturnal hypoventilation in these children. The aim of the study is to determine the feasibility of performing supine spirometry in the clinic and to compare sitting and supine spirometry.

Methods: We undertook a cross-sectional study within the Respiratory neuromuscular disease outpatient clinics recruiting 15 children (aged 5-21 years). Lung functions tests were performed in the upright position then repeated while supine.

Results: 73% of our patients were able to perform supine spirometry; 91% were able to perform the tests when supine at an angle of 45-900. For 27% of our patients it was not feasible to perform supine measurements as they were unable to perform any lung function tests due to weakness or they were unable to lie supine because their wheelchair did not tilt or they required a hoist for transfer out of their wheelchair.

FEV1 and MEPs correlated closely for the sitting and supine positions (R = 0.910 and 0.816 respectively).

Conclusion: This preliminary study suggests that it is feasible to perform supine spirometry in patients with neuromuscular disorders in the clinic setting and that there may be a correlation with sitting spirometric values. Future studies should explore this further as well as the relationship between supine spirometry and overnight sleep studies.

A STUDY OF PAEDIATRIC MEDICAL STUDENT SELF-ASSESSED CONFIDENCE AND CLINICAL EXPERIENCE

Kathryn C.A Ferris, Clare Thomson, Kieran McGlade, Michael Stevenson and Dara B O'Donoghue

Background and aims: QUB medical students undertake a 6 week Paediatrics module in 4th year. The aim of this study is to determine students' performance, confidence and experience in Paediatrics.

Methods: 4th year medical students were invited to participate in the study by completing an online survey.

Students were asked to rate their: Confidence in recognising and managing cases, Perceived knowledge of conditions, Confidence in their ability to perform tasks, Exposure to a range of common Paediatric cases was also surveyed.

Results: 50 students completed the survey; 14.3% postgraduate students; 61.2% females. Every module group and hospital site was represented.

The average rating of student confidence in their ability to recognise and manage these cases/conditions was low; cerebral palsy, spina bifida, SVT, unwell neonate, congenital heart disease, cystic fibrosis and developmental delay. 50% or less of students surveyed had exposure to these cases; cerebral palsy, anaemia, coeliac disease, cystic fibrosis, spina bifida, arthritis and scoliosis. Specialties in which students perceived their knowledge to be low include haematology, metabolism, rheumatology, psychiatry and oncology. The tasks that students felt least confident in performing included discussing ethical issues in paediatrics and discussing infant feeds and nutritional requirements.

Conclusions: We identified areas and tasks were students feel their knowledge and abilities are suboptimal. This will guide the paediatric course co-ordinators to target specific specialties to develop new resources including online lectures and interactive cases which will form the new "blended" course commencing in the 2014/15 academic year.

PRESENTATIONS

LYMPHADENOPATHY: STANDARDISING OUR PRACTICE

Kathryn Ferris, Dr Elizabeth Dalzell, Dr Andrew Fitzsimons

Background: There is no guideline for the management of lymphadenopathy in children presenting to RBHSC A&E resulting in uncertainty, over-investigation and inappropriate referrals/reviews. Lymphadenopathy is a common reason for A&E attendance. Lymphadenopathy is frequently caused by infections and is often self-limiting however malignancy needs to be considered. History and examination alone should guide the clinician towards a diagnosis; in most cases investigation is not required. A guideline should help to guide the clinician to when investigation, follow up and referral is required.

Aim: Establish our current practice and develop a guideline for staff working within RBHSC A&E to standardise and improve our practice

Methods: Retrospective chart review using symphony, Search of patients attending the A&E department between 1st January 2014 to 31st December 2014, Diagnosis of Lymphadenopathy, swollen lymph nodes or lymphadenitis. Results documented in our audit proforma

Results: 64 patients attended RBHSC ED with a diagnosis of swollen lymph nodes, generalised lymphadenopathy and lymphadenitis from 1st Jan 2014 -31st Dec 2014. 66% had other signs or symptoms of infection. 47% of the children had blood tests performed and 31% were scanned on their initial presentation to the ED. 56% had formal follow up organised of which 61% were followed up in our ED review clinic.

Conclusions: We have used our results to develop a guideline on the assessment and management of Lymphadenopathy to be used in the RBHSC ED. We hope that this guideline will help to standardise and improve our practice..

VIRTUAL VISITATION IN THE NEONATAL UNIT- IMPROVING PATIENT EXPERIENCE IN A DISTRICT GENERAL HOSPITAL.

Dr Natalie Thompson, Sister Alison Barrett, Stefanie Minnis, Gemma Currie, Dr Mugilan Anandarajan Consultant Paediatrician

Background: Neonatal units within Northern Ireland have restrictions on visiting times and use of mobile technology due to infection control concerns. Siblings and extended family do not get the opportunity to meet the new baby until after discharge. Families can face emotional difficulties, and changes in family dynamics when the newborns are hospitalised for a prolonged period. The aim of this project is to improve family experience, by using telecommunication devices to allow access to family members at home.

Methods: We introduced 'virtual visitation' where parents are able to transmit real time images of their newborn through

a secure portal to their families, via videoconferencing on a trust encrypted IPAD, using confidential passwords. The pilot project was introduced for 6 months in 2015. The initial project involved 20 families and feedback enabled service development. The next phase of the project involves families using the IPAD on a regular basis. An instruction manual was produced and an IPAD stand purchased for ease of use. Staff training helped to improve the extent of the service offered. Formal written feedback is obtained from each family, driving ongoing improvements.

Results In the pilot phase, all parents (n=20) reported positive feedback in terms of improved family morale and sibling relationships. Areas of improvement were addressed including; equipment issues, Internet access problems, availability of the device, and confidentiality.

During the current phase, formal feedback questionnaires are used to determine family satisfaction.

Conclusions Although the project remains in the early stages, we have shown through verbal and written feedback that virtual visitation can be successfully used as a tool to improve parent experience, bonding, enhance family dynamics and improve confidence in the neonatal team.

IMPROVING MATERNAL BREAST MILK USAGE IN THE HIGH RISK NEONATAL POPULATION.

Authors: G Stewart, J Price, U Robinson, S Craig

Background: Maternal breast-milk confers many benefits for the extremely preterm or growth-restricted neonate. In 2013, national benchmarking demonstrated that at Royal Jubilee Maternity Hospital neonatal unit breast milk feeding at discharge was less than half of the UK population average.

Aims: In order to increase maternal breast milk usage at discharge, we focused on increasing rates at day 28 of feeds. We aimed to increase use by 10% over six months.

Methods: The percentage of exclusive maternal breast milk feeds was recorded for babies born at <32 weeks gestation and/or less than 1500 grams at birth. This was noted for days 1, 14 and 28 of feeds and at discharge. A database of results was created and reviewed monthly. Strategies to drive change were implemented, including: 1. Involving breast-feeding coordinator to enhance milk production, 2. Improving access to breast pumps, 3. Distribution of manual expression equipment 4. Multidisciplinary team education.

Results: 110 babies met the population criteria. Rates of maternal milk usage increased on days 1,14 and 28 of feeds during 6 months. By 4 months of intervention, rates at day 28 had increased by 17%. However, there was no improvement in exclusive maternal breast milk use at the time of discharge noted during this 6 months.

Conclusion: An improvement in maternal milk usage for the at risk population, from initiation to day 28 of feeds was achieved. However, maintenance of this beyond day 28 remains a challenge. Further work is required to identify causative factors and consequently implement change.

FLIPPING PAEDIATRICS!

Kathryn C.A Ferris, Clare Thomson, Kieran McGlade and Dara B O'Donoghue

BACKGROUND AND AIMS: In restructuring the Year 4 Healthcare of Children module we wished to develop a course that represented integration between online classroom and ward; blended teaching not blended delivery. The teaching week was restructured and learning content divided into topics. New content was planned to complement and enhance existing talks creating an integrated online provision. Key to this was flipping lectures, putting didactic elements online freeing the face-to-face session for in-depth discussion and case exploration. Aiming to empower students to take responsibility for their own learning. Flipping lectures is a hot topic in medical education and the Healthcare of Children module has paved the way in introducing lecture flipping in Queen's University Belfast.

METHODS: Video cameras were taken to the hospital sites allowing clinicians to fit recording with their schedules. Training a F2 doctor to do recordings freed time for online content building and development given time constraints. Problems with consent and quality of historic media were addressed by filming new materials. Old paper cases were developed into online interactive cases with a greater emphasis on clinical skills and data interpretation.

RESULTS: The new course includes six flipped lectures. An emphasis on integration between online and face-to-face content reflects a truly blended approach. Focus groups with students and lecturers have highlighted the benefits and the difficulties associated with flipping the classroom.

CONCLUSION: Our results guide further development within the module but also have the potential to inform a true blended approach across the curriculum.

Abstracts

Junior Members Forum & Annual RBHSC Lecture

3rd March 2016, Malone House, Belfast

PRESENTATIONS

MULTIPROFESSIONAL IN-SITU SIMULATION: PROMOTING SAFER AND MORE CONFIDENT PAEDIATRIC PRACTICE

Hart C, Thompson A, Bourke T. RBHSC.

Background and aims: In situ simulation is an emerging tool medical in education with demonstrated benefits in quality improvement[1]. We report our experience of running multiprofessional in-situ simulations of paediatric emergencies in the clinical areas of a tertiary referral hospital

Method: We deliver regular, unannounced simulated emergencies in various clinical areas involving nursing and medical staff of all grades. In this report we describe the technical requirements and issues that have arisen. We report participant experience based on post event interviews and ward system failures that have been identified.

Results: Delivering ward based high fidelity simulation, including video recording, is feasible. The equipment can be used by medical staff with basic IT skills but without technical support. In the post simulation interview both medical and nursing staff voiced some initial anxiety in taking part. However most participants reported an increase in confidence in their clinical skills and agreed that they would welcome more of this type of training. A number of equipment and drug issues were identified and a written report was provided to the relevant senior staff. For example we identified that 3% hypertonic saline is not available at ward level and takes several minutes to be obtained from PICU.

Conclusions: We believe that multi professional in-situ simulation is feasible, acceptable and can identify systems failures as part of a paediatric quality improvement initiative. We are continuing to conduct and evaluate monthly in situ simulation sessions and would recommend this approach to other units.

NEONATAL IV FLUIDS IN THE PAEDIATRIC SETTING: A NEW AND NECESSARY GUIDELINE

Caroline Hart, Cliodhna Duncan, Andrew Thompson, Peter Crean, David Marshall, Thomas Bourke.

Background: There is currently no regional guideline for the administration of IV fluids in infants less than 28 days old admitted to a paediatric or surgical ward in Northern Ireland. A retrospective audit of these patients in our unit revealed enormous variations in fluid types, volumes and monitoring. We wished to develop an evidence based guideline to address this key gap.

Method: We carried out a literature review to identify current evidence based practice. We obtained guidelines from five paediatric units across the world. The guideline development group used these data to formulate a draft guideline which was circulated for multidisciplinary consultation. NICE subsequently released a guideline on paediatric inpatient fluids[1], which included neonates, and the document was updated accordingly.

Results: Our guideline recommends using 0.9% saline with 10% dextrose as a starting fluid in these patients at volumes increasing from 60ml/kg/day on day one to 150ml/kg/day on day five. In this paper we will present the scientific justification for these recommendations.

Conclusions: Our previous audit data clearly demonstrated that there is an urgent need for a guideline for the administration of IV fluids in infants less than 28 days of age. We believe the guideline described here uses the best available current evidence and consensus approach, and should be considered for use throughout Northern Ireland.

Abstracts

Annual Out of Town Conference

7th - 8th October 2016, Ballymascanlon House Hotel, Carlingford

PRESENTATIONS

IMPLEMENTING A NEONATAL RESUSCITATION RECORD TO IMPROVE DOCUMENTATION DURING PROLONGED RESUSCITATION OF NEWBORN INFANTS.

Dr Natalie Thompson, Dr Elaine Mc Kinley,, Dr Sarah Mc Kee, Dr Danielle Leemon, Dr Bronagh Clarke, Dr Mugilan Anandarajan

Background and Aims: Prolonged neonatal resuscitation (>5 minutes) needs careful documentation. However, the timeline of events is often not accurately recorded, leading to errors in future care and unnecessary litigation. The aim of this quality improvement project is to produce a standard document for prolonged neonatal resuscitation, which can be utilised at the time of resuscitation and form part of the medical notes.

Methods: A baseline audit of current practice was conducted in July 2016. Notes of 10 patients admitted to the neonatal unit who met the criteria were reviewed. Documentation was recorded against a standard adapted from a successful newborn resuscitation document from another UK neonatal unit. [1,2]

Results: The baseline audit revealed areas of poor documentation in the medical notes; particularly of demographics (80% no patient identifier, n=10), and location of the patient (50% no location, n=10), reassessments (60% incomplete, n=10) and advanced resuscitation measures. The findings were presented to the target group of medical and midwifery staff. Following this multidisciplinary meeting, the document was amended and role of the scribe established. A pilot phase of 2 months for implementation of the document was commenced with ongoing feedback. The document was stored on the resuscitation trolley. A simulation exercise enabled staff training in the use of the document, and identified latent errors.

Conclusion: The baseline audit highlighted areas of concern in terms of inconsistent documentation for infants needing prolonged resuscitation. An initial document has been produced and is currently in the pilot phase. Ongoing work will aim to implement this document within the trust and to clarify the role of scribe during resuscitation.

REFERENCES

1 Atkinson E., Summers D., Jones H., Berrington J. Neonatal resuscitation – a practical approach. The experience of one UK tertiary neonatal unit. *Infant* 2010; **6(1)**: 9-14.

2 Yip MQ et al. Structured proforma – A solution to accurate documentation of neonatal resuscitation? *Arch Dis Child* 2016;**101**:Suppl 1 A348-A349

EVIDENCE BASED GUIDELINE REDUCES INAPPROPRIATE TREATMENT IN BRONCHIOLITIS - A COMPLETED AUDIT CYCLE

Dr Veena Vasi, Dr Catherine Diamond, Dr Rory Mackle, Dr Thomas Bourke

Background and Aims: Bronchiolitis is the commonest respiratory infection in infancy affecting 10% of all children. We developed an evidence based guideline based on recommendations from NICE and the 'Bronchiolitis of Infancy Discharge Study' (BIDS). This guideline emphasised the importance of minimal handling and suctioning, rare pharmacological treatment and a permissive approach to patients with saturations above 90%. Introduction of the guideline was combined with a robust programme of communication and training for relevant medical and nursing staff.

Methods: We carried out a retrospective audit of infants admitted with bronchiolitis before (n=30) and after (n=36) implementation of the guideline in 2015/2016.

Results: The key results are shown in table 1. There was a statistically significant reduction in use of hypertonic saline ($p<0.05$) and nasopharyngeal suction ($p<0.001$). Use of salbutamol and adrenaline nebulisers was low and the reduction did not reach statistical significance. No significant difference was seen with regards to duration of stay.

Conclusions: Our completed audit cycle demonstrates that adherence to an evidence based guideline reduces inappropriate treatments and promotes minimal handling. Our small study did not demonstrate a shorter length of stay however we plan to complete a larger surveillance in 2016/2017 to establish if we can recreate the significant reduction in length of stay demonstrated in the BIDS study.

THE RBHSC APP – A NEW AND INNOVATIVE RESOURCE FOR STAFF

Dr Ben McNaughten, Clinical fellow in education and simulation, RBHSC

Background: In February 2016 a printed paediatric starter pack was created to complement material distributed at trust induction. The aim was to provide useful practical information about working in the Royal Belfast Hospital for Sick Children (RBHSC). Although feedback was excellent,

staff stated that it was lengthy and difficult to access when working.

Methods: A smart-phone web app was therefore developed. The app outlines the members of the various medical teams. It provides links to useful contact numbers and paediatric resuscitation algorithms. There are direct links to websites and users can access guidelines and review articles on common paediatric conditions. Staff can also access the weekly rota and teaching schedule. Following an initial trial period staff were invited to complete an online survey.

Results: The survey revealed that 92% agreed that the app was easy to access with 50% stating that they use it at least once every three days. The results suggest that the links to contact numbers, resuscitation algorithms and the weekly teaching schedule are of greatest value. Feedback on areas for improvement included 'more contact numbers', and 'maybe an alert system' for new articles. All staff agreed that the app is a useful resource.

Conclusions: Feedback has been very positive. One staff member simply wrote 'I love it!'. By seeking multidisciplinary team input we aim to create a powerful clinical tool accessible to all staff. Proposed future developments include publication on App Store® /Google Play® and exploring the possibility of similar projects in other paediatric units.

Abstracts

Junior Members Forum & Annual RBHSC Lecture

Thursday 9th March 2017, Malone House, Barnett Demesne, Belfast

Oral Presentations

A STRUCTURED INTERVENTION PROGRAMME CAN IMPROVE THE BIOPHYSICAL WELLBEING IN CHILDREN WITH CONGENITAL HEART DISEASE

Dr. Sinead Callaghan, Margaret Louise Morrison, Christopher McCusker, Pascal McKeown, Frank Casey

Background: Improved survival among children with congenital heart disease (CHD) has shifted focus to long-term physical and psychological outcomes. The benefits of an active lifestyle have been well described. This study aims to determine if a structured intervention programme can improve both physical and psychological functioning in children with CHD.

Methods: This is a prospective randomised control trial. Patients aged 5-10years with CHD were identified and invited to participate. Each patient underwent baseline assessment including biophysical assessments and psychosocial assessments

Patients were then randomised into intervention and control groups. The intervention group attended an education session during which motivational techniques were used to deliver exercise and positive lifestyle advice. They also received an individual written exercise plan. The control group continued with their usual level of care. After 4 months, all participants were reassessed.

Results: 163 recruited, 100 males (61.3%), mean age of 8.4years (5.3 – 11.5). EST duration mean 5.89mins (SD2.02). Actigraph: Average MVPA time 45mins (SD-27.2). The 'cyanotic palliated' subgroup had significantly shorter EST and lower levels of daily MVPA. This subgroup also scored significantly lower on HrQOL physical wellbeing. There was a significant improvement in performance at peak exercise in the intervention group following the intervention

Conclusions: Overall physical and psychological wellbeing is well preserved in the majority of children aged 5-11 years with CHD. A structured intervention programme significantly improved peak exercise capacity.

AUDIT ON UNEXPECTED ADMISSIONS OF INFANTS GREATER THAN 36 WEEKS GESTATION TO ULSTER HOSPITAL NICU DURING NOVEMBER 2016.

Dr. Danielle Leemon, Dr. David Cummins, Dr. Nita Saxena, Dr Mugilan Anandarajan

Background: Neonatal intensive care provides a level of care that is both high in cost and low in volume. Admissions of term and near-term infants are a major contributor to workload, not to mention the emotional anxiety caused by separating a mother and new born baby. The aim of this audit was to determine the pattern of potentially avoidable admissions,and the degree of support required by these babies.

Methods: This was a retrospective audit of all babies greater than 36 weeks gestation admitted to NICU during November 2016. All babies greater than 36 weeks and more than 1.8 Kg were included. Those who had a congenital abnormality diagnosed before or after birth were excluded.

Results: 37% of admissions to NICU in 2016 were term babies greater than 37 weeks. In November alone, babies greater than 36 weeks made up 59% of admissions. 71% of these were admitted due to respiratory complications, 80% of them being delivered by C-section. However only 40% required respiratory support. The average length of stay was 6 and a half days. There were no admissions as a result of hypoglycaemia or hypothermia.

Conclusions: 71% of admissions of babies greater than 36 weeks gestation could potentially have been avoided. A transitional care ward for babies requiring NG feeds or respiratory monitoring could reduce this admission rate. This audit needs to be bigger and expanded to other neonatal intensive care units in the province.

STETHOSCOPE HYGIENE ON THE PAEDIATRIC WARD – HOW OFTEN DO YOU CLEAN YOURS?

Dr. Grace Cuddy, Dr. Ben McNaughten, Ms Rachel Henderson, Dr. Carl Harris, Dr. Mugilan Anandarajan

Background: The stethoscope remains one of the most powerful diagnostic tools available to clinicians. However, there is an expanding body of evidence suggesting that stethoscopes may act as vectors for infection. Guidelines advise that stethoscopes should be cleaned after each patient contact. We sought to evaluate trainees' perceptions on how regularly they clean their stethoscopes and to observe practice in the clinical environment.

Methods: We distributed a questionnaire to trainees at local induction asking them how often they cleaned their stethoscope and where they stored it when not working. We

also observed stethoscope hygiene practice on paediatric ward rounds.

Results: A total of 17 trainees completed the questionnaire. Only five (29%) stated that they clean their stethoscope after every patient. Four clean it more than five times per day and seven clean it between one and five times daily. Most trainees (82%) take their stethoscope home with them. During the period of ward round observation there was a total of 36 patient encounters. Seven of these patients had an individual bedside stethoscope and this was used on five occasions when available. When a personal stethoscope was used this was cleaned before use in 59% of cases (17/29).

Conclusions: Despite only 29% of trainees suggesting that they clean their stethoscope between patients, observation of ward round encounters revealed that this practice occurred more regularly (59% cases). However, there is significant scope for improvement in stethoscope hygiene practice and further education is required to enhance compliance with recommendations.

LESS IS MORE: REDUCING THE NUMBER OF BABY CHECKS CARRIED OUT BY PAEDIATRIC TRAINEES TO IMPROVE TRAINING OPPORTUNITIES.

Dr. A Bell, S. Knox, S. Shah, M.Hogan, W. Clarke, P. McStay

Background: Traditionally baby checks have been carried out by paediatric doctors. Over recent years midwives have increasingly been carrying out these checks and a course is now offered in Queens University Belfast to train to complete these examinations. The Northern Ireland Medical and Dental Training Agency issued guidance to Craigavon Area Hospital that paediatric trainees should not be carrying out large numbers of normal baby checks on the postnatal ward in 2016.

Aim: To reduce the number of baby checks carried out by the paediatric team and encourage a cultural shift towards midwife baby checks on the postnatal ward.

Methods: Meetings were held with the Head of Midwifery to highlight that midwife appropriate baby checks were being carried out by paediatricians. Intervention 1: In July 2016 at the beginning of the day the midwifery team were reminded that there were baby checks suitable for midwives to complete. Intervention 2: In November 2016 the sheet where baby's needing a baby check were recorded were redesigned to highlight midwife appropriate baby checks and those (based on local guidelines) requiring a paediatrician check.

Results: Our interventions have reduced the average number of baby checks carried out by paediatrics from 65 per week to 25 per week (intervention 1) to 19 per week (intervention 2).

Conclusions: These interventions have reduced the number of normal baby checks carried out by paediatric doctors by 70%. These simple interventions could be introduced in other hospitals province wide to increase training opportunities for paediatric trainees.

ADHERENCE TO NICE GUIDELINES FOR EARLY ONSET NEONATAL SEPSIS – A QUALITY IMPROVEMENT PROJECT

Dr. Martin Hanna, Joseph Clarke, Dr Mary Ledwidge and Dr Damien Armstrong.

Background: In 2012 the National Institute for Health and Care Excellence (NICE) published 'Neonatal Sepsis (early onset): Antibiotics for prevention and treatment'. This project set out to establish how well this guideline was adhered to in Altnagelvin Hospital and identify any areas for improvement.

Method: Thirty neonates screened for early onset sepsis were identified by the microbiology laboratory. The management of these infants were audited using the NICE audit tool. Two Quality Improvement Plan, Do, Study Act (PDSA) cycles were completed to improve adherence.

Result: In Altnagelvin Hospital adherence to the Neonatal Sepsis guideline was generally good. 28 (93%) had correct indications for screening, 30 (100%) had blood cultures and CRPs carried out before commencing antibiotics, 30 (100%) had the right antibiotics and doses prescribed. 23 (77%) had a CRP repeated at the correct interval. However, only 16 (53%) received antibiotics within recommended hour from decision to treat. This was identified as an area for improvement. The first intervention was a discussion with Delivery Suite Staff to ensure adequate stocking of the neonatal trolley. In the following two weeks 71% of screened neonates received antibiotics within one hour.The project was then presented to the Paediatric Staff and the importance of timely antibiotics was reiterated. In the next two weeks 83% had first dose antibiotics within one hour.

Conclusions: Time to antibiotics in early onset sepsis is often delayed by simple factors like poor stocking of equipment and with small changes this has been greatly improved.

POSTER PRESENTATIONS

A SYSTEMATIC REVIEW OF COUGH ASSIST IN NEUROMUSCULAR DISEASE – DOES IT IMPROVE COUGH PEAK FLOW?

Orla Logue, Kate Donnan, Deborah Fleck, Ciara Hughes and Michael D Shields

Background: It is known that physiotherapy Cough Assist (CA) techniques help clear lung secretions during infections in children with neuromuscular disease. It is not known whether CA results in an improvement in Peak Cough Flow.

Methods: We performed a systemic review using MedLine, Embase and Web of Science of relevant cough assist terms in the neuromuscular context with cough peak flow (CPF) as outcome.

Results: The initial 555 papers were culled to 46 relevant publications. These were independent assessed and 19 were deemed suitable at addressing the key question. 7 of the 19

papers described effect sizes and were used in a meta-analysis with Forest Plots. The weighted mean improvement in CPF was 125 L/min (95% CI: 98-151, normal PCF > 250). The remaining papers were reviewed for qualitative evidence of effect which was in the same positive direction.

Conclusion: Cough assist physiotherapy in neuromuscular disease is associated with a major improvement in CPF and moves these children closer to normal cough. Future research is needed to determine how long the benefit lasts and thus how frequently CA should be performed each day.

SURVEY OF PAEDIATRIC HANDOVER PRACTICES IN NORTHERN IRELAND

Dr. Julia Courtney, Dr Gavin Lavery

Background & Aims: Good clinical handover is a vital component of high quality, safe medical care. Handover has been highlighted as a priority by several professional bodies. The National Patient Safety Agency describe handover as 'one of the most perilous procedures in medicine' which can be a 'major contributory factor to subsequent error and harm to patients.' The importance of handover is escalating with changing work patterns and the Royal College of Physicians state that 'establishing standards for handover should be a priority.' Importantly, 'effective communication lies at the very heart of good patient care' and the BMA recommend 'handover champions.' The Safety Forum is focussed on improving professional communication in Northern Ireland as a priority. Methods: A baseline survey of all paediatric trainees in Northern Ireland was conducted. The results are informing further improvement work reflecting the perceptions, concerns and priorities of trainees.

Results: 35% - no formal training on handover, 58% - want regional handover practices changed/improved Morning(8-9am) handover; 12% no formal handover, 15% no structured handover tool, 73% not bleep free, 27% last >30 minutes, 12% no senior presence/ set location, 35% no task list identified.Afternoon/5pm handover; 27% no formal handover, 8% bleep free, 23% no set location, 35% senior supervision and 15% no structured handover tool

Conclusions: The evidence and support are growing for the requirement for systematic improvement based on a standardised, collaborative approach.

APPRECIATION OF CLINICAL EXCELLENCE: THE PREQUEL

Dr Danielle Leemon (ADEPT Clinical Leadership Fellow), Dr Mugilan Anandarajan (Consultant Paediatrician)

Background: Alternative approaches to analysing what has gone wrong to improve safety are emerging in other fields similar to healthcare. The ethos is to focus on what is done well and adapt this behaviour as a team to improve the overall service. This culture is now emerging in healthcare.

Methods: In order to identify excellence we created a postcard to be completed by staff for each other. Staff can use the postcards to nominate a colleague who has achieved excellence, detail how they achieved excellence and what could be done to develop excellence further. The postcards are deposited in a post-box and are collected at intervals. Certificates are created for the nominees who can be add them to their appraisal folders. We ran a pilot of the project in the neonatal unit in a DGH.

Results: 48% of staff completed a staff morale questionnaire prior to starting the pilot. Most people disagreed with the statement "I receive feedback on how I am performing in my job" and neither agreed or disagreed with "My team inspires me to do my best work". 31 cards have been completed and certificates created for each nominee. The project has been received positively.

Conclusions: Next steps are to begin to analyse the themes of excellence that have been identified and begin to adapt them as a team. We hope to roll out this project to the rest of the directorate, then to other paediatric teams regionally and possibly to other specialities.

THE ULSTER MEDICAL JOURNAL

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    1. a list of all authors when six or less (when seven or more only the first six should be listed followed by *et al*).
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    4. the year.
    5. volume number and issue number (in brackets) **in bold**.
    6. first and last pages.

- *Example:* Devlin LA, Price JH, Morrison PJ. Hereditary non-polyposis colon cancer. *Ulster Med J* 2005;**74(1)**: 14-21.
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