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Editorial

My Learned Friends

In 2012's first edition, the *Ulster Medical Journal* review paper considers a vital question: what precisely ***is*** the difference between a discrepancy and an error? This review has been written by a formidable quartet. Three of the authors (AB, RO'L, PMcC) have been Deans of the Faculty of Radiologists, Royal College of Surgeons in Ireland. The fourth (RMacD) is almost certain to follow suit, should he so elect.

The review paper is written from the perspective of a radiologist, but that's just geography. Is there a difference between discrepancy and error, and does that difference matter?

The authors attest that one test of discrepancy is that in retrospect the same, original, conclusion would be reached with the same tools. With an error, that isn't the case. In fact, it is practically a *sine qua non* that in the case of error, a diametrically different conclusion would be reached in retrospect.

Let me be clear here. This review is not an apology for the intellectually infirm, professionally questionable, or ethically bankrupt medical practitioner. However, a distinction must be made between that which might be reasonably avoided, that which cannot be - and as Reinhold Niebuhr wrote, ' the wisdom to know the difference'. Treating a discrepancy by victimising those implicated would seem a less logical option than using, for example, Root Cause Analysis to ascertain what actually happened and why; and whether it had been an unavoidable or potentially preventable event. Errors too, sadly, must continue to be a facet of our life, for as long as we remain human. Making a distinction between the two is in everyone's interests. I would urge you all to read our latest review.

HOUSE RULES

It is perhaps worth reiterating that there are two constituencies for our Journal. The first is the printed page, with around 800 copies, distributed locally and to the many libraries and academic institutions that subscribe to us. The second is the ethereal world of the internet and PubMedCentral, the US National Institutes of Health digital archive of biomedical and life sciences journal literature. My gifted predecessor, Patrick Morrison, worked tirelessly to get us onto PubMedCentral, and this presents the editorial board with a challenge as well as an opportunity.

While a local audience might be gracious about the merits of an undistinguished case report (and lets face it, that's how we all started), a browsing international academic, searching for specific MeSH terms might not. Equally unimpressed is the senior colleague whose name might have been unilaterally inserted on an article for all to see. This is particularly an issue when that colleague's peers might bring it to his attention as an example of the true calibre of his work. At that stage, the nurturing local aspect is left far behind.

Consequently, your editor will assume that everything published within these pages is visible everywhere - shouting at the world, if you will. So, in 2012 the journal will modify its instructions for authors. There will be a single electronic submission route. Each paper will have a guarantor, typically a senior author, who will assume responsibility for all aspects of the paper. Each author will be required to indicate his or her justification for authorial inclusion, and this will be by completion of an 'Author Role, Originality, and Conflict of Interest Form'. The authors must also indicate whether ethical approval was considered necessary, and if so, when it was granted. Finally, the editorial team will assume that when revised versions of accepted papers are returned by the corresponding author, the revised version will have been agreed by all of its authors.

By definition, this process will be an evolving one, and I would envisage that the revised format will be fully functional by the end of 2012. I would also sincerely hope that these modifications are not too onerous. The revised instructions for authors will soon be available both in paper format within the journal, and also on the Ulster Medical Society website.

SOCIAL NETWORKING

I am delighted to report that our foray into social networking is proving to be a remarkable success. Please follow us on FaceBook (type 'facebook' into your internet browser, and then 'Ulster Medical Journal' in the search pane). Similarly for Twitter, follow us by typing in '@UMJ_Belfast'.

ACKNOWLEDGEMENT FOR REVIEWERS

I am pleased to inform you all that the Journal will begin the process of acknowledging the debt to our many reviewers by issuing them with CME credits, hosted by the Ulster Medical Society. Finally, on behalf of the editorial board, may I wish you all a peaceful and fulfilling 2012. Oh yes, and do keep sending me your good papers.

Barry Kelly
Honorary Editor

LIST OF REFEREES FOR 2011

We pass on our sincere thanks to all of our referees for 2011.

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Dr John Purvis

Professor Roy A J Spence

Dr Keith Steele

Mr Jared Torkington

Professor Oscar Traynor

Mr Michael Williams

Dr Mark Worthington

Ulster Med J 2012;**81(1):**3-9

Review

Discrepancy and Error in Radiology: Concepts, Causes and Consequences

Adrian Brady, Risteárd Ó Laoide, Peter McCarthy , Ronan McDermott

Accepted 3 October 2011

I would give great praise to the physician whose mistakes are small, for perfect accuracy is seldom to be seen. Hippocrates, *On Ancient Medicine*, IX (tr. By Francis Adams)

INTRODUCTION.

"All men are liable to error; and most men are, in many points, by passion or interest, under temptation to it". Locke, John, *An Essay concerning Human Understanding* (1690), bk. 4, ch. 20, sect. 17.

In all branches of medicine, there is an inevitable element of patient exposure to problems arising from human error, and this is increasingly the subject of bad publicity, often skewed towards an assumption that perfection is achievable, and that any error or discrepancy represents a wrong that must be punished[1]. Radiology involves decision-making under conditions of uncertainty[2], and therefore cannot always produce infallible interpretations or reports. The interpretation of a radiologic study is not a binary process; the "answer" is not always normal or abnormal, cancer or not. The final report issued by a radiologist is influenced by many variables, not least among them the information available at the time of reporting. In some circumstances, radiologists are asked specific questions (in requests for studies) which they endeavour to answer; in many cases, no obvious specific question arises from the provided clinical details (e.g. "chest pain", "abdominal pain"), and the reporting radiologist must strive to interpret what may be the concerns of the referring doctor. (A friend of one of the authors, while a resident in a North American radiology department, observed a staff radiologist dictate a chest x-ray reporting stating "No evidence of leprosy". When subsequently confronted by an irate respiratory physician asking for an explanation of the seemingly-perverse report, he explained that he had no idea what the clinical concerns were, as the clinical details section of the request form had been left blank).

Notwithstanding these complexities, the public frequently expects that a medical investigation will produce "the correct answer", all the time. This unfortunate over-simplification of a multi-factorial process is often informed by representations on TV dramas, media reports describing every discrepancy or dispute over interpretation as a scandal, and the political imperative to divert anger over perceived failings on to others, preferably easy targets, often portrayed and perceived as privileged.

Amid many possibilities of error, it would be strange indeed to be always in the right. Peter Mere Latham (1789-1875), *General remarks on the Practice of Medicine*, The Heart and its Affections Ch. IV

With respect to radiological investigations, the use of the term **"error"** is often unsuitable; it is more appropriate to concentrate on **"discrepancies"** between a report and a retrospective review of a film or outcome[1]. Professional body guidelines recommend that all imaging procedures should include an expert opinion from a radiologist, given by means of a written report or comment[3]. **"Opinion"** may be defined as "a conclusion arrived at after some weighing of evidence, but open to debate or suggestion", and thus an expert's opinion should not be expected to be incontrovertible[4]. Error implies a mistake (an incorrect interpretation of an imaging study, in this context). In order for a report to be erroneous, it follows that a correct report must also be possible. Because of the subjectivity of image interpretation, the definition of error depends on "expert opinion". An observer makes an error if he or she fails to reach the same conclusion that would be reached by a group of expert observers. Errors can only arise in cases where the correct interpretation is not in dispute. Somewhere between the clear-cut error and the inevitable difference of opinion in interpretation is an arbitrary division defining the limit of professional acceptability[4].

Errors in judgement must occur in the practice of an art which consists largely in balancing probabilities. Sir William Osler (1849-1919), *Aequanimitas, with Other Addresses*, Teacher and Student.

Unlike physical examination of patients, or findings at surgery or endoscopy, evidence of a radiologic examination remains available for subsequent scrutiny, and can be used for study of observer variation. A 20-year literature review in 2001 suggested the level of error for clinically significant or major error in radiology is in the range 2-20% and varies depending on the radiological investigation[5].

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The issue of error in radiology has been recognised for many years. Studies in the 1940s found that CXRs of patients with suspected tuberculosis were read differently by different observers in 10-20% of cases. In the 1970s, it was found that 71% of lung cancers detected on screening radiographs were visible in retrospect on previous films[4,6]. The "average" observer has been found to miss 30% of visible lesions on barium enemas[4]. A 1999 study found that 19% of lung cancers presenting as a nodular lesion on chest x-rays were missed[7]. Another study identified major disagreement between 2 observers in interpreting x-rays of patients in an emergency department in 5-9% of cases, with an estimated incidence of errors per observer of 3-6%[8]. A 1997 study using experienced radiologists reporting a collection of normal and abnormal x-rays found an overall 23% error rate when no clinical information was supplied, falling to 20% when clinical details were available[9]. A recent report suggests a significant major discrepancy rate (13%) between specialist neuroradiology second opinion and primary general radiology opinion[10].

A recent review found a "real-time" error rate among radiologists in their day-to-day practices averages 3-5%, but also quoted previous research showing that in patients subsequently diagnosed with lung or breast cancer with previous "normal" relevant radiologic studies, retrospective review of the chest radiographs (in the case of lung cancer) or mammogram (in breast cancer cases) identified the lung cancer in as many as 90% and the breast cancer in as many as 75% of cases[11]. Prolonged attention to a specific area on a radiograph ("visual dwell") increases both false negative and false positive errors. Reducing the viewing time for CXRs to less than 4 seconds also increases the miss rate[4].

Comparative studies of other medical non-radiologic fields have found a similar prevalence of inaccuracy in clinical assessment and examination. A Mayo Clinic study of autopsies published in 2000, which compared clinical diagnoses with post-mortem diagnoses, found that in 26% of cases, a major diagnosis was missed clinically[11].

Common experience in radiology suggests that many errors are of little or no significance to the patient, and some significant errors remain undiscovered. Errors are inevitable, and the concept of necessary fallibility must be accepted. Equally a threshold of competency is required of all professionals involved in the delivery of radiology services.

IMPACT OF VOLUME AND COMPLEXITY

The volume and complexity of information being provided to radiologists for reporting has increased enormously in recent years. Given the complexity of newer imaging modalities, particularly CT and MR, it is now commonplace for the interpretation of clinical images to take longer than the process of acquiring them[4].

Workload can be a factor in increasing the likelihood of errors in radiology reporting[2]. A variety of studies have shown that most abnormal findings on plain radiographs are found during the first few seconds of searching the image, with the number of true-positive findings decreasing abruptly after a short time. However, a radiologist interpreting a radiograph in a few seconds is gambling that a large proportion of the radiograph shows normal findings[12]. In at least one instance, a radiologist in the United States has been sued for punitive damages in a medical malpractice lawsuit arising from a case of breast cancer missed on a mammogram, because "the defendant radiologist read too many x-ray examinations on the day in question, demonstrating a wanton disregard of patient well-being by sacrificing quality patient care for volume in order to maximise revenue"[12]. The case was settled out of court without a formal finding. Furthermore, a recent study of radiologists' visual accommodation and performance showed that the ability to focus and detect fractures diminished at the end of the work-day[13]. Longer work-days can only exacerbate this decline in performance, and therefore safety. This is in nobody's best interests.

NEGLIGENCE

> Perfection, *n.* An imaginary state or quality distinguished from the actual by an element known as excellence, an attribute of the critic. (Bierce, Ambrose. *The Devil's Dictionary*).

The legal basis for negligence involves a breach of the standard of care, which is usually defined as being the use of the same degree of knowledge, skill and ability as an ordinary careful physician would exercise under similar circumstances. Many legal judgements in the US and other jurisdictions have clearly established that doctors cannot be required to be perfect, and cannot be expected to guarantee a good result to patients. Negligence occurs not when there is merely an error, but when the degree of error exceeds an acceptable norm[11].

The courts occasionally treat false negative errors as if they were errors of negligence. It is frequently alleged after retrospective review that lesions should have been noted prospectively. However, application of theories of perceptual thresholds shows that it makes sense that more lesions will be perceived retrospectively [14]. An appellate court in Wisconsin gave a ruling in 1998 that said: "radiologists simply cannot detect all abnormalities on all x-rays….Errors in perception by radiologists viewing x-rays occur in the absence of negligence".

Hindsight bias is the tendency for people with knowledge of the actual outcome of an event to believe falsely that they would have predicted the outcome. Hindsight bias is an extremely compelling influence; people try to make sense of what they know has happened rather than analyzing the available data independently. The exact mechanism by which hindsight bias influences judgement called "creeping determinism" - a process in which outcome information is immediately and automatically integrated into a person's knowledge about the events preceding the outcome. Hindsight bias is not supposed to influence the determination of medical negligence, but it ensures that some reasonably-acting defendants will be unfairly subjected to adverse liability judgements when after-injury evaluation has taken place[15].

> Another source of fallacy is the vicious circle of illusions which consists on the one hand of believing what we see, and on the other of seeing what we believe. Sir Clifford Allbutt (1836-1925).

It has been suggested that, in malpractice cases relating to radiology, judges should instruct juries that

"there is an absolutely unavoidable 'human factor' at work in the review of films; some abnormalities may be missed, even the obvious ones; the mere fact that a radiologist misses an abnormality on a radiograph does not mean that he or she has committed malpractice; and not all radiographic misses are excusable. Therefore, the focus of attention should be on issues such as proof of competence, habits of practice, and use of proper techniques"[16].

Err, *v.i.* To believe or act in a way contrary to my beliefs and actions (Bierce, Ambrose. *The Devil's Dictionary*).

GENERIC FACTORS CONTRIBUTING TO UNDERPERFORMANCE/DISCREPANCIES/ ERRORS

1. Radiologist specific causes of error.

Renfrew reviewed 182 cases presented at a problem case conference between August 1986 and Oct 1990. Causes of error identified were subsequently classified:

a. Complacency – the finding was appreciated but attributed to the wrong cause

b. Faulty reasoning – the finding was appreciated and interpreted as abnormal, but attributed to the wrong cause

c. Lack of knowledge on the part of the viewer

d. Under reading – the finding was identifiable, but was missed

e. Poor communication – the lesion was identified and interpreted correctly, but the message failed to reach the relevant clinician

f. Miscellaneous – the lesion was not present on the images, even in retrospect. This may be due to limitations of the examination or an inadequate examination

g. Complications – most frequently during invasive procedures[14].

Another individual cause for error is "satisfaction of search", the phenomenon whereby detection of one abnormality on a radiographic study results in a premature termination of the search, allowing for the possibility of missing other, related or unrelated abnormalities[2,14].

Perceptual errors continue to constitute the bulk of errors made by radiologists and false negative errors are the most frequently committed perceptual mistakes[14].

2. System issues contributing to errors.

System contributors to discrepancies and errors include the following:

a. Staff shortages

b. Excess workload – studies have demonstrated degradation of lung cancer detection with decreased viewing time, and increased error rates in abdominal CT reporting when the radiologist reports more than 20 studies per day[2]. A recent national survey of Consultant Radiologist workload in Ireland has found that, in 2009, the average Irish radiologist was performing 128% of the workload considered appropriate as a benchmark measured in Australia[17,18]. Increasing numbers and complexity of imaging studies requires a matching increase in radiology manpower.

"A motto: Do it tomorrow; you've made enough mistakes today". Powell, Dawn. Entry for 23 August 1956, *The Diaries of Dawn Powell 1931-65,* ed. T. Page (1995).

c. Inexperience of staff

d. Inadequate equipment[2]

e. Inadequacy of clinical information available to the reporting radiologist – the clinical diagnosis has been shown to change in 50% of cases following communication between clinician and radiologist, with a change of treatment in 60% of cases discussed[19]. This is one of the many strong arguments against the use of remote teleradiology reporting for radiologic studies. Knowledge of pertinent clinical history has been shown to increase the accuracy of CXR interpretations from 16 to 72% for trainees, and from 38 to 84% for consultant-grade radiologists[6].

f. Inappropriate expectations of the capability of a particular radiologic technique, which might not be suitable for the question being asked of it.

g. Unavailability of previous studies or reports for comparison[4].

h. Over-reliance on locum radiologists within a department.

GENERIC FACTORS MITIGATING UNDERPERFORMANCE/DISCREPANCIES/ERROR

While the factors causing and protecting against underperformance and discrepancies/errors are similar, whatever the location or working circumstances, we consider these potentially-mitigating factors from the more-specific standpoint of current structures within The Republic of Ireland. The factors outlined below are at different stages of development/underdevelopment within the Irish Healthcare system and individual radiology departments. Some of the factors are therefore, of necessity, aspirational, and their implementation will require significant planning and resources.

a. Availability of trained/accredited Radiologists

The evolving role of competence assurance, including continuous professional development, under the auspices of the Irish Medical Council will play a significant role in the validation of skill maintenance. The requirement that all doctors on the Specialist Register of the Irish Medical Council participate in a Professional Competence Scheme (PCS), which became a legal requirement from May 1st.,

2011, should eliminate the possibility of radiological services being provided by inappropriately-qualified or -certified doctors.

b. Availability of trained and certified Radiographers, Physicists and other staff members within radiology departments.

There is no legal provision at present for radiography services being provided by anybody other than appropriately-qualified and registered professionals. However, some departments do experience difficulty in maintaining adequate staff numbers, as a result of many factors, including recruitment moratoria and lack of availability of suitably-trained individuals.

c. Implementation of an integrated quality assurance/ improvement programme.

There are many components to an integrated quality assurance programme, involving all staff members in a radiology department. The Faculty of Radiologists launched a comprehensive programme for quality assurance in radiology practice in September 2010[20]; full implementation of this programme is underway, with plans for all components to be in place by the end of 2012.

d. Audit - self-directed, randomised or peer audit.

As part of the legally-required Professional Competence Scheme inaugurated in May 2011, all radiologists on the Specialist register must participate in at least one audit per annum.

e. Imaging Protocols.

Adoption of standard imaging protocols may reduce the likelihood of error or discrepancy in some areas of radiology practice, especially in modalities such as CT and MR.

f. Communication Protocols.

Many errors in Radiology may be attributed to poor communication at some stage in the imaging/reporting process. Structure and process audits may identify such deficiencies. As part of the Faculty QA programme[20], recommendations are made for the adoption of a protocol for communication of urgent or unexpected radiological findings by each department.

g. Equipment Maintenance

A regular programme of equipment maintenance within a radiology department is an importance element of quality assurance. A rolling capital programme for equipment replacement is also desirable.

h. Discrepancy meetings:

These are advocated as a learning process, not as a method of competence assessment[21]. They are also provided for and defined in the quality assurance programme[20].

i. Double reading:

There is ample evidence that double reading improves accuracy. The only area where 100% double reading is the norm in the Republic of Ireland is in the Breast Screening Programme. It has also been used in the United Kingdom for Breast screening and for the outsourced Independent Sector MRI contract, where 10 percent of studies were audited/double read. Double reading is one of the best ways to safeguard the quality of service and the introduction of routine double reading on an agreed percentage (e.g. 2-5%) of work would have a significant impact on the maintenance of quality. There is however a significant manpower issue arising from its adoption.

j. Multidisciplinary Conferences

Multidisciplinary conferences have become common (indeed, standard), particularly in the context of cancer care. One of the key elements in multidisciplinary conferences is the double reading of images within the context of the appropriate clinical scenario. This is now seen to be an essential component of cancer care.

HOW DO WE IDENTIFY AND DEAL WITH UNDERPERFORMANCE?

> "No one is completely worthless – they can always serve as a bad example". Anon, *And I Quote*, 'Example', ed. Ashton Applewhite and others (1992).

Again, while these proposed mechanisms are generally-applicable, our comments make specific reference to their application in The Republic of Ireland.

1. Means of assessing error.

Human error can be viewed in either a person-centered or system-centered way, or both. A person-centered approach focuses on the individual who commits the error, and adopts counter-measures aimed at that individual, including disciplinary measures: 'naming, shaming and blaming'[2]. The NHS has concluded that the person-centered approach, though attractive from a managerial and legal perspective, is 'ill-suited to the health care domain'[2, 22]. The system-based approach accepts that humans are fallible and errors inevitable, and seeks to address contributing system causes for these errors. What matters less is who made the error, and more how and why defences failed, and what factors helped create the conditions in which the error occurred[2]. The concept of Root Cause Analysis has been used as a method to learn from mistakes and reduce hazards in the future. This process is based on the principle of answering three questions:

What happened?

Why did it happen?

What can be done to prevent it happening again?[23]

As stated in the NHS Chief Medical Officer's report on this issue : '*It is of course right, in health care as in any other field, that individuals must sometimes be held to account for their actions – in particular if there is evidence of gross negligence or recklessness, or of criminal behaviour. Yet in the*

great majority of cases the cause of serious failures stretch far beyond the actions of individuals immediately involved"[22].

2. Allegation of incompetence.

One of the initial actions should be due consideration of the nature and source of the allegation, and the means by which the allegation is made. The allegation may come from a patient, a relative of a patient, a clinician, management personnel, or a Radiology colleague. Complaints from a referring clinician are particularly significant.

Possible approaches would include all or some elements of the following sequence of escalation:

3. Is there a problem?

(a) The views of the Clinical Director, Institutional Risk Management Director, Medical Director and Hospital Chief Executive Officer (CEO) may be sought.

(b) Evidence of compliance with a Departmental Quality Assurance Programme and the mandatory Professional Competence Scheme should be sought where applicable.

(c) Internal audit.

The local Clinical Director should undertake or arrange for a review of a random sample of cases. The radiologist involved should be informed that an audit is being undertaken.

(d) Should it be considered that there is a problem requiring further investigation or action, the advice of an ad-hoc group comprising representatives of The Faculty of Radiologists, RCSI, and relevant parties from among the Health Service Executive (HSE), the Department of Health & Children (DoH&C) and the Health Information & Quality Authority (HIQA) should be sought with respect to escalating the review.

4. External Review.

If there is persistent concern after an internal audit, an external review may be performed. This review should be initiated through an established mechanisms (e.g. the Forum of Irish Postgraduate Medical training Bodies). If the internal audit has uncovered significant system issues contributing to the perceived problem, this should not only concern the involved Radiologist, but should probably also involve other departmental Radiologists, with their consent. This would allow an internal control for varying departmental factors and also conform to a systems-based approach. Again, a random sample of cases should be used. There should be at least three radiologists conducting the audit (Jolly 2001)[24]. The Radiologists chosen should reflect whether the Radiologist under review is a general radiologist or a sub specialist radiologist, i.e. the same reporting conditions should apply.

5. Medical Council.

In the United Kingdom if there is a persistent concern after an external review, an evaluation and declaration of competency is made by the National Clinical Assessment Service (NCAS). There is no specific similar body in Ireland, and therefore this function presumably resides with the Medical Council. Any determination made by the Medical Council may have grave consequences for an individual under investigation, and due care must be taken to ensure that the processes used are fair and judicious.

6. "Look Back"

Once a problem is confirmed after an external review, a 'look back' may be instigated, if necessary, to assess the impact of the problem; this should be targeted (e.g. mammograms only), graduated (e.g. initially over most recent 3-6 months period) and risk-based (e.g. plain films not reviewed by another doctor). This should probably be performed in the public eye as a problem has now been confirmed (as opposed to a suspicion), and there is a duty to inform the public where a problem exists. All patients whose studies are being reviewed should be informed prior to the commencement of the process.

In general terms, such "looks back" are very labour- and resource-intensive, and should be avoided where possible, given that they inevitably divert resources away from dealing with active and current patients.

7. Risk Assessment Template.

This three-part process, based on the Irish Health Service Executive and the UK Health and Safety Executive Risk Assessment Tool[25], uses a scoring methodology to assess the impact of a particular discrepancy episode and estimate the likelihood of a wider problem. Although unvalidated, it is one possible means of gauging the scale and nature of any needed intervention. The initial assessment should be carried out by the Clinical Director. The process is outlined in Table 1.

APPLICATION OF RISK MATRIX OUTCOME.

BAND 1 (Matrix score 1-5): Local resolution is desirable. The relevant error should be fed back by the Lead Radiologist to the imaging professional concerned and subsequently discussed and recorded at the departmental discrepancy meeting. Relevant clinicians should be informed. Any remedial actions required can be directed from the discrepancy meeting platform.

TABLE 1:

Risk Assessment Template.

STEP 1: Evaluate level of Discrepancy / Error.

Score should reflect the magnitude of the error and the clinical impact.

Score	Impact	
1	Negligible	No ill effects
2	Minor	Minimal ill effects
3	Moderate	Error resulting in short term ill effects
4	Major	Error resulting in long term ill effects
5	Extreme	Error resulting in severe long term or fatal ill effects

STEP 2: Evaluate proof of competence, habits of practice and use of proper techniques.

2(a): System Related Issues

System Factor	Score
Clinical team working environment	5
Audit	5
Case conferences	5
Appropriate Workload	5
PACS/ Available clinical information	5
Discrepancy Meetings	5
Modern Equipment	5
Trained Radiographic Staff	5

2(b): Professional Factors

Professional Factors	Score
Experienced	8
Working in a radiology team	8
Isolated incident	8
CPD	8
No health/stress issues	8

The practitioner's score is calculated as follows:

a. Total score subtracted from 80 (maximum achievable)
b. Remainder expressed as % of 80
c. % rounded to nearest 20, and assigned score of 1 to 5, based on 20% brackets.

Example:

a. Excess workload (subtract 5), no involvement in audit (subtract 5), not an isolated incident (subtract 8). Total score = 80 – 18 = 62.
b. 62/80 = 77.5%
c. 77.5% rounded to 80, assigned score of 4 (out of possible 5**).**

BAND 2 (Matrix score 6-12): Local resolution is possible. The relevant error should be fed back to the imaging professional concerned and discussed at the departmental discrepancy meeting. Relevant clinicians should be informed. The case can be reviewed by the Lead Radiologist with the input of Institutional Risk Management. Consideration can be given to an internal audit as in 3c above.

BAND 3 (Matrix score >/=15): The error should be fed back to the imaging professional concerned and discussed at the departmental discrepancy meeting. Institutional Risk Management and relevant clinicians should be informed.. Consideration should be given to an external review, as in 4 above.

STEP 3: Apply risk matrix:

Risk Matrix (multiplication of level of discrepancy and system/professional factors scores)

	Level of discrepancy:				
System/ Professional factors score	Negligible 1	Minor 2	Moderate 3	Major 4	Extreme 5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	18
2	2	4	6	8	10
1	1	2	3	4	5

CONCLUSION

Errors are inevitable, in medicine as in life, and the concept of necessary fallibility must be accepted. Equally a threshold of competency is required of all professionals involved in the delivery of medical services.

In this paper, we explore the concepts of error and discrepancy in radiology, discuss some of the factors which may contribute to errors and discrepancies, and outline a graduated approach to the management of perceived or identified errors or discrepancies in radiological practice, which, with appropriate adaptation, may be applicable to similar scenarios in other specialties.

The authors have no conflict of interest

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Paper

The true cost of gallstone disease

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ABSTRACT

Introduction: Gallstone related disease accounts for a large expenditure in the NHS. The aim of this study was to review the events and costs of the patient journey to treatment, and propose guidelines to provide an efficient streamlined service.

Patients and Methods: All cholecystectomies performed in one unit in 2009 were reviewed. The cost of all investigations and procedures performed was obtained from the Department of Health website. The individual cost was calculated for each patient. Results were expressed as mean (±SD) and compared using ANOVA.

Results: 132 patients (31 male) were reviewed with an overall age was 45.3 years (±15.1). Overall cost from referral to discharge was £4697 (±2007) per patient, ranging from £3406 to £12011. The largest proportion was contributed by surgery at £2849 (±414), followed by inpatient costs at £1527 (±1322). Pre-operative outpatient consultations were £174 (±144), supplemented by at least one ultrasound (£81±29). Additional imaging was required for only a minority. All blood tests involved in overall care contributed little to the total at £27 (±26). Patients who initially presented as an inpatient had an overall larger cost (£6112±1888 vs. £5097±1607; p=0.004). This difference was largely due to inpatient costs (£2611±1629 vs. £1194±1009; p<0.0001) and not the cost of surgery (p=0.29). Patients who were imaged in primary care prior to referral also had a lower overall cost (£4636±1343 vs. £5697±1804; p=0.0005). This was also due to inpatient costs (£1076±876 vs. £1740±1459; p=0.004) and not the actual surgery costs (p=0.36). Only 39 were reviewed post-operatively, adding £38±69 to the overall cohort costs.

Conclusion: Emergency presentation and repeat admissions result in higher inpatient costs and should be avoided. Reduced delay to elective surgery through active participation by primary care needs to be encouraged.

Key words: Gallstones, investigation, costs

INTRODUCTION

Gallstone related disease accounts for a large expenditure within the UK National Health Service (NHS), with approximately 60,000 cholecystectomies performed each year[1]. Laparoscopic cholecystectomy is standard surgery for gallstone disease in the elective setting, with reduced length of hospital stay and fewer complications compared to open cholecystectomy.[2]

However, there are no guidelines currently available within UK practice for the surgical treatment of acute gallstone disease. Traditionally surgeons have opted for treating acute cholecystitis by interval cholecystectomy some weeks after the initial admission in an attempt to reduce rates of conversion and the associated patient morbidity.[3] Recent studies have challenged this view confirming that early laparoscopic cholecystectomy is safe with no increase in the rate of conversion or complication compared to delayed laparoscopic cholecystectomy and is therefore more cost effective.[4,5,6] However, between 11 and 20% of surgeons in the UK currently perform laparoscopic cholecystectomy for acute cholecystitis.[7,8]

An analysis of surgical practice in England found that 15% of patients had their definitive surgery on their index admission.[3] They also found that there was no difference between conversion rates in operations performed on day 3 or at one week of an acute admission, although the risk was increased compared to elective laparoscopic cholecystectomy. The same study showed a further increased risk of conversion to open cholecystectomy and other complications if the patient was readmitted in the interval period following an episode of acute gallstone disease, thus adding to inpatient costs and morbidity.

The study therefore aimed to review the events and costs of the patient journey from referral to definitive management for all benign gallstone related disease and to formulate guidelines for a cost effective, safe service for patients.

PATIENTS AND METHODS

All patients who underwent cholecystectomy, from 1st January to 31st December 2009 inclusive, in a single district general hospital were identified from the electronic theatre logbooks. The medical records were reviewed to obtain all relevant details. These included all pre-operative assessment and investigations, encompassing blood tests and non-invasive and invasive imaging as deemed necessary by the responsible clinician. The mode of presentation, as elective or emergency

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was used to sub-categorise the patients, as was the relevant investigations arranged by the primary care physician prior to referral. The details of admission were recorded, such as the dates of admission, operation and discharge. In addition, the type of operation and any complications requiring treatment were recorded. All review or treatment subsequent to hospital discharge were included in overall analysis.

The cost of each investigation and procedure was determined by data accessed from the Department of Health website. The cost of each investigation and procedure, from the time of initial referral or diagnosis, until discharge for routine review, which was relevant to the treatment of the gallstones was obtained. These prices were either at a regional basis, or if possible specific to the hospital. The individual prices are detailed in Table 1.[9] In addition to an overall cost analysis, the patients who required ERCP were then excluded, since choledocholithasis follows a very different management pathway. A comparison of costs was then performed between the patients who had acute cholecystectomy, interval cholecystectomy and those presenting at outpatients with an ultrasound already done in primary care.

TABLE 1:

Summary of costs

Procedure	Cost (£)
Outpatient appointment	102
Hospital stay for one day	320
Haematology test	3
Biochemistry test	1
Ultrasound of abdomen	71
OGD	815
MRCP	274
ERCP	1827
CT of abdomen / pelvis	266
Laparoscopic cholecystectomy	2685
Open cholecystectomy	3888

The average values were expressed as mean (± standard deviation) and comparison made by Analysis of Variance (ANOVA). Proportions were compared using Chi-squared test and a p value <0.05 was taken as statistically significant for all tests.

RESULTS

132 patients (31 male) were included in the study cohort. Overall age was 45.3 years (± 15.1), with males (52.8 years ± 16.0) older than females (45.3 years ± 15.1; p=0.01). Most patients (n=101) presented via outpatient clinic as a result of referral from primary care, with 1.7 (± 1.4) pre-operative consultations. Forty-eight patients had an ultrasound arranged by the primary care physician prior to referral. 31 patients presented acutely as an inpatient.

The average time from referral to surgery was 160.4 days (± 122.9), ranging from 1 to 606 days (Figure 1). The distribution of pre-operative investigations are outlined in Table 2. A higher proportion of inpatients (n=10; 32.2%) required a MRCP compared to out-patients (n=17; 16.8%; p=0.11). 23 of the OGDs performed were normal and no new management altering diagnoses were made. Patients presenting initially in the outpatient clinic with an ultrasound already performed (n=11; 22.9%) were less likely to have an OGD before surgery compared to the remainder of the group (n=26; 49.1%; p=0.006). Thirty-three patients required one

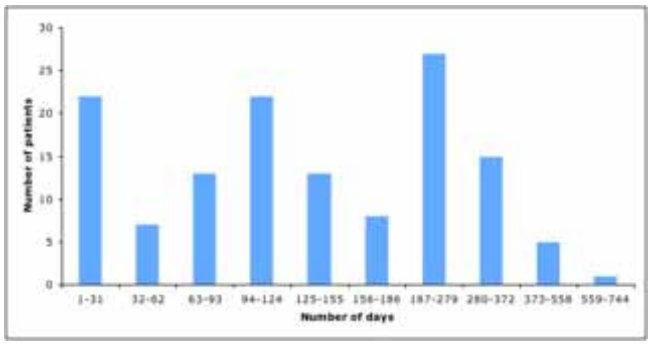

Fig 1. Number of days from referral to definitive treatment

or more extra pre-operative admissions for symptom control (Figure 2).

Of those patients who presented acutely as an inpatient, 15 (48.4%) patients had definitive surgical intervention on the first admission. In this sub-group the mean length of hospital stay was 6.5 days (± 2.6), while those who presented acutely with more than one admission had a mean hospital stay of 9.7 days (± 6.3). On reviewing those who had early acute cholecystectomy, the 2 longest admissions of 10 and 13 days were complicated by deranged liver function tests (LFTs) and required an MRCP prior to surgical intervention. 73.3% (n=11) had a laparoscopic cholecystectomy, while 2 (13.3%) were converted to open and 2 (13.3%) were performed as open procedures.

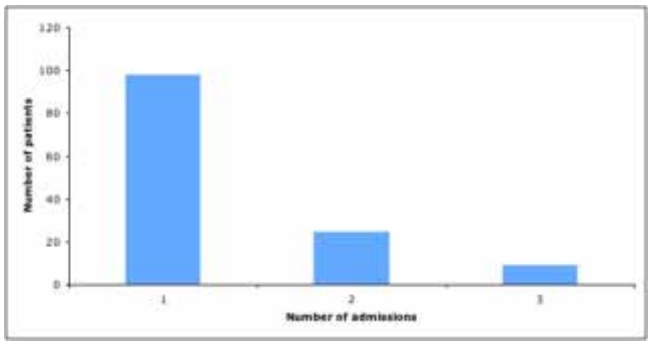

Fig 2. Number of admissions per patient

Overall, 114 cholecystectomies were performed laparoscopically, 13 were converted to open, while the remaining 5 were planned open cholecystectomies. The rate of conversion to open surgery or planned open cholecystectomy was higher for in-patients (n=6; 19.4%) compared to out-patients (n=12; 11.9%; p=0.45). The total bed days was 4.7 (± 4.1), ranging from 1 to 25. This differed according to the surgery (lap 4.3 ± 4.0; converted 7.3 ± 4.2; open 8.4 ± 3.4; p=0.006). Patients imaged prior to referral were discharged quicker (3.4 ± 2.7 vs. 5.4 ± 4.6; p=0.005). Post-operatively, 14 developed minor complications. 93 were not reviewed after discharge, while 33 were seen once. Review was highest in the conversion group (46%), compared to the open (20%) and laparoscopic (28%) groups.

COST

Overall cost from referral to discharge was £4697 (± 2006) per patient, ranging from £3406 to £12011. The largest proportion was contributed by surgery at £2849 (± 414),

followed inpatient costs at £1527 (± 1322). Pre-operative outpatient consultations were £174 (± 144), supplemented by at least one ultrasound (£81 ± 29). Additional imaging was required for only a minority. All blood tests involved in overall care contributed little to the total at £27 (± 26). Patients who initially presented as an inpatient had an overall

Table 2:

Number of patients requiring various pre-operative investigations

Pre-operative investigation	Total number of patients
Ultrasound scan	132
Magnetic Resonance Cholangiopancreatography (MRCP)	27
Endoscopic Retrograde Cholangiopancreatography (ERCP)	8
Computerised Tomography (CT)	3
Oesphagogastroduodenoscopy (OGD)	40

larger cost (£6322 ± 2548 vs. £4934 ± 1961; p=0.004). This difference was largely due to inpatient costs (£2611 ± 1629 vs. £1194 ± 1009; p<0.0001) and not the cost of surgery (p=0.29). Patients who were imaged in primary care prior to referral also had a lower overall cost (£4498 ± 1486 vs. £5623 ± 2374; p=0.0005). This was also due to inpatient costs (£1076 ± 876 vs. £1740 ± 1459; p=0.004) and not the actual surgery costs (p=0.36). Only 39 were reviewed post-operatively, adding £38 ± 69 to the overall cohort costs.

After exclusion of patients who required ERCP, the cost of management between the three subgroups was significantly different (acute: £5255 ±1045; interval £6017 ± 2051; £4238 ± 999; p<0.0001). The significance was not between the acute and interval cholecystectomy groups (p=0.22), but rather between the acute cholecystectomy and primary care USS group (p=0.001) and also between the interval cholecystectomy and primary care USS group (p<0.0001).

Fig 3. Proposed guidelines for the management of acute cholecystitis

DISCUSSION

This review of current practice in a district general hospital reveals the treatment pathway and the main sources of cost in the management of gallstones. Analysis demonstrated that the main costs were accrued as a result of the duration of the hospital stay, and the cost of surgery. Surgical costs are not amenable to reduction, but changes in practice can reduce the number of bed days, and therefore overall expenditure.

There is an increasing acceptance for performing acute cholecystectomy. The present study found that 16 of the 31 patients who presented acutely required more than one admission prior to cholecystectomy. These re-admissions would be avoided by acute cholecystectomy performed on index admission, and thus reduce hospital stay and overall cost (Figure 3). A recent meta-analysis comparing early with delayed laparoscopic cholecystectomy for acute cholecystitis found there was no significant difference in bile duct injuries or conversion to open surgery between the 2 groups, with an overall shorter hospital stay of 4 days in the early group. In the delayed group, 17.5% underwent emergency surgery during the waiting period, with an associated high rate of conversion to open surgery.[4] A prospective randomised controlled trial of 72 patients comparing early and delayed laparoscopic cholecystectomy revealed the overall cost in both groups was similar (p=0.928), with the overall costs of care being less in the early group.[10] Another more recent cost analysis revealed that early surgery for acute cholecystitis was less expensive with enhanced quality of life.[6]

Interestingly, those who had an ultrasound scan of abdomen performed prior to outpatient assessment were noted to have a shorter hospital stay. Therefore, the primary care team, prior to referral, should request an ultrasound scan of upper abdomen to hasten the time from outpatient appointment to definitive surgical intervention, thereby providing a cost effective service (Figure 4). In patients who presented with right upper quadrant pain as an outpatient, an OGD delayed definitive surgery and did not alter management in any case. This is in contradiction of other published data, which suggests that pre-operative OGD is of benefit, reducing persistent symptoms post-operatively.[11] A recent study of 700 patients however noted that a pre-operative OGD only altered the management in 4 cases (0.6%).[12] In light of these reports and the results of the present study, it would be prudent to adopt a more selective approach to OGD provision in patients with right upper quadrant pain with proven gallstones.

Fig 4. Proposed guidelines for the management of uncomplicated gallstones

It is not standard practice within our unit to perform day case laparoscopic cholecystectomy. As the number of bed days contributes substantially to the overall cost of gallstone related disease, this is an essential aspect of providing an efficient cost-effective service. Studies would suggest that it is both safe and cost-effective to perform day case surgery in selected patients, while acknowledging the potential for unplanned repeat admissions for post-operative nausea or pain.[13,14]

In conclusion, emergency presentation and repeat admissions result in higher inpatient costs and should be avoided. Reduced delay to elective surgery through active participation by primary care needs to be encouraged, along with early cholecystectomy in acute cholecystitis by the surgical team.

The authors have no conflict of interest

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Paper

Factors Influencing Performance of Cardiopulmonary Resuscitation (CPR) by Foundation Year 1 Hospital Doctors

Nicole Sayee and David McCluskey

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ABSTRACT:

Background: Foundation Year One (FY1) doctors are often the first medical staff responders at in-hospital cardiac arrests. The study objectives were to assess the cardiopulmonary resuscitation (CPR) skills of FY1 doctors at a Belfast teaching hospital and to highlight factors that influence their performance.

Methods: A group of FY1 doctors working in a Belfast teaching hospital were asked to participate in this study. These junior doctors were regularly on-call for acute medical emergencies including cardiac arrest. Participants were instructed to perform two, 3 minute sessions of CPR on a skills reporter manikin. Each session was separated by a 5 minute rest period, one session using a compression-to-ventilation ratio of 15:2 and the other using a ratio of 30:2. Performance was gauged both objectively, by measuring the depth of chest compressions, and subjectively by a panel of 5 Advanced Life Support (ALS) instructors who reviewed the tracings of each CPR session.

Results: Overall, 85% of medical FY1's working in the hospital participated in the study. Objective results determined that males performed significantly better than their female counterparts using both the 15:2 and 30:2 ratios. The male FY1 doctors performed equally well using both 15:2 and 30:2 ratios, in comparison to female doctors who were noted to be better using the 15:2 ratio.

Individuals with a Body mass index (BMI) greater than the mean for the group, performed significantly better than those with a lower BMI when using the 30:2 ratio.

BMI was an important factor and correlated with chest compression depth. Females with a low BMI performed less well when using a ratio of 30:2. Overall, expert opinion significantly favoured the 15:2 ratio for the FY1 doctor group.

Conclusions: CPR performance can be influenced by factors such as gender and BMI, as such the individual rescuer should take these into account when determining which compression to ventilation ration to perform in order to maximise patient outcome.

This study showed that males and those females with a BMI of >24 performed satisfactory CPR when using the recommended Resuscitation Council guidelines. Females with a BMI <24 performed CPR more effectively when using the 15:2 ratio. FY1 doctors should be fully assessed prior to performing CPR at in-hospital cardiac arrests. Remedial teaching should be given to those less than satisfactory until they are shown to be competent.

INTRODUCTION

As FY1 doctors are often the first medical staff responders at in-hospital cardiac arrests, patient outcome is influenced by their ability to perform effective CPR. Inadequate CPR will not only compromise patient survival [1], but also, of the patients who do survive, the majority are likely to have poor neurological recovery, resulting in significant impairment in quality of life [2].

In an effort to improve survival and post resuscitation quality of life, the European Resuscitation Council Guidelines 2005 placed greater emphasis on the rescuer's performance of chest compressions [3,4]. They recommend using 30 as opposed to 15 chest compressions per CPR cycle. However, studies suggest rescuer fatigue during the performance of 30 chest compressions [5.6.7] may compromise overall CPR performance.

FY1 doctors are expected to be highly proficient in resuscitation. These individuals are usually young, healthy adults who have received CPR instruction on several occasions during their undergraduate training and usually have undertaken a refresher training course before starting work as an FY1 doctor.

Unfortunately, survival figures following an in-hospital cardiac arrest are poor [8]. A variety of factors may be attributable to this including severity of pre-existing cardiac disease, co-morbidity and multiple drug therapy. It is essential however, that FY1 doctors are truly proficient in performing CPR at in-hospital arrests, should the patient have an optimal chance of survival.

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OBJECTIVE

The aim of this study was to subjectively and objectively assess the CPR performance of FY1 doctors and to identify factors which may influence the quality of this basic life support.

METHODS

All FY1 doctors employed, and actively working in a Belfast teaching hospital were invited to participate in this study. Each subject had received CPR training on at least 2 occasions as an undergraduate medical student and less than 3 months before the study and prior to employment at the hospital trust, had completed a compulsory CPR training course. As junior doctors they were expected to act as first medical responders at in-hospital acute medical emergencies including cardiac arrest.

Participants were given the same instructions and asked to perform CPR on a Laerdal Resusci-Anne Skills Reporter Manikin (Laerdal Medical, Norway). Subjects were randomly allocated to perform 3 minutes of CPR using a compression to ventilation ratio of either 15:2 or 30:2. Following a 5 minute rest, a further 3 minutes of CPR was performed using the other compression to ventilation ratio. Group A (18 FY1 doctors) used a ratio of 15:2 while Group B (16 FY1 doctors) used 30:2 for their initial 3 minute period of resuscitation.

A single investigator saved a complete tracing of each individual performance onto a laptop computer. Chest compression depths (mm) obtained from the tracings were measured and recorded by a second investigator who was blinded to the age, gender, BMI and study group to which the subjects belonged.

Using the Hills and Armitage method[9] statistical analysis of the crossover trial was performed. The Mann Whitney U Test[10] analysed the responses on chest compression depths when comparing subpopulations of different gender, BMI and ratios used. McNemara's Test[11] was used for analysis of the subjective data recorded by the 5 ALS instructors who viewed the individual session tracings. For all statistical analysis, a p value of <0.05 was taken as significant.

For the purpose of this study we assessed adequacy of CPR performance by the percentage of chest compressions of depth ≥38mm as recommended in the resuscitation council guidelines. A 3 minute period of resuscitation was deemed effective when >80% of all compressions given were of a depth ≥38mm. No upper level of chest compressions were considered. The body mass index figure of 24 was used as it was the mean BMI for the study population (Table 1).

The responses provided were statistically analysed to compare the following:-

1. male v female using ratio of 15:2
2. male v female using ratio of 30:2
3. 15:2 v 30:2 ratio for all FY1 doctors
4. 15:2 v 30:2 for male FY1 doctors
5. 15:2 v 30:2 for female FY1 doctors
6. BMI<24 v BMI >24 while using ratio of 15:2
7. BMI<24 compared with BMI >24 using ratio of 30:2
8. BMI<24 compared with BMI>24 using both compression ratios combined

Table 1:

Summary of study population characteristics & percentage of FY1 doctors achieving >80% of compression depths of >38mm.

	Male	Female	P value
Number	18	16	
Mean Age	24.9	23.9	
Mean BMI	25.3	22.6	
Ratio 15:2	88.9%	44%	0.008
Ratio 30:2	83.3%	25%	0.005
P value	0.51	0.12	

In addition to the objective study, all CPR tracings were inspected independently by 5 experienced ALS instructors who were asked to categorise each tracing as either 'effective' or 'ineffective' (based on whether or not the outcome was likely to result in neurologically intact patient survival).

The ALS instructors had no knowledge of the occupation, age, gender or BMI of those performing the CPR, nor the study group to which subjects belonged. As it was a possibility that borderline performance tracings could result in difference of opinion, it was decided that, for a period of resuscitation to be categorised as either 'effective' or 'ineffective', a minimum of 4 ALS instructors had to be in agreement.

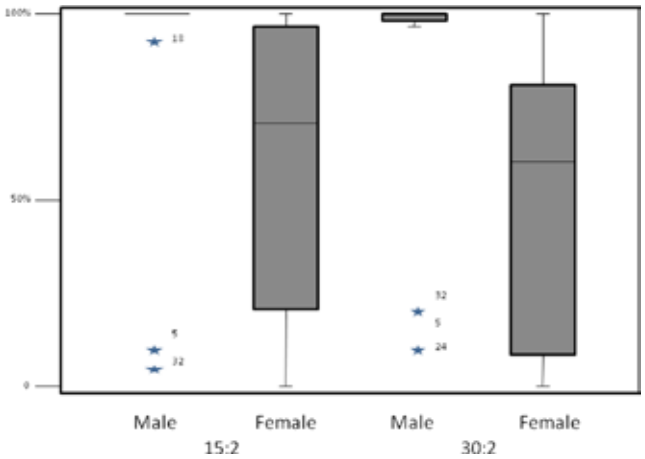

Fig 1. Boxplots of individual male and female F1 doctors performance of CPR using 2 chest compression-to-ventilation ratios

RESULTS

Of the 40 FY1 doctors working in the hospital 34 (85%) agreed to participate in the study. 18 were male and 16 female, the age range was 23 – 35 years (mean 24yrs).

Less than 3 months prior to the study 7 FY1 doctors (21%)

had been involved in CPR as part of an in-hospital acute medical emergency.

Table 2:

Male & female F1 doctors using 2 different CPR ratios. Percentage achieving >80% of compressions of depths of ≥38mm.

RATIO	Male	Female	P value
	N = 18	N = 16	
15:2	88.9%	44%	0.008*
30:2	83.3%	25%	0.005*
P value	0.51	0.12	

Gender:

When adopting the 15:2 ratio, 88.9% of males and 44% of females (p = 0.008) performed effective resuscitation. This gender difference was more marked when using the 30:2 ratio with 83.3% of males and only 25% of females (p = 0.005) being performing adequately (Table 1). Male performance was equal when using 15:2 or 30:2 ratio (88.9% & 83.3% respectively p = 0.5). Although the results for the female FY1 doctors did not reach statistical significance (p = 0.12) a greater number achieved >80% of compressions of depths >38mm using the 15:2 ratio rather than 30:2 (44% c.f. 25%). All but 3 males (when using 15:2) and all bar 4 males (when using 30:2) achieved 100% of compressions ≥38mm

When we compared males at the two ratios no statistical difference was observed (Table 1). 4 male FY1's performed better using the 15:2 ratio, 5 were better when using 30:2 and 9 showed no difference in performance. Of the 16 female doctors, 8 performed better using the 15:2 ratio, 5 were better using 30:2 and 3 were equally good at both ratios. The difference did not quite reach statistical significance (p = 0.12).

BMI:

82% of the junior doctors with a BMI>24 compared to 53% of doctors with a BMI<24 performed effective CPR using the 15:2 ratio. However this did not reach statistical significance (p = 0.126). Using the 30:2 ratio, subjects with a BMI>24 showed significantly better CPR performance than those with a lower BMI (76% c.f. 35% respectively p = 0.045). When comparing CPR performance overall (gender and ratio combined), BMI made a significant difference with 74% of doctors with BMI>24 and only 44% of doctors with BMI<24 performing >80% of compressions ≥38mm (p = 0.03).

Subjective results:

As stated earlier, a CPR session could only be termed 'effective' or 'ineffective' if agreed by four or more ALS.

Table 3:

All F1 doctors. Comparison of those of BMI >24 with those of BMI<24

Percentage achieving >80% of compressions of depth ≥38mm

RATIO	BMI>24	BMI<24	P value
	N = 17	N = 17	
15:2	82%	53%	0.126
30:2	76%	35%	0.045*
P value	ns	ns	

Gender:

Due to the small sample size of the subpopulations, levels of significance could not be achieved. However, clear differences were noted between male & female performance when using different compression-to-ventilation ratios. The majority of females were rated 'effective' when using 15:2 as opposed to 30:2. Taking the group as a whole, and using McNemara's test [11] on the mismatches (i.e. those subjects who were deemed to succeed under one and only one regime) the results showed 7 mismatched pairs. In every single case the 15:2 regime was considered effective and the 30:2 ratio ineffective. McNemara's test recorded a two-sided p value of 0.016 that is highly statistically significant with expert opinion favouring the 15:2 regime.

BMI:

The sample sizes of males and females of differing BMI were too small to achieve statistically significant results. However while the subjective results indicate that BMI has little influence on the CPR performance of male FY1s BMI may influence the performance of the group as a whole and female doctors, especially when using the 30:2 ratio (Table 5).

DISCUSSION

This study identified large variations in the quality of CPR performed by FY1 doctors, with respect to chest compression

Table 4

Number (%age) of CPR sessions rated either 'effective' or 'ineffective' by ≥4 of the 5 ASL instructors for male and female doctors

		Ratio 15:2			Ratio 30:2	
	Male N = 18	Female N = 16	Both N = 34	Male N = 18	Female N = 16	Both N = 34
Effective	15(83%)	7(43%)	21(62%)	13(72%)	2(13%)	15(44%)
Ineffective	2(11%)	8(50%)	10(29%)	3(17%)	9(56%)	13(38%)

TABLE 5

Number and percentage of CPR sessions rated 'effective' or 'ineffective' by ≥4 of the 5 ASL instructors for male and female doctors with a BMI above or below 24 (the mean BMI for the study population)

	Ratio 15:2						Ratio 30:2					
	BMI >24			BMI <24			BMI >24			BMI <24		
	□	□	♂+♀	♂	♀	♂+♀	♂	♀	♂+♀	♂	♀	♂+♀
Effective	11	2	13	4	5	9	10	1	11	3	1	4
%age	92	40	77	66	46	53	83	20	65	50	9	24
Ineffective	0	3	3	2	5	7	0	3	3	3	7	10
%age	0	60	18	33	46	41	0	60	18	50	64	59

depth. CPR performance can be influenced by many factors, here we investigated the impact of gender, BMI and the ratio of chest compressions to ventilations used.

The objective results of this study clearly show that male FY1 doctors perform a greater number of adequate chest compressions in comparison to their female counterparts when using both the 15:2 and 30:2 ratios. There was no significant difference in CPR performance of the male group using either ratio, although female doctors tended to be more efficient using the 15:2 ratio.

There was no statistical difference in performance of doctors with regards to BMI when using the 15:2 ratio. However, with the 30:2 ratio doctors with BMI>24 performed better than their colleagues who had BMI<24. Males tend to be stronger than females and often have a greater BMI, they are less inclined to fatigue as quickly due to their increased muscle mass.

Although the sample sizes were small, the subjective results fully support our objective findings. They demonstrate that males achieve deeper chest compressions than females when using the current European Resuscitation Guidelines (30:2), females perform deeper chest compressions when using a ratio of 15:2 and females with a BMI < 24 deliver suboptimal compressions when using a ratio of 30:2.

Rescuer fatigue is more likely to be an issue when using 30:2 due to the increased number of compressions and absence of muscle recovery time available during the ventilation cycles. Previously, a study found that although the 30:2 ratio was more exhausting, the 30:2 technique delivered more chest compressions[7]. Interestingly, as with the combined doctors results of our study, the overall quality of compressions remained unchanged[7]. However the investigators failed to specifically assess the impact of gender on CPR performance. Sanders et al (2002) has suggested that an increased rate of chest compression is associated with better outcome. They compared the neurological outcome in pigs following induced cardiac arrest and found better neurological recovery at higher rates of compression and lower rates of ventilation[12].

When FY1 doctors were assessed as a group, there was no statistical difference in the percentage of doctors performing chest compressions of ≥38mm between 15:2 and 30:2. This mirrors the results of Conrad et al (2008) who found no statistical decline in chest compression depth and rate when comparing 15:2, 30:2 or 50:2 ratios using male and female subjects[13].

Whilst this study demonstrates that male gender and an increased BMI are associated with increased percentage of chest compressions ≥38mm, previous studies have investigated the impact other factors have on chest compressions such as the position of the manikin[14], whether or not a backboard for the patient is being used[15] and the affect different mattresses have on chest compression depth[16]. With so many factors affecting the depth of chest compressions and therefore the quality of CPR, it is essential to optimise these variables to deliver better quality compressions.

CONCLUSION

This study shows that FY1 doctors perform effective CPR as determined by achieving a depth of chest compressions ≥38mm. We demonstrated that both the gender and BMI of the FY1 doctor can influence the effectiveness of their CPR performance. A pattern which became most apparent on using the 30:2 ratio during the delivery of CPR.

Male FY1 doctors perform equally well using both 15:2 and 30:2 ratio, while females are more effective when using a ratio of 15:2. Our study found that junior doctors with a BMI greater than 24 are capable of more effective CPR, as judged by depth of chest compressions, when using a ratio of 30:2.

The authors have no conflict of interest.

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Paper

Foundation Programme Impact on Junior Doctor Personality and Anxiety in Northern Ireland

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ABSTRACT

Objectives: The main objectives of this study were to assess personality traits and levels of anxiety in Foundation Year 2 (F2) doctors during the foundation doctor training programme in the Northern Ireland Deanery (NIMDTA).

Methods: A prospective survey-based study was conducted for all F2 doctors attending the mandatory generic skills programme at NIMDTA. Anxiety was measured using the State-Trait Anxiety Inventory (STAI) while personality was assessed using the IPIP-NEO questionnaire. These previously validated questionnaires were completed at the start and again at the end of the F2 year.

Results: 147 (M=65, F=82) and 106 (M=55, F=51) F2 doctors completed questionnaires at both time points. STAI scores suggested a moderate level of anxiety amongst both male and female doctors at baseline and at the end of the academic year. There was no difference between gender for either parameter (Baseline-State: 34.0 vs. 36.0, p=0.48 and Trait: 39.0 vs. 40.5, p=0.33) (End-State: 41.0 vs. 36.0, p=0.14 and Trait: 42.0 vs. 40.5, p=0.78). IPIP-NEO scores for F2 doctors were consistently higher in the Accommodation (93.9 & 92.3) and Consolidation (88.8 & 87.6) personality factors and lower in the Neuroticism factor (66.3 & 65.9) at both assessment time-points. Female F2 doctors scored significantly higher in the accommodation factor at the end of the academic year when compared to their male counterparts (88.0 vs. 94.0, p<0.001). There was no difference between the genders for the other personality factors at the end of the year (p>0.09).

Conclusions: This first cohort of F2 doctors were exposed to many emerging changes in their training which did not appear to have any detrimental effect on their anxiety levels or personality profiles and suggests that junior doctors may not be affected by external influences or changing educational environments.

Keywords: Anxiety, Doctor, Foundation, Personality, Programme.

INTRODUCTION

A high level of stress and depressive symptomatology has been reported amongst male and female junior doctors in both Britain and the United States particularly during the transition from medical school to junior doctor [1-4]. Females were reported to be more severely affected with a 1.5 times higher risk of depression and an 8 times higher likelihood of severe depression [2, 4]. Newbury-Birch and Kamali (2001) identified that 37.5% of female and 24% of male pre-registration house officers suffered from possible psychological stress [3]. More recently, Tyssen *et al* (2007) have also described a higher level of stress amongst female medical students [5]. This gender difference in symptomatology is destined to become a more important phenomenon as many medical schools now report a higher proportion of females to males (70:30) in the medical student population [6, 7].

Numerous factors for anxiety and stress have been documented such as overwork and its impact on sleep and personal life, talking to distressed relatives and serious treatment failures [2]. These high levels of fatigue and distress have also been independently associated with self-perceived medical errors in internal medical residents [8]. Despite the introduction of numerous steps to reduce working hours, improve education and clinical supervision, the incidence of psychological morbidity amongst house officers remains high [9-11].

It was hoped that modern amendments to postgraduate training through the combined auspices of Foundation Training Programmes, Modernising Medical Careers (MMC) and Regional Post-Graduate Medical Training Agencies may lead to reductions in overall anxiety and stress amongst junior doctors. However, in a profession that is occupied with the treatment of patients, elements of psychological disturbance can never be completely avoided. The assessment of anxiety in the modern junior doctor is therefore an extremely important factor to determine whether newly implemented strategies to improve the quality of junior doctor experiences, training and quality of life are working.

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Medical doctors have been shown to represent a homogenous group of individuals in terms of intellectual and cognitive ability. They appear to share common personality traits based on their initial choice of the medical profession as a career [12, 13]. However, personality differences within this group do still exist during the early stages of a medical career. Maron *et al* (2007) reported a significantly higher degree of neuroticism and openness in medical students selecting psychiatry residencies compared to a lower degree of neuroticism in medical students selecting family practice. These authors concluded that these personality profiles may only predict medical student selection of some but not all medical specialities [14].

During medical school, trainee doctors often experience a uniform core curriculum which provides a similar range of experiences and perceptions of future career choices. However, environmental differences can still be introduced at an undergraduate level through variances in individually selected special study modules or may only become evident after graduation from medical school where the junior doctor experiences a variety of medical specialties with different work settings, job duties, requisite skills and vocational interests [13]. Despite the influence of a medical environment on an individual's choice of future career, it is also important to consider an individual's personality trait as a major factor in determining their future occupational requirements [15, 16]. Medical educators and career counsellors therefore attempt to explore and match such personality traits to occupational requirements. However, these efforts often rely on anecdotal evidence about the incumbents of different medical specialties to direct the junior doctor towards a specialty that best fits their personality [13].

The attendance of Foundation Year 2 (F2) doctors at the Generic Skills course as part of the Northern Ireland Foundation Programme afforded an opportunity to assess anxiety responses and personality traits amongst doctors in a non-clinical setting removed from the hospital environment (*The generic skills course includes guidance and teaching on clinical audit, career management advice, team working, patient safety with emphasis on risk management allied to clinical governance. All F2 doctors must complete the generic skills course as part of their two-year Foundation Programme). We have previously reported on the effects of MMC on Foundation doctor career orientation in the Northern Ireland Foundation School [17]. The main objectives of this study were to assess personality traits and levels of anxiety in Foundation Year 2 doctors during the F2 training programme.

METHODS

This was a prospective survey-based cohort study assessing all F2 doctors enrolled in the F2 Training Programme in the Northern Ireland Deanery Foundation School for the academic year 2006-2007. A presentation explaining the study aims and objectives combined with written information was provided for each F2 doctor. The F2 doctors choose to participate while attending compulsory training modules of the Northern Ireland Foundation Programme Generic Skills course at the Northern Ireland Medical and Dental Training Agency (NIMDTA). Due to the assessment of a specific cohort of doctors in a single deanery, there was no comparator or control group assessed. Questionnaires were administered at 2 data capture points; at the start of the academic year (August – September 2006) and at the end of the academic year (June – July 2007). Basic demographical data was incorporated into the questionnaire followed by the assessment of anxiety and personality traits. To minimise inter-individual bias between data capture points, F2 doctors did not receive their questionnaire scores at either the start or end of the academic year.

STATE AND TRAIT ANXIETY INDEX

F2 doctor anxiety was measured using the State-Trait Anxiety Inventory (STAI) [18, 19]. The State-Anxiety scale (STAI Form X-1) consists of twenty statements that evaluate how the respondent feels "*right now, at this moment*" corresponding to the level of anxiety experienced in a particular situation. The Trait-Anxiety scale (STAI Form X-2) consists of a further twenty statements that evaluate how the respondent feels *"generally"* corresponding to the general level of anxiety independent of any particular anxiety-provoking event. The total scores for both the State-Anxiety and the Trait-Anxiety scales range from 20 to 80 with mean state scores of 35.7 and 35.2 and trait scores of 34.9 and 34.8 for male and female adults respectively [18]. The internal consistency of the STAI scales remains high with reported Cronbach's α co-efficient 0.93 and 0.92 for the State and Trait subscales respectively [19, 20].

PERSONALITY TRAIT

Study of personality was based on the Five-Factor Model (FFM) which included the assessment of affective, experiental and motivational traits using the five factors of Neuroticism, Extraversion, Originality (Openness), Accommodation (Agreeableness) and Consolidation (Conscientiousness) [21-23]. This study used the Short Form International Personality Item Pool Representation of the NEO PI-R™ personality inventory (IPIP-NEO) to assess personality traits [24, 25]. Each of the main personality domains were divided into thirty sub-domains which had a total of four different components giving 120 items in total. Each component was then keyed as a positive or negative item which was then collated to obtain a total scale score. The reported mean Cronbach's α co-efficient for the Short Form IPIP-NEO is 0.75.

Statistical analysis was completed using the SPSS statistical package (Version 13 SPSS®inc. Chicago, USA). Descriptive data was presented as mean (standard error of the mean - SEM) or median (interquartile range - IQR). Differences in scores between genders were completed separately for doctors at each time-point and then for doctors who completed both questionnaires using the independent sample t-test. The mean percentage change for questionnaire indices at the end of the year was then compared to the baseline value at the start of the year [(End of Year Questionnaire – Start of Year Questionnaire) / Start of Year Questionnaire]. For doctors who completed both questionnaires, each parameter was also analysed independently for differences between both time points using the paired samples t-test. Pearson's rank correlation co-efficient was calculated for state and trait anxiety scores. All statistical tests were 2-tailed with the differences considered significant if the p-value was <0.05.

RESULTS

There were 231 F2 doctors enrolled in the Northern Ireland Foundation Programme during 2006-2007. 147 (63.6%, M=65) and 106 (45.9%, M=55) completed questionnaires 1 and 2 at the start and end of the academic year, while 69 (29.9%, M=33) doctors completed the questionnaires at both time-points. Therefore, 46.9% (69/147) and 65.1% (69/106) of F2 doctors completed both questionnaires when compared to the total number of questionnaires completed for each time point. The study population was representative of the total year group with a mean age of 26 years with the majority graduating from Queen's University Belfast in July 2005 (Male: 26.9 years, SEM 0.40 and Female: 26.1 years, SEM 0.28, p=0.09).

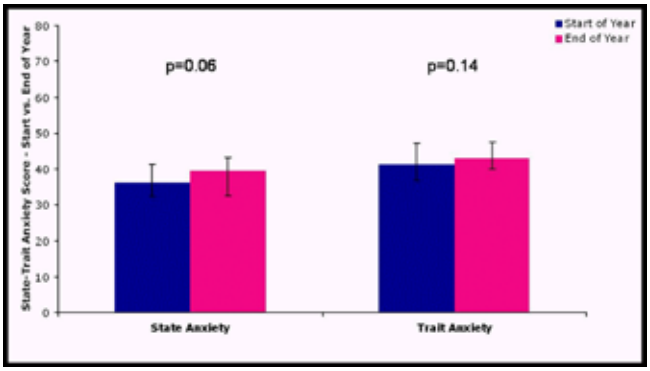

Fig 1. State and Trait Anxiety scores for F2 doctors who completed both questionnaires at the start and at the end of the year (median, IQR).

ANXIETY ASSESSMENT

The median state anxiety scores for male and female doctors were not significantly different for those doctors who completed the questionnaire at the start of the year only (34.0 vs. 36.0, p=0.48) and at the end of the year (41.0 vs. 36.0, p=0.14). There was no difference between gender for those doctors who completed the questionnaires at both time-points; Start of Year (33.0 vs. 36.0, p=0.16) and End of Year (41.0 vs. 37.0, p=0.31) (**Table 1**). There was also no difference identified in state anxiety scores for those who completed both questionnaires when the start and end of year scores were compared (36.3 vs. 39.5, p=0.06) (**Figure 1**).

The median trait anxiety scores for male and female doctors were not significantly different for those doctors who only completed the questionnaire at the start of the year (39.0 vs. 40.5, p=0.33) and at the end of the year (42.0 vs. 40.5, p=0.78). When trait anxiety scores were assessed for those doctors who completed the questionnaire at both time-points, there was also no difference between the male and females; Start of Year (40.0 vs. 41.0, p=0.21) and End of Year (42.5 vs. 39.0, p=0.84) (**Table 1**). There was also no difference identified in trait anxiety scores for F2 doctors who completed both questionnaires when the start and end of year scores were assessed (41.3 vs. 42.9, p=0.14) (**Figure 1**).

Although there was no difference in state and trait anxiety scores for doctors who completed both questionnaires, there appeared to be a trend for a larger percentage increase in both state and trait anxiety scores for males compared to females when the mean percentage change for the end of year scores were compared to baseline (State: 27.2% vs. 4.5%, p=0.06 and Trait: 12.6% vs. 1.0%, p=0.09). There was a high correlation between the scores of state-anxiety and trait-anxiety for all the groups of F2 doctors (r=0.57, p<0.001).

PERSONALITY ASSESSMENT

At the start of the academic year, F2 doctors scored higher in the Accommodation and Consolidation factors and lower in the Neuroticism factor. There was no difference between genders for any of these five factors at the start of the academic year (**Table 2**). At the end of the academic year, F2 doctors continued to score higher in the Accommodation and Consolidation factors with lower scores for the Neuroticism factor. Similar to the start of the year, there was again no difference between genders for any of these five factors at the end of the academic year except for the accommodation factor which was significantly higher in the females (**Table 2**).

When the IPIP-NEO scores were compared for those doctors who completed both questionnaires, there was no significant difference for any of the personality factors between the start

TABLE 1

State and Trait Anxiety scores for F2 Doctors who completed the questionnaire at the start, the end and for those who completed both questionnaires (Median, IQR).

QUESTIONNAIRE		STATE				TRAIT		
		Male	Female	p-value		Male	Female	p-value
Start of Year (n=147)		34.0 (30.0-41.0)	36.0 (32.0-42.0)	0.48		39.0 (35.0-46.5)	40.5 (36.0-47.0)	0.33
End of Year (n=106)		41.0 (41.0-45.3)	36.0 (31.3-45.0)	0.14		42.0 (36.8-47.0)	40.5 (37.0-50.5)	0.78
Both (n=69)	1	33.0 (29.0-39.0)	36.0 (32.0-41.8)	0.16		40.0 (35.5-46.0)	41.0 (36.3-47.0)	0.21
	2	41.0 (33.0-44.8)	37.0 (30.0-43.0)	0.31		42.5 (37.5-47.0)	39.0 (36.0-51.0)	0.84

TABLE 2

IPIP-NEO Personality Factor scores for F2 doctors at the start and at the end of the academic year (median, IQR).

	start of year (N=147)			end of year (N=106)		
PERSONALITY FACTOR	**Male**	**Female**	**p-value**	**Male**	**Female**	**p-value**
Neuroticism	63.0 (56.0-73.0)	66.0 (59.0-73.0)	0.17	63.0 (57.0-70.0)	64.0 (58.0-72.5)	0.17
Extraversion	83.0 (77.0-88.0)	82.0 (75.0-89.0)	0.81	85.0 (76.0-89.3)	81.0 (72.5-87.0)	0.09
Originality	78.0 (72.0-83.5)	80.0 (71.0-85.0)	0.94	76.0 (72.0-83.3)	78.0 (70.5-84.0)	0.64
Accommodation	90.0 (85.0-96.5)	95.0 (89.0-101.3)	0.07	88.0 (80.8-95.5)	94.0 (90.5-100.5)	<0.001
Consolidation	90.0 (80.5-95.5)	90.0 (83.8-95.3)	0.89	88.0 (80.8-94.3)	90.0 (82.5-95.0)	0.78

and end of the academic year (**Figure 2**). However, when the mean percentage change from baseline was assessed between genders for F2 doctors who completed both questionnaires, a significantly higher score was identified in the female doctors for the Accommodation Factor compared to male doctors

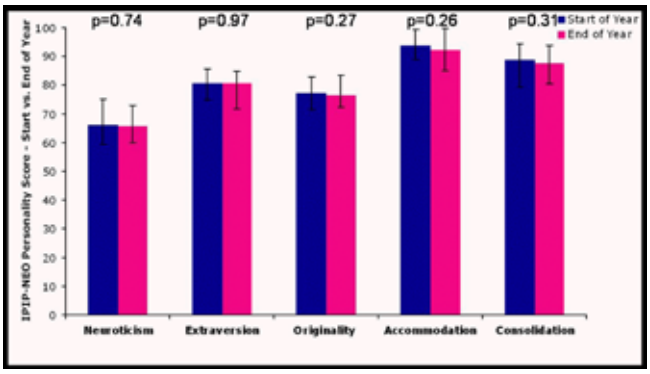

Fig 2. IPIP-NEO Personality Factors scores for F2 doctors who completed both questionnaires at the start and at the end of the academic year (median, IQR).

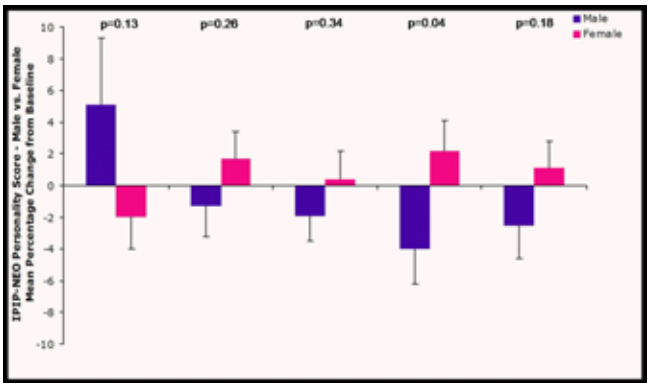

Fig 3. Mean percentage change from baseline in IPIP-NEO Personality Factor scores for male and female F2 doctors who completed both questionnaires at the start and at the end of the academic year (mean, SEM). From left to right, personality factors analysed include Neuroticism, Extraversion, Originality, Accommodation and Consolidation.

(Figure 3). There was no difference in the mean percentage change from baseline between genders for the other factors.

DISCUSSION

Identifying what one is suited to do and securing an opportunity to do it, is imperative in achieving life goals [26]. Anxiety is known to influence many of these types of judgments and decisions with both state- and trait-anxiety shown to be significantly related to career decidedness [27-29]. Previous researchers have emphasised the importance of career decision within an individual's development and personal happiness [30,31] Campagna *et al* (2007) also identified, through regression analyses, that state anxiety was the strongest predictor of career certainty and indecision rather than the trait anxiety indices [29].

Unfortunately psychological morbidity among junior doctors still remains high [9, 10]. Despite Foundation Programmes providing an increased level of pastoral support for new doctors combined with improvements in educational and clinical supervision, it has been suggested that such educational bodies may also act as stress risk factors through increased scrutiny and monitoring of junior doctor professional performance. Mizuguchi *et al* (1991) defined STAI parameters for state-anxiety as; very low <22, low 23–31, normal 32–40, high 41–49 and very high >50 and trait-anxiety as; very low <23, low 24–32, normal 33–43, high 44–52 and very high >53 [32]. Other researchers have also documented mean adult state-anxiety scores of 34.4 whilst trait anxiety levels have been divided into low (<33), medium (33-49) and high (>49) [33,34]. It is important to realise that these extrapolations may only apply to certain demographic groups who have recognisable pathologies.

Depending on the criterion used to define anxiety states, our study reports normal or medium state (36.3 and 39.5) and trait (41.3 and 42.9) scores for all junior doctors at the start and end of year respectively. Although there was no difference in scores between the genders, there was a trend for an increase in state anxiety score for male doctors compared to female doctors when the mean percentage change for the end of year

scores compared to baseline was assessed (27.2% vs. 4.5%, p=0.06). Even with this increase, this would still imply a normal or medium amount of stress for these doctors at the time of their end of year assessment.

As trait-anxiety reflects a personality dimension, trait-anxiety scores would not be expected to change over short periods of time as has been demonstrated in this study (p=0.14). This lack of change combined with the high level of correlation between state and trait anxiety scores ($r>0.57$, $p<0.001$) has served to validate our study results and can be taken as an indicator of reliability in the use of the STAI-trait scale [35]. The STAI-scores from our study do however contrast with other published reports. Peterlini *et al* (2002) reported a mean state-anxiety score of 42.5 and 49.3 for male and female first year residents in Brazil where female doctors had a significantly higher state-anxiety score ($p<0.001$) [35]. They concluded that female doctors may have higher actual anxiety levels but that such a variance could also be attributed to higher reporting rates amongst this group.

Within NIMDTA, there have been numerous factors deployed and integrated into the Foundation Programme to improve the quality of work life balance for new foundation doctors. The majority of foundation doctor rotas are now fully compliant with the European Working Time Directive (EWTD)[36]. Allied to this reduction in overall working hours, there has been a reduction in the actual length of doctor's shifts and an increase in off-duty during the working week ranging from single days up to a full week of leave. Further beneficial effects of the Foundation Programme have included an increase in both clinical and educational support particularly designed to support the mandatory completion of each individual's e-portfolio. The introduction of the Generic Skills Course has afforded the opportunity for foundation doctors to discuss clinical scenarios away from the workplace in an environment with educational tutors and to avail of peer support.

In addition to such exogenous training tools, F2 doctor ability and maturity should also increase as the year progresses leading to an improved ability to deal with clinical scenarios and typical acute hospital workloads. It remains unclear whether the influence of NIMDTA's numerous programmes to improve the Foundation Programme in our study has had an advantageous influence amongst foundation doctor anxiety in Northern Ireland. Furthermore the development and implementation of MMC combined with the Medical Training Application System (MTAS) may also have created both positive and negative experiences for this group of doctors.

From their review of personality and medical specialty choice, Borges *et al* (2002) comment extensively on difficulties associated with defining specific personality types in different specialties due to the multiplicity of factors such as the use of different personality inventories, recruitment criteria, the presence of small sample sizes and the effect of individual assessments at different stages of a medical career (graduates, residents and attending) (**Table 3**) [13]. Other authors have reported specialty choices with other personality traits such as a higher degree of neuroticism and openness with psychiatry and a lower degree of neuroticism in family practice [14]. Hojat and Zuckerman (2008) reported higher "impulsive sensation seeking" and lower "neuroticism" personality scores with surgical specialties whilst higher and lower "sociability"

Table 3

Personality traits for different medical specialties (data collated from review by Borges et al – 2002).

specialty	scoring higher	scoring lower	Character
Anaesthesia	Extraversion, Originality	Neuroticism, Accommodation, Consolidation	Ability to experience negative affect, less sociable and dominating
General Medicine	Consolidation	Extraversion	Tendency to be stiff, cool, sceptical and aloof. Prefer working with things rather than people.
General Practice	Accommodation, Consolidation	Originality	Sympathetic, trusting, co-operative, and altruistic
Obstetrics and Gynaecology	Consolidation	Originality, Accommodation	Highly conscientious, organised, persistent, scrupulous and achievement orientated.
Paediatrics	Neuroticism, Extraversion, Accommodation	Consolidation	N / A
Pathology	Originality	Neuroticism	Able to experience negative effect, less socialable and dominating
Psychiatrists	Neuroticism, Originality, Accommodation	Extraversion, Vary with respect to Consolidation	Imaginative, curious, needing variety, experience feelings deeply, sympathetic, trusting, co-operative, altruistic
Rehabilitation	Neuroticism, Originality	Extraversion	N / A
Surgeons	Extraversion, Originality	Accommodation	Sociable, active, dominant, more antagonistic, less agreeable

scores were attributed to primary care and hospital based specialties respectively with the Zuckerman-Kuhlman personality questionnaire (ZKPQ) [15].

Our study is one of the first to prospectively assess a cohort of junior doctors at the same level who were in the process of considering future career choices. We have demonstrated that these foundation doctors scored higher on accommodation and consolidation but lower in neuroticism at the start of the academic year. Higher scores in accommodation and consolidation suggest a sympathetic, trusting, co-operative, and altruistic personality often attributed to doctors working within general practice. A lower score in neuroticism implies an ability to experience negative effect, whilst being less socialable and dominating often identified in laboratory specialties particularly pathology [13]. The consolidation (conscientiousness) personality trait has also been reported as a significant predictor of performance in medical school where such relationships between personality and performance become increasingly significant as learners advance through medical training [37].

Similar to our study, Buddenberg-Fischer *et al* (2006) assessed specialty choices amongst fourth year Swiss residents and reported that gender had the greatest impact on specialty and career choice whilst career motivation and life goals were two other relevant influencing factors [38]. In contrast, we only identified a minimal gender difference in the accommodation trait and no change in the other personality factors or STAI anxiety scores. These personality trends continued through to the end of the academic year which suggests that our personality testing instrument remained valid as an individual's personality trait should remain fixed over time. We did not assess other attributes such as motivation or aspired life goals.

Although our study assessed the same cohort of doctors over one year, Borges *et al* (2002) commented that differences in personality trait may occur if such assessments are performed at different parts of a junior doctor's career. Bland *et al* (1995) further reported that personality assessment should still be included as one of the many factors that students consider when choosing a specialty. The UK Strategy Group Reforms from 2004 suggested that both personality and aptitude of students and junior doctors should be taken into account during job selection processes [39]. However, it should be understood that personality type testing is not an exact process as there is a greater variation *within* medical specialties than *between* them [13].

Similar to Borges *et al* (2002), we accept the limitations of our study whereby it remains difficult to compare these personality traits of foundation year doctors with those already in a specialty and who have already made a career choice. However, our study does provide early indicators of personality types for this group of doctors. Borges *et al* (2002) acknowledged inconsistencies regarding data recording probably due to measurement error and sampling idiosyncrasies. They further accepted that their review did not include any evidence of randomisation and may therefore be biased by an under- or over-representation of certain population subsets. A selection bias could also have been introduced because the individuals who chose to participate in the study may have had personality traits at the outset that attract them to particular psychological interventions. Although our data was not randomised, a true representation of the foundation year 2 doctors for the period of the study was obtained. However, similar to previous studies with varying response rates between 45.7% and 67.5%, it is unclear as to the influence of a potential selection bias in this selected group of doctors as only 63.6% of the total cohort chose to complete the questionnaires whilst a gender bias may also have been introduced due to differences in completion demographics between the two time points [5, 8, 40].

Despite recruitment from a single deanery, one of the major strengths of this study was the assessment of a fixed cohort of doctors who were exposed to a uniform Foundation Programme Generic Skills course. Although it would be impractical to attempt to initiate randomisation of foundation doctors to receive or abstain from generic skills tuition, a cross-sectional study incorporating a different deanery would be very useful to investigate the actual effect of the Foundation school on this group of doctors when compared to different foundation methodologies. However, this may also have ethical ramifications as it is important for optimisation of junior doctor training and development particularly within the first few years following qualification. It would also be useful to conduct this study at the very beginning of medical school with annual assessments rather than completion on multiple occasions in a single year. These assessments could then continue throughout medical school, the foundation programme and into the junior doctor's career.

CONCLUSION

Studying this group of inaugural foundation doctors proved a challenging task. Despite the implementation of MMC with a coordinated UK wide specialty application process (MTAS) on the first cohort (2005-2007) of Foundation doctors, a detrimental effect on their anxiety levels and personality profiles was not evident. The resilience of new medical graduates is the most striking outcome demonstrated. However, the role of rota compliance, improved clinical and educational supervision as well as the generic skills course at the Northern Ireland Foundation School must not be discounted.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. We certify that we have participated sufficiently in the work of this paper. We have reviewed the final version of the manuscript and approve it for publication. To the best of our knowledge and belief, this manuscript has not been published in whole or in part nor is it being considered for publication elsewhere. No research funding or external financial support has been provided for this study.

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Case Report

Lumps, Bumps and GI Bleeding

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ABSTRACT

We report the case of a patient presenting with malaena and anaemia secondary to a metastatic phyllodes tumour of the breast. This is an unusual clinical presentation from a breast tumour that rarely metastasise.

CASE

64 year old woman presented with a one-week history of melaena and increasing lethargy. Past medical history included a right breast lumpectomy in 2007 for a borderline phyllodes tumour, hypertension and irritable bowel syndrome. Physical examination was unremarkable. Clinical Observations on admission were within normal limits. Laboratory tests on admission showed: haemoglobin 7.4g/dL, C-reactive protein 138mg/L and albumin 26g/L. Other blood investigations were within normal limits. Ultrasound scan of the abdomen was unremarkable. Gatroscopy showed non-erosive gastritis with several nodules on the greater curve of the mid-body (fig. 1). Multiple biopsies were taken. Chest X-Ray showed lesions suspicious of pulmonary metastases. Computerised Tomography (CT) scan showed multiple pulmonary metastases, a 12mm right hilar lymph-node and enlarged para-aortic lymph nodes. No primary lesion was identified. A CT guided biopsy of an apical pulmonary nodule was undertaken.

Histological examination of the gastric biopsies showed an ulcer with an underlying population of pleomorphic spindle cells displaying high mitotic index. The spindle cells lay within a myxoid stroma and surrounded by native glandular gastric structures (fig 2). Immunohistochemistry showed diffuse tumour cell positivity for smooth muscle actin and negativity for epithelial markers, CD117 (KIT), DOG1, S100, desmin, oestrogen receptor, and CD34.

Fig 1.

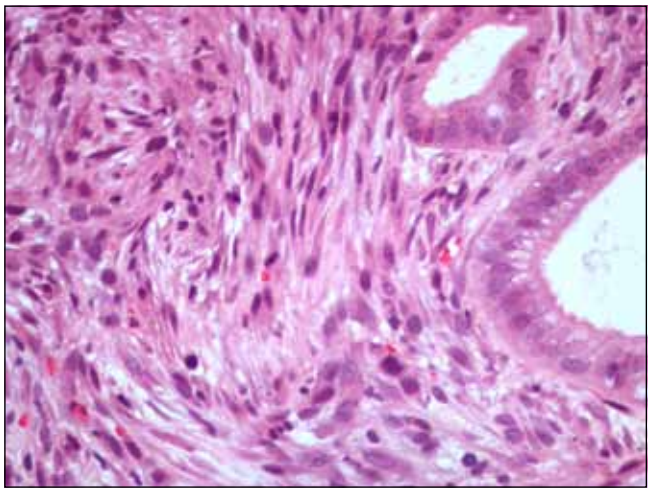

Fig 2.

A diagnosis of metastatic phyllodes tumour from the breast was made, based on the morphological and immunohistochemical features, and a comparison with those of the previously diagnosed primary breast tumour. Identical features were also seen within a biopsy from one of the pulmonary nodules.

DISCUSSION

Phyllodes tumours are fibro-epithelial neoplasms which comprise less than 1% of all breast tumours with an incidence of 1 in 100,000. The tumours can be classified histologically into benign, borderline and malignant based on morphological features. The primary tumour in this case was classified as borderline with respect to malignant potential. Primary treatment is surgical excision. These tumours recur locally at an approximate rate of 15%. 15-33% of phyllodes tumours are of the malignant subtype of which 2-25% will metastasise haematogously with the commonest sites being lung and bones. "Borderline" phyllodes tumours may also

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rarely metastasise.[1+2] A case series of 33 breast phyllodes tumours showed 7% of patients developed distant metastases.[3] None of their patients with metastases had primary tumours classified as benign or borderline.

Lobular carcinomas are the most common type of breast malignancy to metastasise to the gastrointestinal tract; more frequently to the stomach than the colon or rectum.[4+5] Consensus is that disease spread to the gastrointestinal tract from the breast is underdiagnosed. In each of these case series reports they advised a high index of suspicion in patients presenting with suspected primary gastrointestinal malignancy who had a history of breast neoplasia.

There have been some trials utilising chemotherapy for metastatic phyllodes tumour, however current consensus is that it has no role in the treatment of these tumours and that management is palliative.[6]

The authors have no conflict of interest

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Case Report

Acute Respiratory Distress Syndrome Caused by Mycoplasma Pneumoniae Diagnosed by Polymerase Chain Reaction

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ABSTRACT

Mycoplasma pneumoniae (M. pneumoniae) is a common pathogen in cases of atypical pneumonia. Most individuals with Mycoplasma pneumonia run a benign course, with non-specific symptoms of malaise, fever and non-productive cough that usually resolve with no long-term sequelae. Acute lung injury is not commonly seen in Mycoplasma pneumonia. We report a case of acute respiratory distress syndrome cause by *M. pneumoniae* diagnosed by quantitative real-time polymerase chain reaction (RT-PCR).

CASE REPORT

A previously well 15-year-old female presented with a one week history of dry, non-productive cough and a three-day history of occipital headache, photophobia, sore throat and fever. She was a smoker of 0.5 pack years. She was a student and lived in an urbanised area with her family. There was no history of recent foreign travel, no known exposure to moulds and no exposure to birds or farm animals. Physical examination was unremarkable. Investigations revealed that the white cell count (WCC) was raised at 12.6 X 10^9/L (neutrophils 9.89 X 10^9/L , lymphocytes 1.32 X 10^9/L) and the C-reactive protein (CRP) was elevated at a level of 192 mg/L. Admission chest X-ray (CXR) was normal. She was empirically treated with IV ceftriaxone 2g BD for presumed meningitis. She had declined lumbar puncture prior to initiation of antibiotic therapy. There was initial improvement with intravenous fluid and antibiotic administration however, on day 3 of her hospital admission, she deteriorated with a raised respiratory rate and high temperatures. Her throat was noted to be inflamed and IV benzylpenicillin 1.2g q4hrs was added empirically to cover for tonsillitis. She continued to deteriorate the following day with a fall in $p0_2$ of 7.5 kPa on room air arterial blood gas. CRP remained elevated at 205 mg/L. Repeat CXR revealed a dense, left-sided consolidation. She was transferred to the High Dependency Unit (HDU) for supportive ventilation on day 3 of her admission and initial antibiotics were changed to IV meropenem 2g BD and IV clarithromycin 500mg BD for broader antimicrobial cover. Despite aggressive management, there was further clinical deterioration with worsening CXR changes involving the right lung base within 24 hours of HDU admission. She was tachypnoeic with a respiratory rate of up to 50 breaths per minute and remained pyrexial. She continued to deteriorate and required intubation and ventilation within 24 hours of HDU admission due to exhaustion. She was diagnosed with acute respiratory distress syndrome (ARDS) based on CXR findings which showed bilateral alveolar infiltrates and pO2 of 6.9 kPa on high flow oxygen.

Blood and urine cultures were negative. Sputum sample cultures were negative on direct culture. Legionella and pneumococcal urinary antigens were negative. A previously published real-time PCR for detection of *M. pneumoniae* specific P1 cytadhesin was modified to quantify *M. pneumoniae DNA* in 10µl assay volumes[1,2]. Her throat swab contained 7780 copies/ml of mycoplasmal DNA. Mycoplasma pneumonia was diagnosed and PO doxycycline 100mg BD was added for additional atypical pneumonia cover at day 10 of her admission. A bronchoalveolar lavage (BAL) was performed at day 6 of intensive care stay because of persistently raised inflammatory markers and high ventilator requirements.

Real-time PCR of her BAL detected 6440 copies/ml of *M. pneumoniae* DNA. Cold agglutinins were also detected in serum at a dilution of 1/32. Serum for Mycoplasma IgM, taken at day 9 of the presentation, was negative however a subsequent sample taken at day 18 of the presentation was positive. These serological results support the PCR findings in confirming *Mycoplasma pneumonia* as the cause of her acute respiratory distress syndrome. She improved over the course of her ten day admission to the Intensive Care Unit, was weaned off ventilator support and was transferred back to a General Medical ward to finish her treatment. She completed a two-week course of clarithromycin and doxycycline. Repeat chest X-ray prior to discharge showed marked improvement. She was discharged and has since made a complete recovery after 21 days in hospital.

DISCUSSION

Mycoplasma pneumonia is the commonest cause of atypical community acquired pneumonia (CAP). It has a worldwide prevalence which tends to occur in epidemics. In the UK, epidemics were always described as occurring every 3 – 4 years; the last proper epidemic was late 1997-1998. Since then, less infection has been seen than expected, hence the

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previously observed 3 – 4 year cycle pattern has broken down[3]. It is well recognised that the vast majority of Mycoplasma infection is undiagnosed. Mycoplasma pneumonia tends to occur primarily in young adults but may occur in any age. Symptoms of mycoplasma pneumonia include fever, sore throat and a non-productive cough[4]. Central nervous system involvement due to mycoplasma infection is well documented in the literature which ranges from aseptic meningitis, encephalitis, cerebral ataxia and transverse myelitis[5]. Our patient presented with headache and photophobia and was initially treated as meningitis.

Radiological findings in cases of mycoplasma pneumonia are usually an interstitial pattern as opposed to lobar type pneumonia, as seen in Streptococus pneumoniae infection[6]. Techniques for laboratory diagnosis of mycoplasma pneumonia include culture, serological and molecular methods. As *M. pneumoniae* is a bacteria which lacks a cell wall, culturing this organism is difficult. She et al. assessed the utility of culture for *M. pneumoniae* for the diagnosis of respiratory tract infections and found that culture was less sensitive and had low yield when compared to other laboratory techniques such as PCR and IgM serology[7]. When comparing between PCR and IgM serology for the diagnosis of mycoplasma infection during the acute phase of infection, Nilsson et al. found that PCR was superior to serology. This study also found that following an acute infection, persistent and sometimes long-term, carriage of *M. pneumoniae* DNA in the throat is common following an acute infection which is not affected by antibiotic therapy[8].

Cold agglutinin is a non-specific laboratory investigation which is raised in about 75 percent of cases of mycoplasma pneumonia. Serum titre levels of more than 1:64 in a person with a lower respiratory tract infection would highly suggest Mycoplasma pneumonia infection. Another feature in patients with *M. pneumoniae* infection is acute thrombocytosis which usually occurs 1-2 weeks into the illness[9]. This patient had serum platelet levels exceeding above 700 during the course of her illness which returned to normal levels during the recovery period.

M. pneumoniae is a bacterium that lacks a cell wall, hence cell wall acting antibiotics such as penicillins and cephalosporins have no action. Tetracycline, clarithromycin or erythromycin remain as the mainstay treatment for *M.pneumonia* and should be used empirically in treating community-acquired pneumonia[4]. Most Mycoplasma pneumonia infections resolve without complications however, some cases can progress to acute respiratory distress syndrome (ARDS). Cell-mediated immune response is thought to be the pathogenesis of pulmonary injury in mycoplasma infection, for which steroids may have a role in the treatment of severe cases. Radisic et al. described a case of mycoplasma infection complicated by ARDS which improved on prednisolone treatment[10].

CONCLUSION

Mycoplasma pneumonia is an uncommon cause of acute respiratory distress syndrome. This case report shows the advantage of using PCR for detection of *M. pneumoniae* DNA in throat swabs and respiratory tract secretions in acute infection. PCR is superior to serology which requires acute and convalescent samples to confirm the diagnosis of *Mycoplasma pneumoniae* infection. Mycoplasma pneumonia should be considered in patients who do not respond to broad-spectrum antimicrobials and empirical atypical cover with a macrolide such as clarithromycin should be started. We consider PCR as the front-line investigation for the diagnosis of acute *Mycoplasma pneumoniae* infection. Clinicians suspecting mycoplasma infection should send respiratory secretions for *Mycoplasma pneumoniae* PCR.

The authors have no conflict of interest

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Grand Rounds

What is the Real Function of the Liver 'Function' Tests?

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ABSTRACT

Liver enzymes are commonly used in the evaluation of patients with a range of diseases. Classically they are used to give information on whether a patient's primary disorder is hepatitic or cholestatic in origin. However, knowledge of enzyme ratios and pattern recognition allow much more information to be derived from these simple tests.

This paper offers an insight to generalists on how to extract greater information from these tests in order to improve the investigation and management of liver disease.

INTRODUCTION

Liver Function Tests (LFTs) are one of the most commonly-requested screening blood tests. Whether for the investigation of suspected liver disease, monitoring of disease activity, or simply as 'routine' blood analysis, these tests can provide a host of information on a range of disease processes. The title 'liver function tests' is, however, somewhat of a misnomer; only the bilirubin and albumin given in this panel offer information regarding the functional capacity of the liver. At a basic level the evaluation of liver enzymes simply gives information as to whether a patient's primary disorder is hepatitic or cholestatic in origin. However, much more may be interpreted from these assays with knowledge of enzyme ratios and pattern recognition. This paper offers an insight to generalists of how to yield greater information from this simple test.

ENZYME PHYSIOLOGY

A basic understanding of each enzyme is fundamental to interpreting the meaning of their titre. The basic pathophysiology of each is delineated in table 1.

PATTERNS AND USE OF HEPATIC ENZYMES IN PRACTICE

The liver enzyme profile should always be assessed in conjunction with a thorough history and clinical examination. Despite these invaluable tools, there are many occasions when doubt persists over an underlying diagnosis. For example, does an overweight diabetic who enjoys a few glasses of wine at the weekend have alcoholic or non-alcoholic fatty liver disease? In such circumstances the absolute liver enzyme levels and ratios may point the clinician in the right direction. Furthermore, the pattern of enzymes will assist, not only with differentiating between cholestasis and hepatitis, but will aid diagnosis when there is a mixed picture.

UNDERSTANDING CHOLESTASIS: MECHANICAL OR MEDICAL?

Mechanical biliary obstruction results in raised levels of ALP, GGT and often bilirubin. ALP will usually be markedly raised in comparison with ALT. Levels of ALP and GGT elevated in similar proportions signify a hepatobiliary source. Otherwise alternative causes of single enzyme elevation should be considered.

When due to choledocholithiasis, the levels of ALP and GGT tend to fluctuate (in comparison to stricture forming disease) and may be associated with a normal bilirubin.[1] Enzyme titres tend to rise and fall gradually and may be preceded by a peaked rise in liver transaminases which can reach >1000 I/U.[2]

The AST:ALT ratio (De Ritis ratio) may assist in differentiating the site of biliary obstruction. When associated with a cholestatic picture, an AST:ALT ratio of <1.5 suggests an extrahepatic obstruction. In such circumstances the ALT titre is frequently considerably higher than AST. An AST:ALT ratio of >1.5 indicates intrahepatic (mechanical or medical) cholestasis is more likely.[3]

Drug-induced cholestasis usually presents with a preferential rise in ALP, rather than GGT, or with an ALT:ALP ratio of <2. Causative drugs would include: antibiotics, immunosuppressants, tricyclic antidepressants and angiotensin converting enzyme inhibitors.[4]

In Primary Biliary Cirrhosis, an autoimmune condition of the intrahepatic biliary ducts, the level of ALP is generally greater than that of GGT. In this case, transaminases are invariably normal or only minimally elevated. Both the European Association for Study of the Liver (EASL) and the American Association for Study of Liver Disease (AASLD) recommend that a diagnosis of PBC may be based on cholestatic liver enzyme levels in conjunction with the demonstration of anti-mitochondrial antibodies.[5;6] If either of these two criteria is absent, imaging and liver biopsy become necessary.

AST and ALP are used within some scoring criteria to monitor the effects of ursodeoxycholic acid in the management of PBC. A recent study has shown that a raised AST:ALT ratio outperforms other non-histological indicators of cirrhosis in PBC, but still only achieves a low sensitivity and a specificity of 65-79%.[7]

As with PBC, liver enzymes play a key role in the diagnosis of Primary Sclerosing Cholangitis (PSC). When other causes of liver disease have been excluded, a raised GGT, and particularly ALP, are diagnostic when associated with

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Table 1:

Pathophysiology of liver associated enzymes

Alanine Transaminase (ALT):
- Produced in hepatocytes
- Very specific marker of hepatocellular injury
- Relatively low concentrations in other tissues so more specific than AST
- Levels fluctuate during the day
- Rise may occur with the use of certain drugs or during periods of strenuous exercise.

Aspartate Transaminase (AST):
- Occurs in two isoenzymes, indistinguishable on standard AST assays.
- The mitochondrial isoenzyme is produced in hepatocytes and reacts to membrane stresses in a similar way to ALT.
- The cytosolic isoenzyme is present in skeletal muscle, heart muscle and kidney tissue.
- Caution must be exercised in its use to evaluate hepatocellular damage.
- Usually rises in conjunction with ALT to indicate hepatocellular injury: a hepatitic picture.

Alkaline Phosphatase (ALP):
- A group of isoenzymes that act to dephosphorylate a variety of molecules throughout the body.
- Produced in the membranes of cells lining bile ducts and canaliculi.
- Released in response to the accumulation of bile salts or cholestasis.
- Non-hepatic production in the kidney, intestine, leukocytes, placenta and bone.
- Physiological rise in pregnancy or in growing children.
- Pathological rise in Paget's disease, renal disease and with bone metastases.

Gamma-glutamyl transferase (GGT):
- Present in liver, kidney, pancreas and intestine.
- It is found in the microsomes of hepatocytes and biliary epithelial cells.
- Elevation of GGT in association with a rise in ALP is highly suggestive of a biliary tract obstruction and is known as a cholestatic picture.
- Subject to rise with hepatic enzyme induction due to chronic alcohol use or drugs such as rifampicin and phenytoin.

typical Endoscopic Retrograde Cholangiopancreatography (ERCP) or Magnetic Resonance Cholangiopancreatography (MRCP) findings. This can preclude the need for a liver biopsy.[5] Transaminase levels may be raised up to 2-3 times normal values in PSC but this is not diagnostic. AST is a component of the Mayo Risk Score, which calculates the risk of disease progression in PSC. A high Mayo Risk Score, and an AST:ALT ratio of >1.12 have been shown to be indicators of risk for the development of oesophageal varices.[8] In PSC, as with other liver diseases, there are suggestions that an AST:ALT ratio of >1 indicates the development of cirrhosis.[9]

Alcohol induces hepatic enzymes leading to a raised GGT with an ALP which may be normal, or disproportionately lower than the GGT. A GGT:ALP ratio >2.5 in association with jaundice suggests alcohol as a cause of liver disease.[10;11] The presence of a macrocytosis, due to either an associated dietary deficiency of folate or B12, or due to a direct suppression of bone marrow by alcohol is supportive of the diagnosis of alcoholic liver disease. A raised GGT is not diagnostic of alcohol abuse, with research showing it remains high in former drinkers as well as current drinkers. In men, the highest levels of GGT occur in those who drink daily. In women, binge drinkers and those consuming alcohol without food will have especially high levels. The level of GGT is loosely dose dependant, with those in the top two quartiles of alcohol intake having the highest titres.[12] A diagnostic algorithm for "cholestatic" liver enzymes is shown in figure 1.

THE FATTY LIVER AND THE AST:ALT RATIO

During the last few decades there has been research into using the AST:ALT ratio in the differentiation of alcoholic liver disease (ALD) from other forms of liver disease, particularly the Non-alcoholic Fatty Liver Disease (NAFLD) spectrum. Both AST and ALT enzymes require pyridoxal-5'-phosphate (vitamin B6) to function properly. Its absence in nutritionally-deficient heavy-drinkers has a much larger effect on the production of ALT than that of AST, causing the AST:ALT ratio to rise.[13;14] A normal AST:ALT ratio should be <1. In patients with alcoholic liver disease, the AST:ALT ratio is >1 in 92% of patients, and >2 in 70%.[13] AST:ALT scores >2 are, therefore, strongly suggestive of alcoholic liver disease and scores <1 more suggestive of NAFLD/NASH.[15] High ratios reflect the severity of hepatitis or underlying liver disease rather than high alcohol consumption. This means that most heavy-drinkers will not have an AST: ALT ratio >1 as they have not yet developed ALD.[16;17] No studies have shown that the AST:ALT ratio, either alone or in combination with other factors or models, has the necessary sensitivity or specificity to definitively differentiate between ALD and NAFLD, but it acts as a useful clinical guide when considering the need for liver biopsy. It should also be noted that liver transaminases are known to worsen in response to cessation of alcohol intake (often coinciding with admission to hospital) and that ALT has also been shown to rise simply from admission to hospital, even in patients with no liver disease.[18;19]

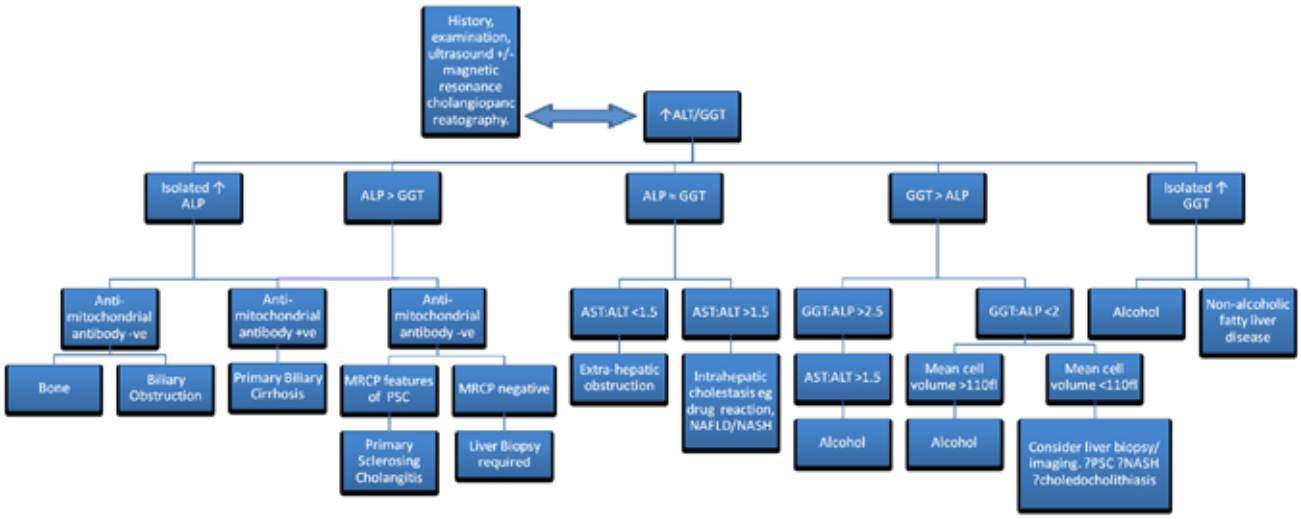

Fig 1. Diagnostic algorithm for cholestatic enzyme pictures

Although models exist which exclude cirrhosis in NAFLD with reasonable accuracy, liver enzyme analysis has so far failed to provide a sensitive and specific enough means to make a diagnosis.[20] At present liver biopsy cannot be avoided in cases where confirmation of NASH or cirrhosis is necessary.[21;22]

The role of liver enzyme analysis in NAFLD lies in both the early identification and modification of associated metabolic risk factors such as hypertension, hyperlipidaemia and glycaemic control and in risk stratification for the future. A scoring system developed at the Mayo clinic uses age, hyperglycemia, body mass index, platelet count, albumin, and AST:ALT ratio to accurately differentiate patients with advanced fibrosis in NAFLD.[23] The AST:ALT ratio becomes considerably less specific in determining underlying disease with the development of cirrhosis, as the ratio will increase across a broad range of diseases. It is, however, useful in NAFLD patients known not to be abusing alcohol as a score of >1 should lead to the consideration that the patient may have developed cirrhosis.[24;25]

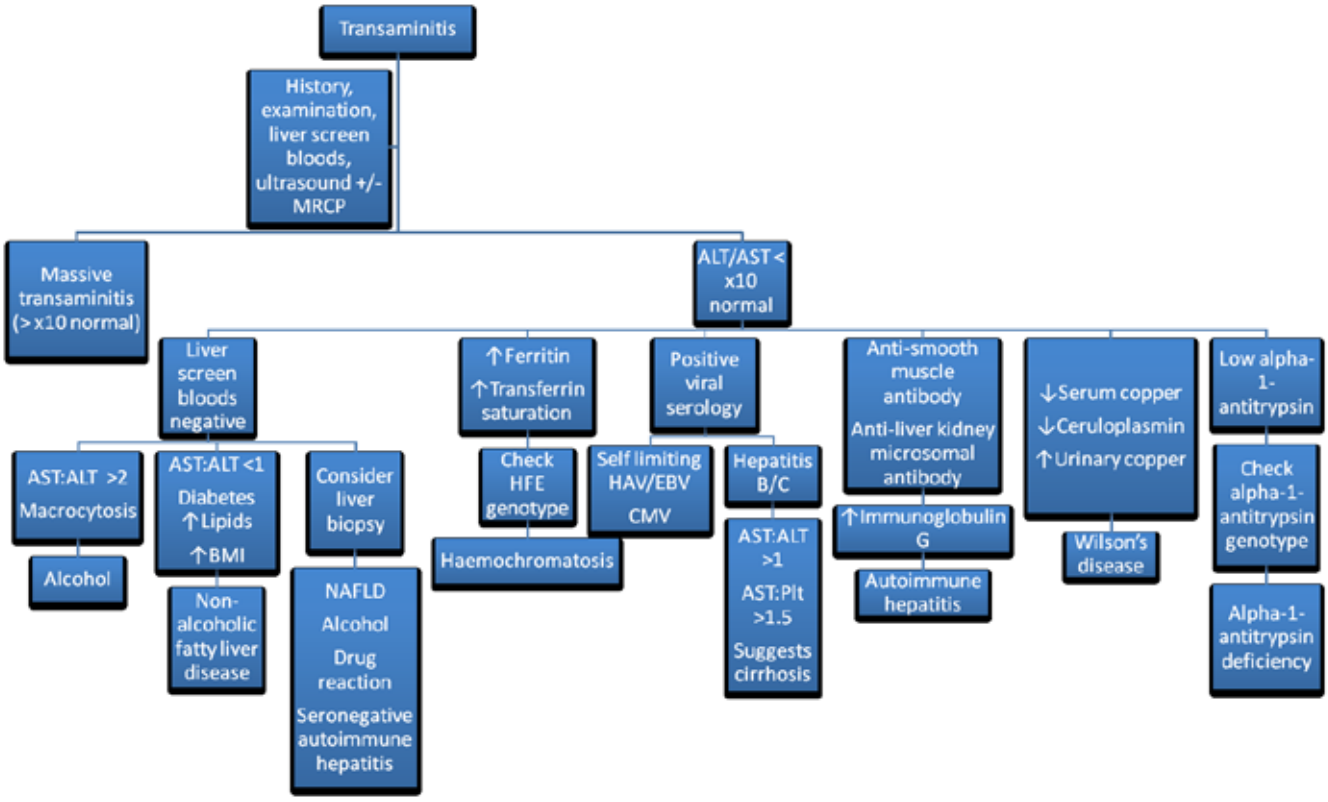

Fig 2: Diagnostic algorithm for transaminitis

TABLE 2:

Summary of enzymes patterns in liver disease

Summary Table

	ALP	AST	ALT	GGT	Other Features
Cholestasis	↑↑	↑	↑	↑↑	AST:ALT <1.5 suggests extrahepatic AST:ALT >1.5 suggests intrahepatic
Primary Biliary Cirrhosis	↑↑↑	↑/N	↑/N	↑↑	Raised AST:ALT may indicate cirrhosis
Primary Sclerosing Cholangitis	↑↑	↑/N	↑/N	↑↑	AST:ALT >1 may indicate cirrhosis AST:ALT >1.12 indicates risk of oesophageal varices
Alcoholic liver disease	↑/N	↑	↑	↑↑	AST:ALT > 2
NAFLD/NASH	↑/N	↑	↑	↑	AST:ALT <1 unless cirrhosis present
Wilson's disease	↑	↑↑	↑↑	↑	ALP:bilirubin < 4 AST:ALT > 2.2
Hepatitis B/C	↑	↑↑/ N	↑↑/N	↑	AST:ALT >1 indicates cirrhosis AST:platelet >1.5 indicates at least moderate fibrosis Enzymes may all be normal
Autoimmune hepatitis	↑	↑↑	↑↑	↑	Persistently high transaminases indicate poor prognosis
Ischaemic injury/ shock liver	↑	↑↑↑	↑↑↑	↑	
Toxic injury	↑	↑↑↑	↑↑↑	↑	

USING ENZYME RATIOS TO PREDICT DISEASE SEVERITY, PROGNOSIS AND MANAGE DISEASE

It is possible to predict the severity of some diseases using liver enzyme ratios. The chronic form of the rare genetic disorder Wilson's disease is characterised by a mild liver enzyme alteration, whether its presentation is hepatic or neurological in nature. A compilation of bilirubin, AST level and prothrombin time help to classify patients by disease severity using the Nazer score, which assists clinicians in determining the appropriate management.[26] A recent study indicated that in cases of acute liver failure, using the combination of an ALP:bilirubin ratio <4, along with an AST:ALT ratio of >2.2, Wilson's disease can be diagnosed with 100% sensitivity and specificity. Further studies will be required to evaluate whether this is reliable enough to negate the need for other diagnostic tests prior to liver transplantation.[27]

In patients with chronic viral hepatitis B or C, cirrhosis has been demonstrated in those with a normal ALT, which limits its use as a diagnostic tool.[28;29] The main use of ALT in viral hepatitis is therefore in the monitoring of anti-viral treatment.[30] Again, an AST:ALT ratio >1 suggests cirrhosis. This is a poorly sensitive test, but its specificity for cirrhosis reaches over 99% when used in conjunction with a platelet count of <150,000/mm^3 and other variables, such as prothrombin time.[31] A derivative of this, the AST:platelet ratio index (APRI), is another useful indicator of cirrhosis in hepatitis patients, but is limited by its poor sensitivity.[32] An APRI >1.5 has been used to signify moderate to severe fibrosis. It is hoped that with further analysis of these scores, along with new biomarkers and imaging techniques aimed at detecting liver fibrosis, a significant number of patients may avoid the need for liver biopsy, which at present remains the gold standard for diagnosis and estimating prognosis in liver disease.

The clinical presentation of Autoimmune Hepatitis is widely variable but may include jaundice, pruritis and either gradual or rapid onset of liver failure. The International Autoimmune Hepatitis Group guidelines state that a predominant serum transaminase abnormality, in association with a GGT of >1.5 times normal, is suggestive of AIH when combined with autoantibody and histological data, and when all other causes have been excluded.[33] Liver enzymes are not useful for accurately predicting the presence or absence of cirrhosis.[34] However, a sustained rise in transaminases >10 fold, or >5 fold in association with a twofold rise in GGT, is indicative of a higher mortality and the need for aggressive treatment.[35] Liver enzymes are used in the initiation of treatment, monitoring of response, remission and relapse, and in aiding decisions to discontinue treatment when enzymes have normalised for a prolonged period. Persistently high transaminases, despite treatment, indicate a high risk of disease progression to cirrhosis and hepatocellular carcinoma, as well as a higher risk of disease recurrence following liver

transplantation.[36;37] A guide to the diagnostic work-up of a patient with transaminitis is shown in figure 2.

MASSIVE TRANSAMINITIS - WHAT INFORMATION CAN ABSOLUTE ENZYME LEVELS GIVE US?

Liver transaminases are often only mildly increased in ALD, rising to no higher than 6 or 7 times normal in 98% of cases.[13] Absolute AST and ALT levels of more than 500 are virtually never due to alcohol alone. In the acute setting, the most likely causes for massive transaminitis are paracetamol overdose (the most common cause of acute liver failure in western society), hypoxic liver injury and acute viral hepatitis. This provides diagnostic difficulty where clearly the consequences and treatment of transient infection by a virus, such as Epstein Barr, differs greatly from that of paracetamol overdose and hypoxic injury. In cases of acute liver injury, the measured titre of transaminases offers no prognostic information and is a poor predictor of liver failure in comparison to other indices, such as prothrombin time, renal function and acid base balance. It is important to consider these diagnoses in the broader differential of those patients with a chronic rise in transaminases who present with an acute deterioration.

The majority of patients presenting with extremely high transaminase levels (>75 times normal) have suffered either ischaemic or toxic injury and a careful history will often elucidate the likely cause. In a typical hepatocyte, zone 3 of the acinus is located centrally, far away from the arterial oxygen supply of the portal triads. It is also the area of the hepatocyte highest in AST concentration. An ischaemic or toxic insult to this zone, which is already starved of oxygen, causes AST levels to peak earlier than ALT, often at extremely high levels. In difficult cases where the enzyme rise is not quite so high, transaminases and bilirubin levels usually normalise quickly in cases of ischaemic and toxic injury, but tend to persist for longer in other causes of acute hepatitis. It is important to note that normalisation of liver enzymes can occur with both the resolution of liver injury as well as with total necrosis. Regular monitoring of the patient's clinical status and markers of hepatic functional capacity are therefore vital. Hypoxic liver injury is often associated with an increased level of LDH, a marker of general ischaemic damage.[38]

The disease process in adults with hepatitis A is usually self-limiting with ALT levels settling within 4-12 weeks. Serial levels are recommended to ensure resolution. In viral hepatitis, liver transaminase titres range from normal to several thousand (in cases of fulminant hepatitis). They tend to fluctuate over time and occur at lower levels in cases of hepatitis C when compared to A or B.[28] The diagnostic considerations for massive transaminitis are shown in figure 3.

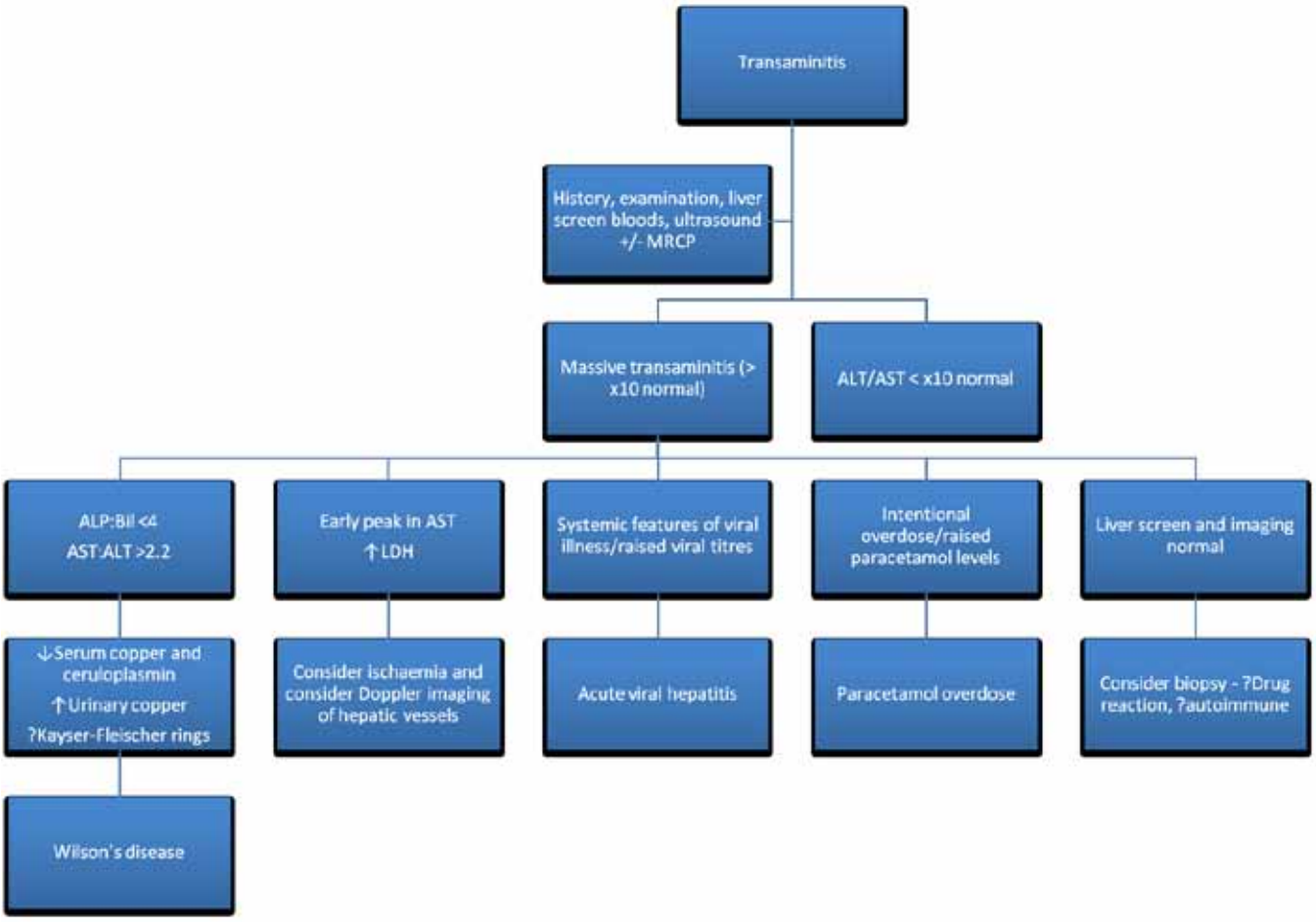

Fig 3. Diagnostic algorithm for massive transaminitis

THE FUTURE OF ENZYME ANALYSIS – OBESITY AND CARDIAC RISK STRATIFICATION

NAFLD accounts for the largest proportion of mild alterations in liver enzymes in western society, with up to 30% of the American population being affected.[39] The spectrum encompasses the reasonably benign, simple fatty liver disease (NAFLD), through to Non-alcoholic Steatohepatitis (NASH), which can progress in time to cirrhosis and liver failure. Classical presentation is with a mild elevation in ALT up to 5 times normal, with associated rises in GGT and occasionally ALP. This gives a non-specific picture similar to that of alcoholic liver disease.[39] GGT and ALP are of little diagnostic value in NASH; relying on ALT to make a diagnosis is also problematic.[40] A normal ALT has been demonstrated in patients with disease at all ends of the spectrum, and two thirds of patients with NASH, at any given time, will have a normal ALT.[21;39] Studies differ in opinion as to whether a high ALT level infers any adverse prognostic value. However, scoring systems such as the Mayo NAFLD/NASH score have shown some correlation.[23]

NAFLD falls under the ever-broadening umbrella of conditions associated with the metabolic syndrome. There are many studies linking ALT and GGT levels in particular to the later development of diabetes, hypertension, hyperlipidaemia and coronary atherothrombosis. Indeed, in patients where other causes of liver disease have been excluded, ALT levels are associated with a raised Framingham risk score.[41] Features of the metabolic syndrome may, therefore, point to a diagnosis, but NAFLD also occurs in their absence.[38] GGT has been shown to be elevated in only 52% of alcoholic patients in the absence of severe liver disease, but can be raised in up to 50% of patients with NAFLD.[42;43] This limits its use diagnostically as it is neither sensitive nor specific for alcohol misuse, despite common misconceptions.

CONCLUSION

Knowledge of how to correctly analyse liver enzymes is essential in the diagnosis, monitoring and treatment of liver disease. Although a variety of laboratory and imaging investigations are readily available to aid in this process, an enhanced knowledge of liver enzyme patterns can help prevent unnecessary investigations and expedite interventions, such as liver biopsy, when required. Future research may further define the role of liver enzymes in diagnostic algorithms, or in triggering the need for further investigation of disease by complex biomarkers and new imaging modalities. The relationship of liver enzyme abnormalities in patients with features of the metabolic syndrome is yet to be fully understood, and may provide insight into a condition set to affect many over the coming years.

The authors have no conflict of interest.

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Medical History

The Frustration of Lady Aberdeen in her Crusade against Tuberculosis in Ireland.

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ABSTRACT

When in his Annual Report for 1905 the Registrar General for Ireland pointed out to the lately arrived Lord Lieutenant, The Earl of Aberdeen, that annually in every 100 deaths in Ireland 16 were victims of tuberculosis, Lady Aberdeen took notice. In March 1907 she founded the WNHA with the clear duty of taking part in the fight against the appalling ravages of that disease, and organised a Tuberculosis Exhibition the following October. And so began a campaign that led to the building of Peamount Sanatorium in county Dublin, the Allan Ryan Hospital at Ringsend, and the Collier Dispensary in the city centre. However, the Irish parliamentarians at Westminster emasculated the Tuberculosis Prevention (Ireland) Act 1908 by ensuring that notification was not made compulsory. Passage of the National Health Insurance Act (1911) necessitated changes that resulted in the Tuberculosis Prevention (Ireland) Act (1913), but the crucial shortcomings of the earlier Act were not rectified: notification was necessary but still not compulsory. Lady Aberdeen recognised this serious flaw she was powerless to correct, and turned to propaganda, editing *Sláinte*, a monthly magazine founded in January 1909 by the WNHA, and editing a three-volume account of *Ireland's Crusade Against Tuberculosis* (1908-1909).

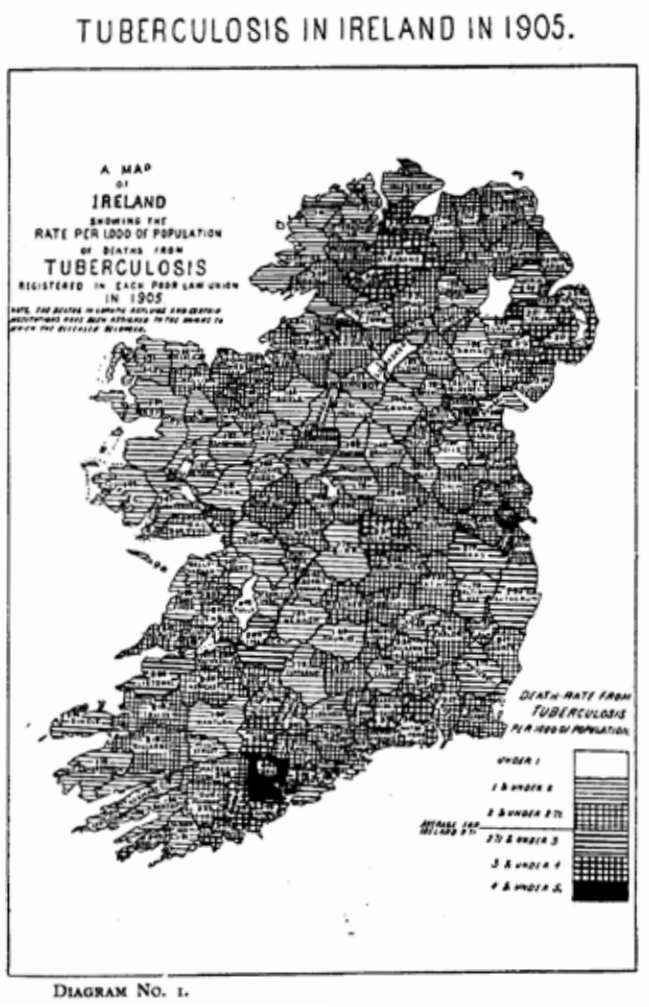

Fig 1. Deaths from tuberculosis in Ireland recorded in the Forty-second Annual Report of the Registrar General for Ireland, HMSO (1905).

LORD AND LADY ABERDEEN.

There's a divinity that shapes our ends,
Rough-hew them how we will.

Hamlet V ii 10.

Four deaths in the space of ten years brought John Campbell Gordon (3:8:1847-7:3:1934) to the peerage.[1] His grandfather George Hamilton Gordon, fourth earl and prime minister died in 1860; his father George John James (fifth) died in 1864; his eldest brother (sixth) was swept overboard while working under an assumed name in the American mercantile marine in 1870; his second brother having died in a rifle accident in 1868, John Campbell was confirmed as seventh earl of Aberdeen in 1872. After education in St. Andrews and Oxford he regularly attended the House of Lords and supported the Liberal Party. In 1886 he spent a courageous if brief spell in the Vice Regal Lodge in the Phoenix Park, Dublin; his departure, precipitated by the defeat of Gladstone's (1809-1898) First Home Rule Bill, after a friendly lord-lieutenancy was widely regretted. The regret was heightened especially after Salisbury [1830-1903] embarked on 'resolute government' and Balfour (1848-1930) the Chief Secretary adopted a policy of 'repression and reform'. From 1893 to 1898 he was Governor-General of Canada and in 1906, with the Liberals again in power, he returned to Dublin, for the longest term (nine years) in the history of the lieutenancy.

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King Edward VII (1841-1910) came over in 1907 and George V (1865-1936) in 1911 (visits engraved in the new Royal College of Science, now Government Buildings), the Home Rule Bill became law in 1914, and Aberdeen announced his retirement. He was persuaded to extend his term, and in 1915 when he finally left he was advanced a step in the peerage as Marquess of Aberdeen and Temair (from *Teamhair* Tara, the royal seat in Meath). On his estates in and around Haddo House in Scotland he improved the welfare of farmers and labourers.

It was during 1886 that the Irish Industries Association attempted to set up cottage and village industries. The restoration of Irish industry was the theme of the Irish International Industrial Exhibition opened on 12 October 1907, the first year of the return of the Aberdeens to Ireland. A City and Town Planning Exhibition opened at the Linenhall Barracks on 15 July 1914, featuring a planning competition for Dublin.

Fig 2. Lady Aberdeen Photographed with Alfie Byrne, perennial Lord Mayor of Dublin, at Peamount Sanatorium in 1937, courtesy of Dr.Tim Healy (p xi)[31].

Away back in 1877 Lord Aberdeen had married Ishbel Maria Marjoribanks (14:3:1857-18:4:1939). Ishbel, the youngest daughter of Sir Dudley Coutts Marjoribanks, later Lord Tweedmouth, and Isabella Hogg, was born in London and educated privately (Figure 2).[2] Her character and ideals, and deeply religious convictions, were moulded by her mother. In Canada with her husband from 1893 to 1898 she became interested in the National Council of Women (which had been founded in Washington in 1888), was elected President in 1893, and thereafter worked strenuously for the social and economic improvement of the status of women. Before leaving Canada she founded the Victoria Order of Nurses in 1898.

Hubert Butler (1900-1991) recalled his Aunt Harriet:

> In the days before the War and the 1916 Rising, the more enlightened of the Anglo-Irish were trying desperately to identify themselves with Ireland. ...
>
> The Gaelic League was not politicised in those days and even the British saw nothing against it. When Lady Aberdeen, Ireland's all but last Vice-Reine, came down to open our local concert hall, she defied the ridicule of the Anglo-Irish neighbours by dressing herself and the ladies of the party in emerald green with Tara brooches. ... She entertained very little in the Vice-Regal lodge, but started a campaign against tuberculosis with no political overtones, and motored all over Ireland trying with some success to introduce village nurses into every community.
>
> Despite all this they were unpopular ... one line [of a poem alleged] that 'They cut the penny buns in half when Larkin came to tea'. ... The Cuffes and Aunt Florence and my mother all threw themselves into the crusade against tuberculosis (Aunt Harriet believed it was a delusion of the mind) and I think the Bennettsbridge village name was amongst the first in Ireland [3]

Castle spongers in Dublin rumoured, on account of the quality of the sandwiches provided at official entertainments, that the Aberdeens were mean, but Denis Johnston (1901-1984) recalled that he was the recipient of a guinea in his charity collection box at the bottom of Grafton Street - dismissed by the sneer that it was a sovereign from a half-sovereign.[4]

THE RISING DEATH RATE

Ishbel the Campaigner did not arise fully formed from the head of Hygeia in 1907, for the rising mortality from consumption in Ireland was unquestionable. The Forty-Second detailed Annual Report of Registrar General for Ireland during 1905 was presented to His Excellency John Campbell Gordon, Earl of Aberdeen, Lord Lieutenant in 1906. In his Introduction Robert E Matheson (1845-1909) wrote:

> I venture to invite your Excellency's special attention to the mortality from tuberculous disease during the year 1905, the number of deaths from all forms of tuberculous disease registered in Ireland during the year was 11,882 representing a rate of 2.71 per 1,000 of the population estimated to the middle of the year, or taking the mortality from the disease in relation to the deaths from all causes registered in 1905, it will be found that in every 100 deaths from the latter, 16 were the victims of tuberculous disease. (p xxi)[5]

The preponderance of deaths from tuberculosis over the other principal causes of death was stressed diagrammatically (facing p xiii)[5] and it contrasted

> the death rate for all forms of tuberculous disease in Ireland for a period of 42 years as compared with the rates for England and Wales and Scotland. From this it would appear that in the year 1864 the rate in England and Wales was 3.3 per 1,000, and that in 1903 it had fallen to 1.7 per 1,000, rising in 1904 to 1.8. In Scotland in 1864 the rate was 3.6 per 1,000, and in 1903 it had declined to 2.1 per 1,000. In Ireland in the year 1864 the rate was 2.4 per 1,000, but in 1904 it had increased to 2.9 per 1,000, falling in the year 1905 - now the subject of review - to 2.7 per 1,000 of the estimated population. (p xiii)[5]

The age distribution of deaths from all forms of tuberculosis in 1903 was also analysed:

> In England and Wales the highest rate 3.2 per 1,000

> appears in the population under 5 years; this is also the case for Scotland, the rate in the case of Scotland being 3.5 per 1,000 living at that age period; while the rate for deaths for tuberculous disease in the population of Ireland under 5 years was 2.7 per 1,000.
>
> In Ireland the highest death rate occurred amongst those living at the age period 25 to 35 years, nearly 4.5 per 1,000. In England and Wales the rate at this age period was 2.0 per 1,000, and in Scotland it was 2.7 per 1,000, which was the highest rate for adults in that country among the selected age periods. Of the adult age periods, the highest rate in England and Wales appears among those living between the ages of 46 and 55 years, the rate for this age period being 2.4 per 1,000. (p xxiii, and diagram facing this page)[5]

Grimshaw's (1839-1900) map was revived (facing p xxiv)[5] - without the meteorological isopleths - (Figure.1).

> The maps ... give the death rate per 1,000 of the population from all forms of tuberculosis for each poor law union or superintendent registrar's district for Ireland for the years 1871-80 and 1905; the deaths occurring from this disease in the lunatic asylums and in some of the principal charitable institutions of persons admitted thereto from Unions other than those in which institutions are situated, having been assigned to the Union areas to which the diseased persons originally belonged. As before stated, the general death rate from all forms of tuberculous disease was 2.71 per 1,000 of the population. It will be seen from the 1905 map that the poor law unions having the least death rate were Tullow 0.92 per 1,000, Lisnaskea 0.93, Borrisokane 1.05, Castletown 1.07, Portumna 1.10. Dunfanaghy 1.14, and Kenmare 1.16; and those having the highest death rate were Londonderry 2.35 per 1,000, Castlederg and Kinsale 3.48 each, Waterford 3.56, Belfast 3.85, Dublin South 4.38, Cork 4.53 and Dublin North 4.70.

Tuberculosis deaths were classified under the following headings: pulmonary tuberculosis (phthisis), tuberculous meningitis, tuberculous peritonitis, tabes mesenterica, lupus, tubercle of other organs, and general tuberculosis (scrofula). (p xxiv)[5] Between 1870 and 1904 the decennial average death rate from tuberculous meningitis was 710 (355 males, 188 under 5 years and 355 females, 162 under 5 years of age). The aggregate decennial deaths from peritonitis and tabes mesenterica were 437 (205 males, 232 females; 227 under 5 years of age), amounting to 0.10 per 1,000 of the population. (p xxiv)[5] Ninian M Falkiner (1857-1929), Medical Superintendent of Statistics, was thanked for his valuable assistance, (p xxxii)[5] and meteorological observations made by J W Moore (1845-1937) were tagged on over thirty one pages. (pp 147-178)[5]

Lady Aberdeen was approached in 1906 by the National Association for the Prevention of Tuberculosis (NAPT) to take part in its programme,[6] largely ineffectual because of its elitist character. To campaign for better conditions for women, especially in relation to maternity and child welfare, Lady Aberdeen founded the WNHA, which held its inaugural meeting on 13 March 1907. When it was formed:

> it was clear that one of the first and foremost duties of that Association would be to take part in the fight against the appalling ravages of tuberculosis in Ireland. .. (p. 1)[7]
>
> The primary object of the Women's National Health Association is to reach the women of the country and to bring these facts home to them as the guardians of the homes of the country. (p. 6)[7]

On inquiry she found that an itinerant Tuberculosis Exhibition had been found of great value in the United States of America and Germany and elsewhere, so she resolved to form a special committee with a view to organising such an Exhibition. The Exhibition thus formed was opened in the Home Industries Section of the International Exhibition in Dublin from 12 October 1907 to 7 November 1907. When the Exhibition closed in Dublin it moved to Belfast on 7 December, moved to Lisburn 18 December, and on to Lurgan on 11 January 1908.[8] When the Exhibition closed, the Committee purchased a horse-drawn caravan, named "Eire", to carry the exhibits round the country. "Eire" was burned at Lifford in February, but by 1 April "Phoenix" replaced it and set off from Fintona to complete its rounds. In April 1909 the Tuberculosis Exhibition came to rest with a final appearance in the Pillar Room of the Rotunda in Dublin.[9, 10]

THE CRUSADE

Mortality from tuberculosis continued to increase: from all forms in 1904 there were 2.9 deaths per 1000 population.[1] The NAPT, of which a Dublin branch had been founded in 1899, by its lectures and pamphlets awakened the people to the value of sensible precautions. A start had begun to the provision of tuberculosis hospitals and sanatoria thus reducing the number of active cases - the ultimate sources of infection - in circulation. Lady Aberdeen's Crusade gave added impetus to the modest beginning which had to await the development of chemotherapy in mid-century for a dramatic change to appear.

As a prelude on the eve of the Official Opening of the Tuberculosis Exhibition in Herbert Park, Dublin, in October 1907 Sir William Osler (1849-1919) gave the Keynote Address in the Royal Dublin Society's Lecture Hall. Lady Aberdeen on a return voyage from Canada met the future Regius Professor at Oxford.[11] 'Osler made use of his powers as an auctioneer in wheedling over £10 out of the passengers' pockets for Charity Grant for Seamen programmes I had decorated with sundry sketches by order of the captain'.

Outlining the knowledge available for a successful campaign, Osler opened the Crusade on an optimistic note, stressing not only compulsory notification and 'the proper provision for the care and cure of patients' but also the necessity for enthusiasm and perseverance. [12] As keynote speaker he was well chosen for he had recently transferred from Johns Hopkins University to Oxford with a reputation that made him the leader of the medical profession. And he was an orator of the front rank.

The Registrar General, Sir Robert Matheson, had attended the London and Paris Congresses as representative of the government, but had retained an affection for Arthur Ransome's (1834-1922) view that improved sanitation would provide the answer to the problem he had outlined in his Annual Report for 1905.[13] Fortunately Sir John Byers (1853-

1920), professor of midwifery in Queen's College Belfast, a devotee, summarised Arthur Newsholme's (1859-1943) more rational explanation of 'Why tuberculosis is common in Ireland' - the failure to remove consumptives from their families by providing indoor relief and thus preventing spread of the causative organism without which there could be no tuberculous disease. [14] Like his academic colleague, Professor Lindsay (1856-1931), professor of medicine,[15]Byers denied altogether that the Irish (or some said the Celts) were especially susceptible to tuberculosis.[14] The scale of the problem was addressed by Dr Lawson, medical superintendent of Nordrach-on-Dee Sanatorium, Banchory (named after the sanatorium at Nordrach in the Black Forest - much against the wishes of that institution's founder, Otto Walther [d. 1919]). After answering the old chestnut that 'the value of sanatorium treatment has not been proved', Lawson calculated the Irish requirements at 20,000 beds, compared to the 410 available, and echoed Osler, as did many speakers, on the necessity of compulsory notification.[16]

There were those who knew that sanatorium treatment was not the complete or only answer. The Victoria Dispensary set up in Edinburgh in 1887 by Robert Philip (1857-1939) was described in detail by Dr Frank Dunne (1863-1929), physician in charge of the Tuberculosis Hospital, South Dublin Union,[17] (who also provided information on the economical construction of sanatoria) and by the Lady Superintendent at Edinburgh, Miss Guy.[18] The work of the corresponding Calmette dispensaries in Paris was described by Miss Fitzgerald Kenny.[19]

Through a special effort of the Gaelic League, Séamus Ó Beirn, of Leenane, was seconded to lecture in Irish on the topics of the Dublin addresses in the Gaeltacht.[20]

The enviable success of the campaign against tuberculosis in Germany was explained by E J McWeeney (1864-1925), who pointed out that the development of the institutional treatment in that country was not ascribable to Robert Koch (1843-1910, Nobel Prize 1905), the discoverer of the bacillus which placed phthisis firmly among the infectious and preventable diseases.[21] The consequences of that discovery were not exploited until the great systems of workmen's insurance were developed towards the year 1886 or 1887. The mainspring of collective action was Clause 18 of the Workmen's Insurance laws which read:

> If an insured person is taken ill in such a way as to render it probable that he may lose his earning power, and thus become entitled to the invalidity pension prescribed by the law, the Insurance Office is empowered to supply in his case whatever course of treatment may seem to it most suitable for preventing such loss of earning power. (p 18)[21]

In 1895 this clause was held to apply to tuberculosis, and the way was thrown open for the enormous development of the sanatorium system that then took place: at the beginning of 1907 there were 87 working class sanatoria with 8,422 beds. {II 16-37}

Simultaneously, consumption dispensaries were also established along the lines of the Philip and Albert Calmette (1863-1933) dispensaries in Scotland and France respectively. (pp 23-25)[21] Applicants might come of their own accord or be referred by a doctor. If the presence of tuberculosis was established, the patient (at the second visit after 14 days) was asked to bring the other members of the family or household, more especially the children, for examination. By 1907 there were 117 such dispensaries funded by local taxation and voluntary subscription, by insurance societies and by grants from the German Central committee for the Prevention of Tuberculosis.(p 31)[21]

McWeeney distinguished carefully between the dispensaries and the Irish hospital dispensaries and Poor Law dispensaries which provided curative medical care:

> The German Tuberculosis Dispensary seeks to track the enemy to his lair - to follow up the disease, discover its hidden hiding places, and cleanse them. It does not seek to cure, but to co-ordinate the already existing curative measures, and focus them on the plague-spots so dragged to the light of day. It seeks out the cases, segregates them into their categories, and puts them on the road to cure, or should this be impossible, robs them of their danger to the family and the community. . (pp 31-32)[21]

With the information already available to all, it should be possible, McWeeney argued, 'to devise a scientific, uniform, and a reasonable plan of campaign against the common enemy - tuberculosis.'(p 33)[21]

Home treatment and the results of Joseph Hershey Pratt's (1872-1956) "Class" method of treatment in Boston were described, and bovine tuberculosis and the control of milk supplies received the all too necessary attention from a variety of speakers. The message was put in a nutshell by Dr Frank Dunne

An organised and co-ordinated scheme would include:

i. compulsory notification of disease.

ii. tuberculosis dispensaries in cities and large towns.

iii. sanatoria for the treatment of curable cases

iv. hospital accommodation for the isolation of advanced, highly infectious, and incurable cases.

v. the proper inspection of food supplies, and in particular the bacteriological examination of milk. (p 57)[17]

The lectures were printed and published for mature reflection, and tangible results slowly materialised.[22] The Collier Dispensary for the Prevention of Tuberculosis, a solid two-storey building in Charles Street West, Dublin 1, recalls the donation of Peter F Collier (1849-1909) who was born in that street, emigrated to America where he founded *Collier's Magazine* and the *Saturday Evening Post*. The Allan A Ryan Hospital for Consumption (at the Pigeon House on the South Wall in Dublin), another endowment solicited by Lady Aberdeen during a tour of the United States, remained in use until 1955. The WNHA (Figure 3), in collaboration with 14 local authorities (county councils) built a sanatorium at Peamount, Newcastle Co Dublin, with 140 beds, and a smaller one at Rossclare Co Fermanagh. After the enactment of the Tuberculosis Prevention (Ireland) Act in 1908, the Treasury made its first building grants to the Association and the county


The International Congress on Tuberculosis
Washington United States of America
September 21st to October 12th 1908
This Certifies that one half of the Grand Prize of One Thousand Dollars has been awarded to The Women's National Health Association of Ireland for evidence of effective work in the prevention and relief of tuberculosis by a Voluntary Association since 1905
Theodore Roosevelt

Fig 3. Certificate of Grand International Prize shared with New York Association in 1908

councils then contracted beds in these and other institutions in preference to building their own. Such a penurious / skinflint approach is explicable in light of the fact that a ViceRegal Commission was established in May 1903 to find ways of reducing cost to taxpayers of supporting the sick and indigent poor - The Report was given to Lord Aberdeen in 1906. The sanatorium at Peamount, Newcastle, Co Dublin was built and opened despite considerable local opposition - on 21 July 1912, the eve of its opening, men from nearby towns and villages demolished one of the pavilions. (p 168)[23]

They had the support of the *Sinn Féin Weekly*, which previously echoed the praiseworthy propaganda of the WNHA. (pp 168-9). [23] Sinn Féin (We Ourselves [Sinn Féin Amháin = ourselves alone]) founded in 1906, it must be remembered, was at that time largely a one-man-band; It was only when its founder Arthur Griffith (1872-1922) was incarcerated with the leaders of the 1916 Rising - in which he took no part - that his party became part of the Republican struggle for independence. Indeed Griffith favoured, as outlined in his *Resurrection of Hungary*, a dual monarchy with a parliament meeting in Dublin, a schism to be achieved by non-violent means.

Sinn Féin hostility in 1912 must not be seen as a purely Irish problem. It should be recalled in the context of the 'hostile, or at least apprehensive' welcome given to the Papworth Village Settlement founded twelve miles outside Cambridge three years later by Pendrill Varrier-Jones:

> And not only the ordinary people. A local squire, Colonel Sir Mansfield Baker, led the campaign against a diocesan scheme in 1921 to have the parishes of Papworth St Everard and Papworth St Agnes, a rural mile and a half from each other, amalgamated. "It would empty our church as surely as the plague", he wrote to the Bishop of Ely. The scheme was abandoned. In both Papworths the villagers kept the lungers at arms length. In 1923 those living along the Papworth-Cambridge bus route lobbied the local bus company not to stop the buses near the village settlement, at least on the early morning school-run. That wish too was granted. (p 312)[24]

It is a truth universally acknowledged that all politics is local - but some is less local than we care to admit.

The ViceReine used her influence with the Viceroy and Chief Secretary for Ireland to meet a deputation with a view to introducing legislation. On 29 November 1907, a deputation of medical corporations and societies and other associations working against tuberculosis was received by the Lord Lieutenant, Mr Birrell (1850-1933), the Chief Secretary, and Mr Russell, Vice-President of the Department of Agriculture. (p 127)[25]

The Countess of Aberdeen introduced the focus points to be presented by members of the bodies:

(1) That special legislation should be introduced without delay with the object of making it compulsory that all cases of tuberculosis should be notified, taking care at the same time to protect consumptive patients from any undue interference with their liberty.

(2) That the adoption of some stringent and uniform measures for the regulation of milk and food supplies is urgently required.

(3) That County Councils in Ireland should be enabled to erect and maintain such hospitals, sanatoria, and dispensaries for the treatment of consumptives as they think fit.

(4) That there is urgent necessity for a system of medical inspection of schools and school children. (p 127)[25]

The Countess then asked individual delegates to speak on the four points, *seriatim.*

In dealing with compulsory notification Dr Joseph M Redmond (1853-1921), president of the Royal College of Physicians, stressed that 'every precaution should be taken so that the liberty of the poor patient suffering from tuberculosis should not in any way be interfered with, and also that every safeguard should be used in order to prevent the confidential relations which exist between the medical attendant and his patient from being in any way strained'. Sir Henry Swanzy (1844-1913), President of the Royal College of Surgeons, also urged that notification be compulsory 'to enable us to discover all the cases of pulmonary tuberculosis if it be properly applied, but warned that 'with regard to the public, no very harsh measures must be attempted', and, further, he realised that 'compulsory notification ... will be much in the hands of the medical profession, ... and it is of the utmost importance that their good will should be secured in order that this recommendation may be worked with success'. (pp 130-132)[25]

The Chief Secretary, 'to whom the work of putting through any Parliamentary measure will be allotted', replied by saying that he recognised the 'first rank' importance of notification, quoting the Paris October 1905 conclusion 'that it is desirable that it should be the general practice to notify all cases of advanced tuberculosis', but concluded (with due regard to human nature and medical etiquette) 'We must recognise the necessity of notification, but we will take into consideration the hints you have given us so as to avoid imposing penalties or creating a scare in the public mind, which would destroy the very object we have in view'. (pp 146-150)[25]

Was Lady Aberdeen aware of the subtle undercurrent that foreshadowed later legislation? Compulsion, it has to be said, has lost none of its difficulties.

Infection by ingestion as well as inhalation was not neglected. In his lecture on 'Control of Milk Supplies and other Conditions affecting Tuberculosis' A K Chalmers (1856-1942), Medical Officer of Health of Glasgow, pointed out that legislation controlling milk supplies was only indirectly useful with regard to spread of that disease.[26] Dairies' Orders under Section 34 of Contagious Diseases (Animals) Act of 1878 were drafted **not** with the object of protecting mankind from disease, but of controlling the spread of infections (cattle plague, foot and mouth disease, pleuro-pneumonia, and - later - anthrax) among domestic herds. It was not until 1899 that Amending Orders brought tuberculosis of the udder into the list. The clauses of various Public Health Acts applied in their original conception to epidemic diseases such as scarlatina (scarlet fever) and enteric (typhoid) fever. And the intentions behind the Sale of Food and Drugs Act (1875) concerning milk supplies were designed to deal with the adulteration and watering of milk.[26] A footnote on page 10 of Chalmers' lecture pointed out that a start was made with the specific structural provision in the Dairies, Cowsheds, and Milk-Shops Order issued in February 1908, applicable throughout the districts of all sanitary authorities in Ireland after 1 May 1909.[26]

To show the way forward Professor Albert E Mettam (1866-1917), first Principal of the Royal Veterinary College Dublin in reviewing 'Tuberculosis in Lower Animals' drew attention to the fact that already in Schleswig-Holstein, the province annexed by Germany in 1864, all cattle affected with tuberculosis (in whatever site) were destroyed, and compensation allowed.[27]

Professor Thomas Carroll (1887-1918) showed how unfavourably Ireland, and to a lesser extent Scotland and England, compared with Denmark, when death-rates between the years 1875 and 1905 were examined,(pp 31-37)[18] and he proffered the reason

> By an Act of 1893, the movement of animals evidently suffering from tuberculosis to fairs, markets, shows, strange stables, etc., is prohibited. It is not allowed to sell or offer for sale the meat of such animals except after it has been examined by a qualified veterinary surgeon, and is certified by him as being fit for use ... The regulations as to the sale of milk in Denmark are particularly rigid. By an Act of 5 February 1904 ... it is required that all dairy milk and buttermilk shall be heated at 80^{O}C ... all cream churned for butter-making must be heated to 80^{O}C. No milk can be imported unless it is heated. ... We can learn a lesson from Denmark that, even in public health, co-operation may be a great aid. (p 35)[28]

But even the Danish farmers so eulogised by Professor Carroll,[28] when they were preparing milk for their own use, were remiss or less than careful in Pasteurisation, for there was a higher incidence of bovine infection in agricultural as against urban areas as late as 1935.[29]

As among people, however, among nations and governments there are slow learners, and the ViceRegal Commission on the Irish Milk Supply which made its Final Report (of the Irish Milk Commission) in 1911 did not materially improve the quality in bacteriological terms.[30] However, as always, Lady Aberdeen led by example and paid for land acquired to enlarge the farm attached to Peamount Sanatorium to supply safe milk and fresh food for the patients, some of whom initially helped in the farmwork.(pp 83-87)[31] The finances of the model farm with pedigree milch herds were separate from those of the sanatorium, and at various times were boosted by sale of tobacco and barley crops.(pp 130-136)[21] Peamount Industries 1930-40, watched over by P J Varrier Jones (1883-1941), was a separate development (pp 92, 96-101)[31]

Fig 4. Statue of Sir James Craig in the Hall of Parliament Buildings, Stormont

In 1925 over 8 per cent of milk samples in Dublin contained live tubercle bacilli; 'the powerful farmers' lobby saw to it that the Free State Government regularly shelved Clean Milk Bills, let alone compulsory pasteurisation'.(p 240 n 20)[24] In a usually impeccably referenced text, Thomas Dormandy does not provide a source for this statement but directs the reader to Chapter 29, where it merely reappears in paraphrasis in a footnote (p 332 n 9) [24].

PARLIAMENT AND PEOPLE

On Wednesday 3 June 1908 the Tuberculosis Prevention (Ireland) Bill:

> To prevent the spread and provide for the treatment of Tuberculosis, and for other purposes connected therewith,

was presented by Mr Birrell; supported by the Attorney-General for Ireland; to be read a second time upon Wednesday next, and to be printed.[32]

Hansard noted that the Report from Standing Committee A .C. was lain on the Table of the House on 4 November, to be printed, as well as the Standing Committee's Minutes.[33] On 10 November Mr Ginnell wished to ask Mr Birrell to consider the advisability of dropping the Tuberculosis Bill in favour of the promised Land Bill.[34] A week later Capt Craig (first Viscount Craigavon 1871-1940, Figure 4), careful Ulster housekeeper that he was, asked the Prime Minister whether it was proposed to extend the scope of the Bill to England and Scotland lest consumptive poor persons there might be sent to Ireland where they would become a burden on the rates; Prime Minister Asquith (1852-1928) answered that 'The inquiry opens up a large question with regard to the Law of Settlement'.[35] To Mr J P Farrell's (1865-1921) request on 23 November that words be inserted 'which will give individuals and families notified a right of appeal ... before removal from their houses', Birrell was able to respond that 'the member is under a misapprehension in thinking that power is sought under the Bill for the compulsory removal from their homes of persons suffering from tuberculosis'.[36]

The Bill as amended by standing Committee A came up for its Third Reading on 16 December 1908. Tom Kettle (1880-1916, Figure 5)

> had no desire to be ungracious, but speaking with the sincerity and seriousness of a person two members of whose own immediate family history had died from tuberculosis, he was bound to say that the Bill was going to scare everybody and cure nobody in Ireland. He believed that the medical men supporting the Bill had made pretensions to knowledge they did not possess; and as the noble Lord [Balcarres] had said, the disease, if it was to be compulsorily notifiable, ought to be notified in the early stages. He had in his own experience, had the perfectly definite statement of a leading medical specialist to the effect that there might be no symptoms of tuberculosis in a person and yet he might be dead and buried four months afterwards. If they were going to make the notification compulsory, if they were going to make a physiological black list in Ireland, if they were going to make an attack on family life, and if they were going to make those afflicted with the disease to be looked upon as lepers, then the State ought to have done something to help them; but it had done nothing to help by contributing funds for the establishment of sanatoria or the making of provision for the treatment of tuberculous patients. Whatever satisfaction the Bill might give the Vice Regal Lodge in Dublin, he did not believe it was going to cure a single person affected with tuberculosis . The problem was rather one of bad houses, under feeding and general depression than anything else. Certain members were exalting the Bill as one of first-class importance, and he felt bound to make these remarks.[37]

Before Mr Kettle got to his feet another hardheaded Unionist, Mr Barrie, warned that 'there were county councils in Ireland who were not so anxious to incur additional taxation with a view to preventing this terrible scourge'.[38] Like Craig he was more honest than dissenting Home Rulers too conscious of ratepayers' voting power. If under feeding and poor housing were so important how did the disease kill any of the well-to-do Kettle farmers? Moreover, the word 'Prevention' in the title gave the Bill no pretensions to cure a single person.

Kettle was invidious in his selective attitude to the medical profession: those supporting the Bill were misguided fools, but a specialist friend was infallibly correct. Selective quotation from his emotional outburst (p. 169) [23] scarcely does justice to the misapprehension that brought him to annihilation at Ginchy on 11 July 1916 believing that he was soldiering on behalf of

> *a dream, born in a herdsman's shed.*

On 17 December the Bill was brought from the Commons to the House of Lords. Tributes were paid to Lady Aberdeen, even though Lord Killanin (1867-1927) opined that 'the measures will accomplish very little' because 'healthy young people are emigrating' in response to Yankee advertisements in newspapers.[39] Two days later the minor amendments proposed by their lordships were considered forthwith, and agreed to. Among the many Bills receiving the Royal Assent on 21 December 1908 were the Tuberculosis Prevention (Ireland) Act and 'an Act establishing two universities in Ireland (Queen's University Belfast and the National

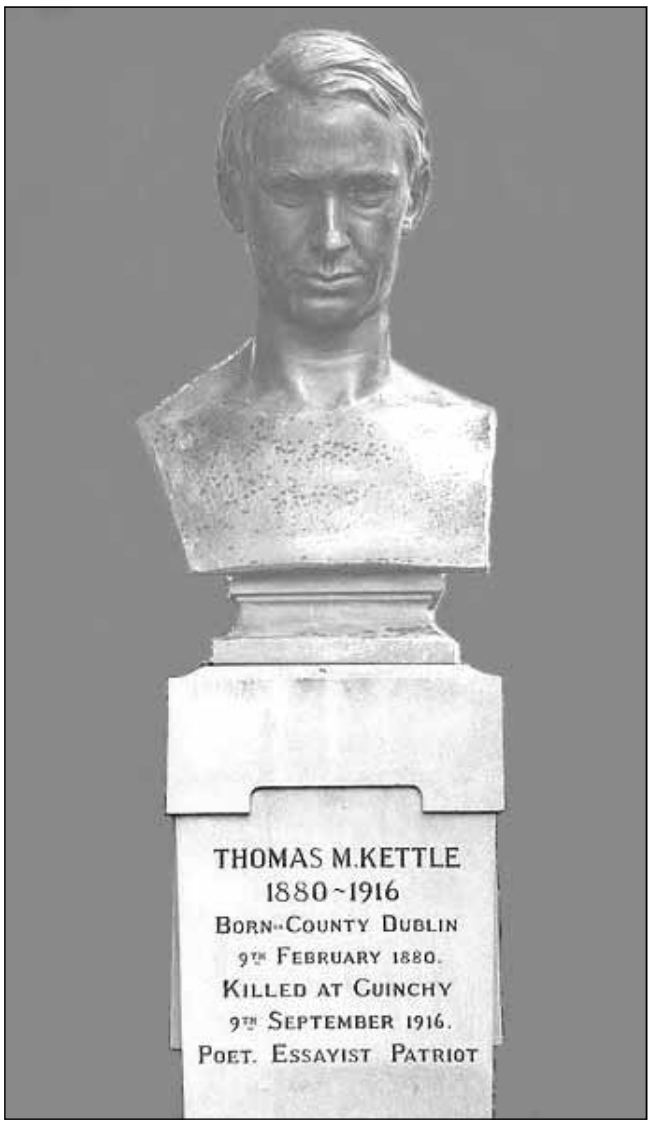

Fig 5. Bust of Tom Kettle in St. Stephen's Green, Dublin

University) to take 'an honourable part in the future education of the country'.[40]

The Tuberculosis Prevention (Ireland) Act was reprinted in Volume III of Lady Aberdeen's *Crusade*,[26]

Part I Notification and Disinfection	Part III Sanitary Provisions
Part II Hospitals and Dispensaries	Part IV General

I 1 - (1) If any medical practitioner attending on any person, within any district to which this Part of the Act extends, becomes aware that that person is suffering in any prescribed circumstances from tuberculosis of any prescribed form, or any prescribed stage, the medical practitioner shall within seven days after he becomes aware of the fact send to the medical officer of health a certificate in the prescribed form and containing the prescribed information.

3 - (1) This part of this Act shall extend to any urban or rural sanitary district in Ireland after the adoption thereof.

II 4 - (1) A county council may, if they think fit, provide hospitals and dispensaries for the treatment of inhabitants of their county suffering from tuberculosis, and for that purpose may

(a) themselves establish and maintain such hospitals or dispensaries; or

(b) enter into an agreement with any person having the management of any hospital or dispensary for the reception, maintenance, and treatment in the hospital or for treatment in the dispensary, as the case may be, of any such inhabitants of their county as aforesaid.[26]

In the Bill as originally drafted the duty of prescribing the forms and stages of tuberculosis to which, and the circumstances in which, notification of the disease should apply was entrusted to the Local Government Board alone. When the Bill reappeared in the Commons five months later in November 1908, as amended by Standing Committee A, subclause 2 of clause 1 had been altered so that the Irish Branch Council of the General Medical Council would serve as an Advisory Committee to the Irish Local Government Board. The Irish Branch Council was willing to act but pointed out to the Government that it had no funds at its disposal to defray the necessary expenses. As it transpired, without consulting the two incumbents, the Presidents of the two Royal Colleges in Dublin were constituted an "Advisory Committee" to the Local Government Board.[41]

On 3 June 1909, The Local Government Board issued an "Order" prescribing the forms and stages of tuberculosis to which, and the circumstances in which, section I of the Tuberculosis Prevention (Ireland) Act should apply. Notification was not 'indiscriminate'; under Section I it applied to any stage of "Tuberculosis of the Lung" at which the sputum discharged by the patient made him liable to communicate the disease to other persons, but only in very restricted circumstance: where the person suffering (from the disease)

(1) Habitually sleeps or works in the same room as any other person or person not so suffering, or

(2) Is employed or engaged in handling, preparing, or distributing milk, meat, or any other article of human food intended for sale to the public.[41]

Limitations were inevitably a feature of contentious legislation; it is easy to see now how discrimination could also gain silent entry.

The Act came into force on 1 July 1909, but only two sanatoria were built, at Streamhill, Buttevant Co Cork and at Crooksling, Co Dublin, the latter - closed during World War I - an incomplete copy of Nordrach.

But Section 3 - (1) left the adoption open, and the permissive rather than the compulsory nature of notification was a serious failure attributable to rhetoric and rationalisation of the Irish Parliamentary Party at Westminster. It has to be said, however, that Bulstrode's Supplement in continuation of the Report of the Medical Officer to the Local Government Board for 1905-06 provided suitable ammunition, and Arthur Newsholme may have quietly advised against compulsion, favouring voluntary notification for Britain as a whole. [1]

Sharing the Grand International Prize (Figure 2), for the most effective work accomplished since 1904 by a voluntary association, with New York, was small compensation when it was awarded in Washington at the International Congress (26 September to 3 October 1908) attended by A Newsholme, J P McDougall and T J Stafford who furnished a valuable report which stressed once again that compulsory notification was 'an indispensable preliminary to effective and complete preventive measures against tuberculosis'.[26] From its first number in January 1909, Lady Aberdeen edited *Sláinte,* the magazine of the WNHA, which, as well as promoting a healthy life-style, portrayed sanatorium treatment in an understandably favourable light.[42]

National Health Insurance

A system of compulsory national health insurance for large numbers of the workforce was introduced in Germany in 1883.[43] Its architect, Otto von Bismarck (1815-1898), would have wished to introduce an exclusively state-funded scheme but contributions came in varying proportions from the workers and employers as well. Major industries with numerous employees were the main contributors, so that a large segment of the workforce in agriculture and poorly-paid jobs was ignored in a predominantly urban scheme, not entirely a disaster since tuberculosis is an urban rather than a rural disease.

Influenced no doubt by the German experience, Lloyd George (1863-1945) - when he was Liberal Chancellor of the Exchequer - successfully steered his National Health Insurance Act through parliament in 1911, and the Irish Insurance Commission established in 1912 was in satisfactory operation by 1913.[44] In 1912 the Treasury set up a Departmental Committee on Tuberculosis with T J Stafford of the Irish Local Government Board and Dr Maguire of the Irish Insurance Commission under the chairmanship of Waldorf Astor (1879-1952). With Arthur Newsholme now medical officer to the Local Government Board, it is no surprise to find

the provision of sanatoria and tuberculosis dispensaries given top priority, and the appointment of county medical officers of health and the provision of school medical services strongly recommended.[45] In a codicil to the National Health Insurance Act the Medical Research Committee (later Council) was created with a budget to fund tuberculosis research; but the failure of inspiration in that regard prompted the members to spread their nets elsewhere.

Lloyd George, in gladly accepting the Report, committed the government to paying county and borough councils half of the cost of treating non-insured persons. However, the compulsory notification of tuberculosis, which the Local Government Board recognised as crucial to the success of the scheme, yet again met with Home Ruler opposition and did not apply in Ireland. But at least a tuberculosis dispensary service was inaugurated, and by March 1913, 25 councils had appointed tuberculosis officers, and an additional three were appointed the following year.[41] Few, if any, new posts {jobs for the boys to stem medical emigration (p 168)[23]- a drop in the ocean} were subsequently established. But building suitable tuberculosis dispensaries was another matter, the education programmes of the Itinerant Exhibition and the WNHA failed to convince many that such dispensaries were not foci of infection for the spread of the disease. The Tuberculosis Prevention (Ireland) Act 1913 was introduced to make the necessary changes brought about by the National Health Insurance Act of 1911, but unfortunately none of the shortcomings of the 1908 Act were rectified by this new legislation.[41] The responsibility for providing sanatoria was shifted from Joint Hospital Boards and Boards of Guardians on to county councils. Dublin Corporation took over the Collier Dispensary in Charles Street and the Allan Ryan Hospital at the Pigeon House, Ringsend, and Belfast Corporation took over Whiteabbey Sanatorium in 1914. Sanatoria were built at Armagh, Dungannon, Clonmahon, Roscrea and Monaghan, and dispensaries sprang up at Tralee and Killarney in Kerry, in Tipperary and, on behalf of Dublin County Council beside the Meath Hospital and Dublin County Infirmary (to give that hospital its full title) in the city.[41] In any event the political consensus achieved through Lady Aberdeen's patience and organisational skills between "'constructive' unionists and parliamentary nationalists … in the campaign against tuberculosis was beginning to disintegrate" before she sailed for home with the Viceroy in 1915 [46] , frustrated by the lack of progress in Parliament in the five years after the 1908 Act that failed to introduce compulsion, a key component of preventive legislation.

In reality the seeds of fiscal trouble were already sown. Parsimonious Irish politicians had already covered themselves with ignominy when they relentlessly ensured that the Education (Provision of Meals) Act, 1906, [47, 48] enabling local authorities – at their discretion - to provide meals for school children, for fully a decade did not apply in Ireland. (p98)[49] A celebratory breakfast in April 1900 in the Phoenix Park for the visit of 'the Famine Queen' was all that had been possible within their little reign.(p 63)[49] The following June the Patriot Children's Treat Committee feasted 20,000 Dublin children in Clonturk Park, Drumcondra, and from the Committee grew *Inghinidhe na hÉireann* (Daughters of Ireland) presided over by Maud Gonne (1866-1953) even when she was away in Paris.(p 63)[49]. In October 1910, stimulated by their President, *Inghinidhe* began supplying dinners to the children of St Audoen's parish (with the blessing of Canon Kavanagh) and nearby John's Lane school.(p 99)[20] Although Maud originally assumed that 'starvation of little children working hard with their brains' led to mental ill health, by December 1910 she could write to the Irish-American lawyer, John Quinn (p.97)[21]

> The number of deaths from consumption in Ireland – the more I looked into the question – the more shocking I found the neglect of the children. It is one of the most vital national questions. If we are to get free and keep free, we must keep up the strength of the race.

Quinn sent £25, and meals were also provided from February 1911 in Ringsend school.(p 99)[49] With the help of James Connolly (1870-1916) and the Irish Trades Council, *Inghinidhe* arranged meetings in the Mansion House in November 1910 and November 1912, but their protests failed to convince Dublin Corporation that meals should be provided in the city schools. In December 1911 Maud Gonne's philippic appeared:

> A great wrong is being done in our midst. Hundreds of child lives are being sacrificed; thousands of Irish boys and girls are being condemned to life-long physical suffering and mental insufficiency by schoolday starvation.
>
> Under pain of imprisonment Irish parents are by English law obliged to send their children to school, and from 9:30 to 3 o'clock the children are obliged to remain in school.
>
> No provision is made for feeding the children thus taken into custody. [50]

And she went on to cite the needs of growing children as recommended by medical specialists, and warned Irish MPs that 'Revolutions have been made for less valid causes'. The 1906 Act permitted local authorities to strike a halfpenny rate, and 4 pence a week per child sufficed in St Audoen's.[51] A year later an essay by Dr Stephen Walsh was no more successful.[23] The city fathers pleaded that they could not strike a rate without permission from Westminster until the Act was extended to Ireland; after gelded Home Rule was conferred in August, extension was finally achieved in September 1914. (p100)[49]

Lest it be said that this portrayal of pennypinching polititians is unduly biased, let the earlier words of Mr Birrell, when he was President of the Board of Education, speak for most if not all of his colleagues:

> … Charity was not to be sneezed at, but it required to be steady and well-organised, otherwise it was apt to be sporadic, fanciful, and fitful. He hoped, too, that local education authorities would fully consider whether they could not properly utilise voluntary agencies and organise and receive contributions from them in aid of the rate or any other relief they might think it necessary to establish. He did not suppose for a moment that any popularly-elected body, with ratepayers behind it, would be anxious to increase the burden of the rates, or that they would desire to discourage the assistance of charitable persons in the community. He thought it was not much use saying that this question was part of a far greater question – everything was part of a greater question. Everything was part and parcel of education. … [52]

and indeed of the prevention of tuberculosis. But Mr Birrell cannot be pilloried exclusively, for when the medical deputation led by Lady Aberdeen met the Lord Lieutenant on the 29th October 1907, the Presidents of the Royal Colleges in Ireland voiced the likely difficulty in persuading physicians and surgeons to notify cases. They hinted broadly to the Chief Secretary that he should 'avoid imposing penalties or creating a scare'[25].

The authors have no conflict of interest

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Letters

WHAT IS THE FUTURE OF MINOR SURGERY IN NORTHERN IRELAND

Editor,

The NHS here faces challenging times with significant disinvestment over the next few years. The arrival of commissioning will provide an opportunity to continue to provide the best service we can within financial constraints. Now, more than ever, we need to be looking at who provides what service and where.

Minor surgery has always been provided in primary care. Changes in the GP contract in 1990 and 2004 have seen an increase and diversification of procedures. Everything from skin tag excision to hernia surgery is offered at primary care centres throughout the UK.

Evidence for the quality of minor surgery in primary care seems to be heavily influenced by who has undertaken the study. Two major recent studies reached opposite conclusions. Prof Primrose, a surgeon found outcomes to be better in hospital and Professor Murchie, a GP found better care in primary care. NICE revised its skin cancer guidelines in 2010 after its initial recommendations, written nearly entirely in secondary care, were rejected by GPs who had been effectively excising low risk BCCs and SCCs for years.

Community surgical services are delivered by a wide-ranging group of clinicians. Some are members or fellows of the royal college of surgeons and others have limited surgical experience. Indeed the RCGP does not include minor surgery as a core competency for GPs. This heterogeneity of providers has lead to some concern both within general practice and from our hospital surgical colleagues.

Some GPs are also working in inadequate facilities for the procedures they are providing. It is likely that the Care Quality Commision will curtail some practitioners when GP surgeries face licensing in the next few years.

We need to look again at community based surgical procedures and standardise facilities and training. The family planning model is one I feel we could borrow from. Family planning can be delivered from specially equipped centres staffed by clinicians with a special interest. It is based in primary care but works closely with both GPs and hospital consultants. A relationship builds up overtime with primary and secondary care. There is appropriate clinical governance so Consultants and GPs alike are confident in the service.

A similar care pathway could be developed for community surgery. Discussions need to be had between stakeholders as to what procedures could be offered and by what providers. In the Grampian region of Scotland they have appointed a community based Consultant Surgeon to oversee this process.

In Northern Ireland there are no competency criteria for GPs providing minor surgery and no requirement for audit of procedures that are done. There are no established training pathways for GPs to provide surgical services. There is also no regulation of premises from which the service is provided. There is little support from hospital colleagues for our minor surgery activity.

Now is the time to tackle the issue of primary care surgery in Northern Ireland. In Great Britian there are national audits on primary care vasectomy, carpel tunnel and other surgical procedures being collated. We need to become more pro-active and look at our own services or risk getting left behind with outdated, expensive and potentially dangerous care pathways.

The author has no conflict of interest

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ARE WE PROVIDING THE MULTIMODALITY TREATMENTS ADVOCATED WITHIN CURRENT GUIDELINES WHEN MANAGING PATIENTS WITH LOWER BACK PAIN?

Editor,

Low back pain (LBP) is a common disorder, affecting around one-third of the UK adult population annually. Usually, this is a benign, self- limiting disorder not requiring professional advice or specific treatment.[1] Around 20% of people with LBP will consult their GP.[2] Annually LBP in the UK costs about £10,668 million.[3]

Table 1:

Percentage of individual modality uptake in patients

Modality	%
Physiotherapy	82
Chiropractor/ Osteopath	72
Acupuncture	12
Combined Physical & Psychological Therapy	0
NHS Documentation	18

The National Institute of Clinical Excellence (NICE) published guidelines in 2009 on the 'Early management of persistent non specific lower back pain' outlining the initial care of LBP using current and complementary treatment modalities.

Recommendations include a multidisciplinary approach employing manual therapy with spinal manipulation or massage, physiotherapy with a structured exercise programme, and acupuncture. Information literature is recommended to encourage patients' involvement in their care. They suggest referral to a combined physical and psychological treatment programme, which is not available in all regions.

We constructed a questionnaire for patients attending a single spinal surgeons outpatient department over a 2-month period, with a history of non-specific LBP of less than 12 months.

Age, gender and duration of symptoms were determined, together with all treatment options/information provided to patients. 50 consecutive patients were questioned. The mean duration of LBP was 8.7 months. Average age was 45 years. The percentage of patients attending each modality is shown in table 1. No patients received all the treatment modalities, and 4% had failed to receive any prior to consultation. 78% had received two modalities at time of referral.

The NICE guidelines provide evidence-based best practice for managing acute persistent LBP. They offer a strategy for primary care management prior to spinal outpatients referral. Surgery is considered only after other modalities have failed. Appropriate management of this complex patient group has the potential to minimize those with disabling long-term back pain, and reduce the personal, social and economic impact of LBP.[2]

NICE identifies various multidisciplinary treatments including promoting patient self-management through advice and information. They aim to reduce the impact on a patient's day-to-day life, even if the pain cannot be relieved completely.[2] Only 18% of patients had received written information or advice. NICE advise referral to a combined physical and psychological treatment programme but such a service is not provided by healthcare trusts within Northern Ireland.

Table 2.

Percentage of combined modalities offered to patients

Total number of modalities utilised	% of patients undertaking
5	0
4	2
3	16
2	52
1	26
0	4

NICE recommends acupuncture. Systematic reviews have found it a useful adjunct to conventional care.[4] In this cohort, only 12% received acupuncture. Availability of NHS acupuncture is limited in our region.

Referral to a surgeon may be for advice and reassurance, and the assumption that all patients being referred should have undertaken all modalities would be unfair. Referral pathways may reflect longstanding traditional routes, possibly explaining the large percentage receiving physiotherapy compared to complementary therapies.

Despite a full complement of treatments there will always be patients refractory to conservative management who may benefit from spinal outpatients referral. Further studies may determine whether greater awareness and adherence to such guidelines improves clinical outcome. At present the adherence to the guidelines is inconsistent. New guidance must be effectively disseminated among healthcare professionals to offer patients the best evidence based care and ultimately reduced the morbidity and economic impact of the condition. Treatment options proposed need to be available to the primary care physician, perhaps explaining why, within our region, such guidelines cannot be fully observed.

The author has no conflict of interest

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HOME TREATMENT: CHANGES TO MENTAL HEALTHCARE IN NORTHERN IRELAND

Editor,

During episodes of acute illness people with complex and enduring mental disorder will require intensive monitoring, support and treatment to help return them to stability.

With the progressive deinstitutionalisation of psychiatric services to the community, episodes of acute illness are being increasingly managed without hospital admission. The establishment of Home Treatment/Crisis Response (HTCR) mental health teams has allowed alternatives to be offered. In areas with HTCR team intervention there have been reduced rates of hospital admission[1,2], reduced lengths of in–patient stay[1] and higher levels of satisfaction among users and families reflected by reduced loss to follow-up[3].

In 2007 the Southern Trust established the first Home Treatment Service to exist outside of Belfast, only the second of its kind in Northern Ireland and the first to gate-keep all acute psychiatric admissions. It offers an alternative to in–patient care for patients who in the absence of the service would imminently require hospital admission. HTCR also facilitate early hospital discharge.

The patients will have a serious mental illness or complex psychological needs. They are vulnerable or disabled to the extent that they need intensive or extended hours of treatment and support. Treatment is delivered by a multidisciplinary team offering home-based care from 9am – 9pm, 7 days a week, 365 days a year. The same team also provides a Crisis Response service for people with a mental health crisis outside of working hours. The team triage referrals and gate-keep all potential hospital admissions, seeing patients within 2 hours when a clinical and risk assessment is completed.

If admitted to Home Treatment a comprehensive package of care is offered that on average lasts two to three weeks but can extend up to twelve weeks and may involve several visits per day. Patients and carers are actively involved, with support and education comprising a significant part of the treatment delivered.

Being within the home enables robust assessment of the patient's social supports allowing the team to address directly any effects these may be having. Cases are discussed at twice daily handovers, with review of the overall care plan occurring during the twice weekly, consultant led multidisciplinary clinical meeting. Discharge planning is paramount with discussion on relapse indicators, relapse plans and a joint home visit to handover to a patient's long term key worker.

The switch of the hospital admission gate-keeping role from sector consultants and GPs to the team has been a challenging transition. However, ongoing development of gate-keeping is vital to ensure the continued effectiveness of the team[4].

We are fortunate that Home Treatment offers an alternative to patients, carers and clinicians. While endorsing it in its own right it is clear that its ultimate usefulness is within the context of an integrated comprehensive mental health care system.

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PERFORATION INTO THE PERICARDIAL SAC OF AN INFANT: A RARE COMPLICATION OF CENTRAL VENOUS CATHETER INSERTION

Editor,

Cardiac tamponade following insertion of a central venous (CV) catheter is a rare but recognised complication associated with a high mortality rate, that was addressed recently in a circular from the Department of Health, Social Services and Public Safety in Northern Ireland (1). We report a case of CV line perforation into the pericardium that was diagnosed early by a simple contrast study.

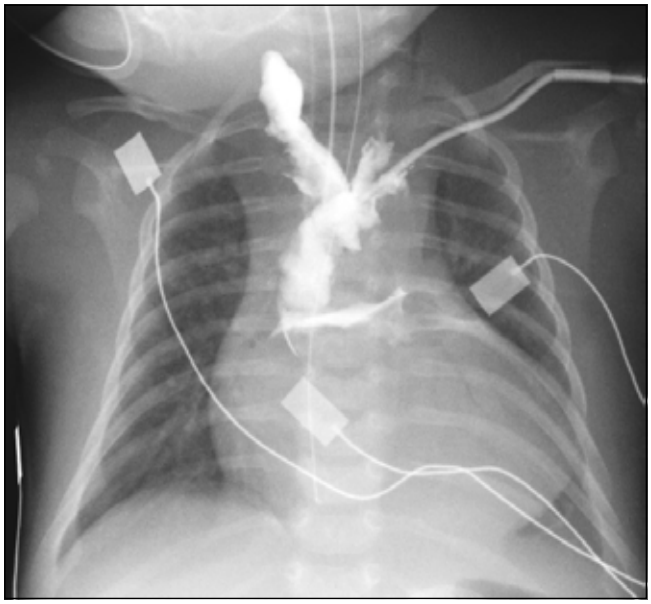

Fig 1. "Linogram" study. Water-soluble contrast has been injected into the left subclavian line. The contrast extravasates from the line tip outlining the central great vessels and the superior aspect of the pericardial sac.

A male neonate was born by elective Caesarean section following an antenatal diagnosis of exomphalos major. During a stormy in-patient course, a left-sided subclavian line (SCL) was inserted on day 33 of life. In the hours that followed, the patient's left arm and face were noted to be "puffy". The SCL was documented to be flushing easily but not bleeding back; its use was discontinued and a "linogram" contrast study requested [Fig. 1]. Contrast was seen outlining the central great vessels and the superior aspect of the pericardial sac. A follow-up chest radiograph showed layering of contrast within the pericardial sac, outlining the heart [Fig. 2]. An echocardiogram demonstrated a small pericardial effusion.

The infant gradually recovered from his surgeries over the next weeks and was discharged at 3 months.

DISCUSSION

Complication rates for CV catheter insertion vary between studies depending upon the puncture site. Earlier studies reported rates of up to 6% for infra-clavicular subclavian line insertion (2), with the rate of complication being less for those operators with greater experience (3,4).

In the described case, no problems at the time of line insertion were recorded in the patient's operative notes, and an immediate chest radiograph showed a catheter that appeared to be well placed. A subsequent contrast study showed the line tip to have perforated into the pericardial sac; a complication that is associated with a significant mortality

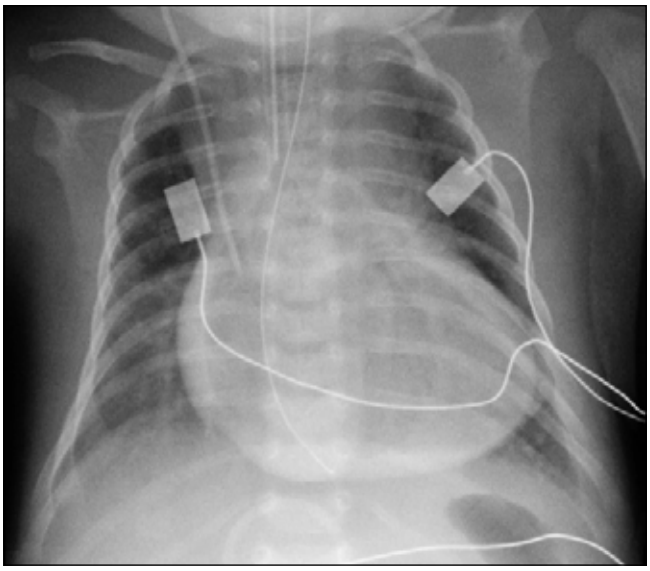

Fig 2. Follow up chest radiograph after removal of the left subclavian line and insertion of a new right-sided internal jugular vein catheter. Contrast is seen filling the pericardial sac, outlining the heart.

rate due to the risks of cardiac tamponade if the problem is not recognised and fluid infusions via the line continue (5). In 2009, a circular from the Department of Health in Northern Ireland highlighted the risks of CV line insertion. It followed a review after a patient died from cardiac tamponade due to a perforated right atrium, as a complication of CV line insertion. Whilst late perforation may be caused by the catheter tip eroding through the vein or chamber wall (2), early tamponade was thought more likely due to the dilator used to assist line placement. The Department counselled that dilators should not be inserted to the hilt over the guide wire, but should only be inserted far enough to open the vein puncture site. Moreover, cardiac tamponade should be considered if a patient clinically deteriorates soon after CV catheter placement. In the infant described, the line had been in situ for only a few hours before problems became apparent, and its use was immediately halted. This case highlights a rare and serious complication of CV line insertion that both radiologists and intensivists should be aware of.

The authors have no conflict of interest.

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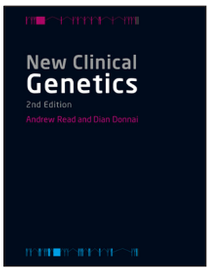
Book Reviews

NEW CLINICAL GENETICS – 2ND EDITION.



A Read, D Donnai. Scion publishing Ltd, Banbury, UK, 2011, pp442, £31.99. ISBN 978-1- 904842-80-4.

The second edition of this book within four years of the first edition, shows how fast moving the specialty of genetics is – the up to date changes from the recent first edition means that the book justifies its title. The primary readership here is for medical students, but the clinical information would be of interest to all branches of medicine, and those older physicians and surgeons who are a bit nervous of the language of genetics will find lots of very clinical based information in an easily digestible but authoritative format. It follows the UK and American curricula for undergraduate medical students and I would have liked this book as a student myself with the very clinical format had it been available in the 1980's but of course genetics textbooks then were much thinner on detail.

The case histories – 26 in total based on different diseases in theoretical families from A-Z, are excellent and easy to follow. New sections of the book include information on single nucleotide polymorphisms and exome sequencing, and the limitations of genome-wide association studies - all easy to understand for the student or aging physician.

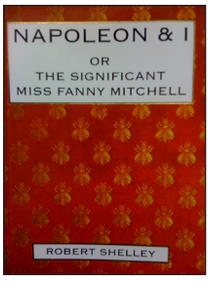
The only error I could find is in one of the case scenarios. All the fictional case histories appear correct – the irony is that the one real pedigree the authors included based on Queen Victoria and her haemophilia A is actually now incorrect in that in 2010 a mutation in factor IX was found to be the cause of haemophilia in Queen Victoria's descendants. I expect the next edition to be updated to haemophilia B and the authors could well extend the story into mentioning some of the recent publications on how using mitochondrial DNA from Prince Philip (a 3rd cousin of Queen Elizabeth – as well as her consort, just to give more genetics trivia) helped fit pieces of historical genetic jigsaw together into the Russian royal family DNA investigations, following exhumation of some of the Tsar's family – all fascinating reading and gripping stories that would interest all students.

For the next edition, the authors might consider a digital edition for the iPad, given that CD and DVDs are now passé and the digital download is the current vogue. This should be cheaper and a way to boost sales to students in the current recession.

They might also include some actual snippets on genome screens on public figures who have had their entire DNA analysed. They could do worse than start with Ozzy Osbourne – the Prince of darkness and beheader of bats. Publication of his DNA sequence confirmed that he carries some Neanderthal lineage, and also provides an explanation for why he has survived a lifetime of injecting or ingesting large quantities of narcotics and alcohols. Complete genome analysis found he had unusual variants in his ADH4 gene that metabolises alcohol, and other genes were identified to explain his addictive personality, tremor and dyslexia. What better way for students to learn how genetics works than studying some contemporary figures?

Patrick J Morrison

NAPOLEON AND I OR THE SIGNIFICANT MISS FANNY MITCHELL



Napoleon & I Or The Significant Miss Fanny Mitchell, Robert Shelley. Quiller Publishing Ltd 2011 RRP: £6.99, ISBN: 978-1-84689-114-4

Robert Shelley's intention was to create an informal and approachable book that would share the intriguing and fascinating details of Napoleons demise. This he has certainly succeeded in doing, creating a very enjoyable read for anyone interested in the history of medicine.

Shelley uses the journals of four doctors who treated Napoleon in his years on St Helena; B.E. O'Meara, J. Stokoe, F. Antommarchi and A. Arnott. These sources help build a wonderfully human story. Political details are interwoven with the more mundane aspects of restrictions on Napoleon's household and how these all impacted on his health. We are taken through the events that led from Napoleon being in good health, simply a rather tubby man, in Oct 1815, to his death as his vital organs failed in May 1821. The final chapter details his subsequent post mortem. Shelley's account engenders much sympathy for O'Meara and Stokoe who were caught by regulations, vexations and even spiteful tricks created by Sir Hudson Lowe, Governor of St Helena. For endeavouring to carry out their medical duties O'Meara and Stokoe were dismissed from Naval service with the later also being court-martialled. High stakes indeed.

Throughout we are given remarkable medical details of Napoleon's symptoms and his doctor's attempts to bring him comfort. Never keen to take medicines his doctors were often limited in their prescriptions to a variety of baths, warm or salt water, and enemas. We do however hear of such things as the massage he accepted with an ammonia and opium liniment for vague pains and many other concoctions that the doctors would have liked him to take. It adds up to a fascinating insight into the medical times of Napoleon.

Robert Shelley is the nom de plume of retired medical practitioner Robert Richardson. Whilst his medical training is an undoubted advantage in his interpretation of the writings of the various doctors his style is such that his work can be equally appreciated by a non- medical audience. I very much enjoyed this book and would fully recommend it.

Susan Kelly

Ulster Med J 2012;**81(1):**53-55

Abstracts

Autumn Meeting Ulster Society of Gastroenterology, 10th November 2011

Hilton Hotel, Templepatrick

President **Dr A Varghese**
Secretary **Dr P Lynch**
Treasurer **Dr G Caddy**

PROGRAMME

Approved for 3 external CPD credits (RCP)

13:30 Registration & Tea / Coffee
14:00 Welcome & Free papers
15.30 Coffee/ exhibition stand
3:50 Modern Management of Pancreatic Cancer
Mr Mark Taylor
Consultant Hepatopancreatobiliary Surgeon, Mater Hospital
4:20 Neuroendocrine tumours: advances in their medical, surgical and radiological management
Prof Per Hellman
Dept of Surgery, University Hospital, Uppsala, Sweden
17:00 Business meeting
18:00 Meeting close & USG Dinner

ORAL PRESENTATIONS

Prize Winning Presentation:

Transient hepatic elastography reliably excludes cirrhosis in an unselected liver disease population.

Carl I, Addley J, McDougall NI, Cash WJ

Royal Victoria Hospital, Belfast Trust

Introduction: Liver biopsy has long been the gold standard to evaluate fibrosis. Unfortunately, it is invasive and associated with complications. In addition the accuracy of the histology sample is subject to significant heterogeneity. Transient elastography (Fibroscan) is a simple, non-invasive method of assessing liver fibrosis. The role of Fibroscan in unselected liver disease has not yet been established.

Aims: To assess if Fibroscan is a suitable tool to exclude cirrhosis in an unselected population of liver disease patients.

Method: All patients who underwent liver biopsy and fibroscan between May 2008 and July 2011 were included. We compared Fibroscan, AST/platlet ratio(APRI), Ultrasound and Biopsy results.

Results: 266 patients underwent fibroscan, of which 154 also underwent concurrent liver biopsy. 89 (58%) patients had a normal Fibroscan. None of these patients had evidence of cirrhosis/severe fibrosis on liver biopsy (Ishak score ≥5). 4 patients had an Ishak score <5 but definite evidence of cirrhosis on imaging in addition to abnormal fibroscan and APRI scores.

	NPV	PPV	SENS	SPEC	ACCURACY
Fibroscan	100%	25%	100%	64%	68%
APRI	95%	18%	73%	58%	59%
Ultrasound	92%	19%	38%	82%	77%
Biopsy	97%	100%	80%	100%	97%

Conclusion: Fibroscan is an excellent non-invasive tool for excluding cirrhosis. Moreover, it has identified patients in this population who have convincing evidence of cirrhosis which was under-estimated by liver biopsy. This has the biggest clinical implication in diseases where a diagnosis has been made and the disease needs to be staged to ensure screening for Hepatocellular carcinoma is not required.

Ten year data on Needle Knife Fistulotomy in a University Teaching Hospital

Tharian B, Dickey W

Altnagelvin Hospital, Londonderry

Introduction: Supra papillary needle knife fistulotomy (NKF) is a very useful, yet controversial rescue technique in cases of difficult biliary cannulation. This allows access when cannulation via the orifice cannot be achieved. Concerns have been expressed about its safety.

Aims/Background: The aim of this retrospective study was to evaluate efficacy and safety of NKF by a gastroenterologist, with experience in this technique.

Method: This was a single centre study of data from a single operator who uses NKF. A needle knife is used to enter the intramural duct clear of the orifice. The cut is then extended if necessary with a standard sphincterotome. The study was retrospective, looking at data from January 2000 to May 2011, by searching the data available on the endoscopy soft ware 'ENDOSCRIBE', patient centre, medical notes and radiology reports.

Results: A total of 2639 ERCP were done in this period, with 82.75% (2184/2639) performed by the endoscopist who uses NKF. 200 (7.5% of all and 9.1% of the operator's procedures) involved NKF. The mean age was 67.5 years.

63.5% (127/200) were women, 64% (128/200) jaundiced and 70% (140/200) had a dilated common bile duct. CBD cannulation rate

was 58% (116/200) and 80.17% (93/116) had definitive treatment. NKF was successful, in 82.9% (39/47) with choledocholithiasis and 81.25% (26/32) of strictures, with dilated ducts. 0.5% (1/200) had bleeding, mild pancreatitis in 3.5% (7/200), necrotising pancreatitis in 1% (2/200) and perforation in 1% (2/200).

Conclusion: NKF is safe and effective in the hands of an experienced endoscopist.

A retrospective study of Entonox versus intravenous sedation for patients undergoing colonoscopy

Tharian B, Ridley T, Garrett D, Dickey W, Murdock A

Endoscopy Department, Altnagelvin Area Hospital

Background Patients usually undergo colonoscopy with conscious sedation using intravenous (IV) opiate plus benzodiazepine. Recently we have offered patients the option of Entonox.

Methods This was a retrospective study from June 2010 to June 2011. A total of 2870 colonoscopies were performed. The data was obtained from Endoscribe and comfort scores were obtained from the endoscopy register. Statistical analysis used chi-square with Yates' correction and $p< 0.05$ as significant.

Results 149 patients (5.2%) opted to have no sedation and 50 (4.5%) of 1119 patients who opted for Entonox subsequently required IV sedation and were excluded. Of the remaining, 1069 (40.0%) patients chose to have Entonox, and 1602 (60.0%) patients IV sedation. Of 1472 women included, 542 (36.8%) opted for Entonox and 930 (63.2%) for IV sedation, compared with 527 (44.0%) and 672 (56.0%) of 1199 men ($p<0.001$). Colonoscopy was complete to the caecum in 1013 (94.8%) of patients given Entonox and 1501 (93.7%) receiving IV sedation ($p=0.288$). Ileal intubation was achieved in 511 (47.8%) of the Entonox group vs. 957 (59.7%) of the sedated group ($p<0.001$). Polyps were seen in 264 (24.7%) of the Entonox group vs. 397 (24.8%) receiving IV sedation ($p= 0.997$). 974 (91.1%) patients given Entonox were given a high comfort score of 1 or 2 compared with 1436 (89.6%) patients receiving IV sedation ($p=0.233$).

Conclusion Entonox is a safe and effective method of sedation with comfort scores and completion rate to the caecum comparable to IV sedation. However, significantly fewer women choose Entonox for conscious sedation.

Is unsedated colonoscopy the way forward?

Addley J, Kalansooriya V, Johnston S, Mitchell RM, Mainie I

Department of Gastroenterology, Belfast City Hospital

Introduction Colonoscopy is a very common procedure with several diagnostic and therapeutic uses. Although widely available and successful unsedated colonoscopy remains underused.

Method A retrospective analysis was carried out to identify patients attending Belfast City Hospital having unsedated outpatient colonoscopy from September 1st 2009 to December 31st 2010. A proforma was completed with details relating to demographics, seniority of endoscopist, presence of a trainee, reason for referral, outcome of procedure, interventions required and any subsequent complications noted. 87 of the 244 patients during the period September 2010 to December 2010 were analyzed further with respect to comfort scores.

Results 244 patients had unsedated colonoscopies (68 female and 176 male) with a median age of 60.6 years. The completion rate was 96 % with an average completion time of 22 minutes. Of those assessed with respect to comfort (36%), the majority of comfort scores (78%) were at levels 1 and 2 (high levels of comfort).

Discussion An increasing number of unsedated colonoscopies are being performed successfully in our unit with high completion rates and satisfactory comfort scores.

Conclusion A heightened awareness of the availability of unsedated colonoscopy is required- it should be offered to all suitable patients who can make an informed decision based on appropriate pre-procedure counseling and education in the setting of a colonoscopist who has the appropriate expertise to carry out the procedure without sedation.

Laparoscopic colorectal surgery experience in a single centre

Jones C, Smyth SC, Dooher M, Lee J, Armstrong A

Department of Surgery, Belfast City Hospital, Belfast

Introduction Laparoscopic resection has significant benefits over open surgery for colorectal patients. This study aimed to compare outcomes for laparoscopic and open colorectal resection in a single centre.

Patients and Methods A retrospective review, of all patients who underwent open or laparoscopic colorectal surgery, for benign or malignant disease, from July 2006 to August 2009, was performed. Patient demographics, operation details, length of stay and histology were collected. Results were expressed as median (IQR). Continuous variables were compared using Mann Whitney U test and proportional analysis by Chi squared test. A p value of <0.05 was considered significant.

Results 199 (103 male) patients were included. 115 operations were performed laparoscopically (22 converted). Age was similar in the open group (65.4 vs. 65.1 years; $p=0.94$). Laparoscopic approach was more frequent in elective patients and open in emergencies ($p<0.0001$). By intention-to-treat analysis, the length of stay (LoS) was lower after laparoscopic surgery (7.0 days (5.0-10.8) vs. 10.0 days (7.0-20.5); $p<0.0001$). After conversion, LoS was 9.5 days (7.0-15.5), similar to open ($p=0.56$). In colorectal cancer patients, 70.4% underwent laparoscopic surgery. The T stage was similar ($p=0.77$) but there was a higher N stage ($p=0.01$) in open group. Number of nodes harvested respectively was similar (18.0 vs. 16.0; $p=0.52$) as was resection margin (15.0 vs. 15.0; $p=0.21$).

Conclusions This study demonstrates laparoscopic colorectal surgery is routinely performed in the elective setting with acceptable conversion rates, with an overall reduction in hospital stay. In colorectal cancer, laparoscopic surgery provides an adequate oncological resection.

Redefining resection margins in pancreatic surgery

Jones C, Badger SA, Verma M, Diamond T, Taylor MA, McKie LD, Loughrey M

1 Department of HPB Surgery, Mater Hospital, Belfast HSCT, 2 Department of Pathology, Royal Victoria Hospital, Belfast HSCT

Introduction A British Society of Gastroenterology survey of pathologists found a range of practice for reporting of Whipples

specimens, and therefore a greater need for conformity. As a result, R0 and R1 resection margins have been redefined. The aim of the study was to determine this effect on histological results.

Patients and methods The new protocol was introduced incrementally in 2007. The pathology reports of all patients who underwent Whipples resection between 2004 and 2006 (Group 1) were compared to those in 2008 to 2010 (Group 2). Results are expressed as median (IQR) and comparison between groups using Chi squared test.

Results 34 patients were in Group 1 and 53 in Group 2. They had similar age (59.0 vs. 64.0 years; p=0.08) with larger tumours in Group 2 (25.0 vs. 30.0mm; p=0.19). Most tumours were in the head of pancreas in both groups, with adenocarcinoma being the predominant type. R0 resection was achieved in 19 of 34 (55.9%) patients in Group 1, compared to 24 of 53 (45.3%) patients in Group 2 (p=0.46). This difference was most noticeable in head of pancreas tumours (57.1% vs. 29.6%; p=0.42). The distribution of T stages was similar between groups (p=0.41). Although the average number of resected lymph nodes remained steady (p=0.80), the proportion of involved nodes increased p=0.004).

Conclusion The new protocol has resulted in a higher rate of detection of disease in lymph nodes and resection margins. Further studies are however required to assess the implications on prognosis and overall survival.

A comparison of short-term outcomes following standard and extralevator abdominoperineal resections for low rectal cancer

Bell Z, Loughlin P, Gilliland R, McCallion K, McAllister I

Ulster Hospital, Dundonald

INTRODUCTION Extralevator abdominoperineal resection (APR) is currently suggested to be an oncologically superior surgical approach for low rectal cancer. This study compared early short-term results for this procedure with those obtained by a conventional operation.

METHODS Clinical and pathological data were collected retrospectively on 93 consecutive standard APRs performed by 5 colorectal surgeons between 2004 and 2011. These were compared with the first 23 extralevator excisions carried out by 2 of the surgeons who adopted the new technique during the study period.

RESULTS There was no statistical difference between the groups in terms of pre-operative staging, tumour site, neoadjuvant therapy and pathological staging. Patients were more likely to have involvement of the circumferential margin (CRM) if the tumour was pT3 (p=0.02), pT4 (p=0.001) or pN2 (p<0.001). Extralevator APR resulted in a reduction in CRM involvement (from 27.2 to 13%; p=0.19) and intra-operative perforation (from 15.2 to 0%; p=0.07) compared with standard surgery. However extralevator excision was associated with a significant increase in perineal wound complications (from 16.3 to 26%; p=0.045).

DISCUSSION This study supports current evidence that rates of IOP and CRM for low rectal cancer surgery can be improved by an extralevator approach. Indeed, although statistical significance was not achieved with the small sample size, CRM involvement was halved in this patient cohort.

Endoscopic Surveillance for Barrett's Oesophagus: a Population-Based Study of Surveillance Practice and Outcomes

Bhat S, Coleman HG, Murray LJ, McManus D, Gavin A, Johnston BT

Centre for Public Health, Queen's University Belfast, Northern Ireland. (SB/HC/AG/LM), Belfast Health & Social Care Trust, Belfast, Northern Ireland. (BJ/DM)

Background: Barrett's oesophagus (BO) is the precursor to oesophageal adenocarcinoma (OAC). Endoscopic surveillance of BO is recommended in order to detect early OAC. Few studies have examined surveillance practice and clinically relevant outcomes. Our aim was to describe endoscopic surveillance practice in a large cohort of BO patients.

Methods: A standardised review of hospital records was conducted on 3,167 BO patients from the Northern Ireland Barrett's oesophagus register. Data were collected relating to entry into surveillance, and any subsequent endoscopies. Follow up for malignancy or death was conducted through matching with records from the Northern Ireland Cancer registry.

Results: The majority of patients (1975 of 3167; 62.8%) were entered into surveillance at BO diagnosis. There were 117 patients that subsequently progressed to malignancy (cancer or high grade dysplasia). Patients entered into surveillance were more likely to be male (65.8% vs 56.9%; p<0.001) and younger (mean age 59.9 vs 67.3 years; p<0.001) than those not entered. Patients with the lowest co-morbidity scores were more likely to be entered into surveillance than those with higher co-morbidity scores (p<0.001). Entry into surveillance was associated with higher surgical resection rates for OAC, and improved all cause survival (adjusted relative risk of death 0.66 (95% CI 0.56-0.77).

Conclusions: This population based study of surveillance practice has shown that age, sex and comorbidity are significant factors associated with entry into surveillance. Although surveillance was associated with higher surgical resection rates and improved survival, selection bias is likely to account for a large proportion of these differences.

Ulster Med J 2012;**81(1):**56-58

Abstracts

Spring Meeting Ulster Society of Gastroenterology, 10th March 2011

Ramada Hotel, Belfast

President	**Dr A Varghese**
Secretary	**Dr P Lynch**
Treasurer	**Dr G Caddy**

PROGRAMME

Approved for 3 external CPD credits (RCP)

13:30	Registration & Tea / Coffee
14:00	Welcome
14:05	Free paper presentation
15.30	Coffee/ exhibition stand
15:50	Dysplasia **Dr Maurice Loughrey** Consultant Pathologist Royal Victoria Hospital
16:30	BSG Devolution **Dr Miles Allison** Consultant Gastroenterologist Royal Gwent Hospital Newport
17:10	Business meeting
18:00	Meeting close & USG Dinner

ORAL PRESENTATIONS

Prize Winning Presentation:

The proportion of oesophageal adenocarcinoma patients with prior Barrett's oesophagus: results from a large population based cohort

S Bhat[1], H Coleman[1], D McManus[2], A Gavin[3], L Murray[1], BT Johnston[4]

1. Centre for Public Health, Queens University Belfast, 2. Department of Pathology, Belfast Health and Social Care Trust, 3. Northern Ireland Cancer Registry, Queens University Belfast, 4. Department of Gastroenterology, Belfast Health and Social Care Trust, Belfast, United Kingdom

Introduction: Barrett's oesophagus (BO) is a premalignant condition that predisposes to oesophageal adenocarcinoma (OAC). Few population based studies have determined the proportion of OAC patients who had a prior diagnosis of BO. The aim of this study was to estimate the proportion of OAC patients with a prior BO diagnosis.

Methods: The Northern Ireland Barrett's register (NIBR) is a large population based register of all patients in Northern Ireland (NI) diagnosed with BO between 1993 and 2005. Data on all patients diagnosed with OAC between 2003 and 2005 were obtained from the N. Ireland Cancer registry database, together with mortality and surgical resection data. These data were matched to the NIBR to identify OAC patients with a prior BO diagnosis.

Results: 487 patients were diagnosed with OAC in NI between 2003 and 2005. A total of 34 patients had a prior diagnosis of BO (6.9%). OAC patients with prior BO were significantly more likely to have undergone surgical resection than those without (41.2% vs 20.8%; p=0.006). Adjusted survival analysis showed that OAC patients with prior BO had a reduced risk of death compared to those with no prior BO.

Conclusion: The proportion of OAC patients with a prior diagnosis of BO is small. Survival analysis suggesting a survival advantage for those with prior BO is likely to be influenced by both lead time and length time bias. Current strategies for the detection of BO in the population identify only a small proportion of those that eventually progress to adenocarcinoma.

Diagnosing colorectal carcinoma: "red flag" or "red herring"?

AS McCoubrey, C Warren, I McAllister, R Gilliland

Ulster Hospital, Dundonald, BT16 1RH

INTRODUCTION In 2000-2004 there were, on average, 938 new cases of colorectal cancer (CRC) diagnosed per annum in Northern Ireland, accounting for 13.9% of all cancers. The two week "red flag" referral system aims to detect 90% of patients with CRC for prompt treatment. The aim of this study is to examine the impact of the "red flag" referral system on identification of patients with CRC, time to treatment and stage of disease.

METHODS A random sample of 200 patients referred via the "red flag" system was identified from the local cancer patient tracker database. Data pertaining to demographics, time to hospital appointment, appropriateness of referral and diagnosis were collected. For patients identified with CRC, the stage of disease and time to first definitive treatment were also documented.

RESULTS Of the 200 patients, 56% were female. The age range was 27 - 93 years. Eighty three percent were seen within 14 days of referral. Referrals adhered to the guidelines in 45% of cases. There were 4 pancreatic cancers, 1 endometrial cancer, 1 ovarian cancer and 1 myelodysplasia diagnosed. Three patients were diagnosed with CRC (1.5%). Of these, 1 was palliative and the remaining 2 commenced definitive management within 6 days of decision to treat.

CONCLUSION The "red flag" referral system does not appear to be effective in identifying patients with CRC but did identify patients with other types of cancer. Less than half of the referrals adhered to

the guidelines. A review of this system should be undertaken.

Audit of Red Flag Endoscopy Referrals in Whiteabbey Hospital

C. Braniff, I. Carl, C Rodgers, P. Lynch, G. Jacob, S. Ali

Background The red flag referral system is designed to enable early cancer diagnosis. NICE and NICAN have published guidance on red flag symptoms which should be assessed urgently by a specialist within two weeks. Gastroenterologists use this guidance to decide which patients need urgent endoscopy.

Aim To audit the red flag endoscopy referral system, assessing timeliness, appropriateness and outcomes.

Methods A list of all patients referred for red flag endoscopy in the period 2009-2010 was compiled using the hospital coding system. 100 patients from this list were selected randomly.

An audit form was completed recording each patient's details, symptoms, dates of referral and procedures, along with endoscopic findings.

Results The patients included 61 women and 39 men. Each group had an average age of 63 years. 65 patients were referred as red flag or urgent by their GP, with 35 patients upgraded by consultant.

Average waiting times:

OGD	24 days
Colonoscopy	27 days
OGD & colonoscopy (double)	34 days
Flexible sigmoidoscopy	20 days

4% of patients were diagnosed with cancer.

Cancer yields per procedure were:

OGD	1.8%
Colonoscopy	5%
Sigmoidoscopy	0%

79.8% of procedures performed as red flag met with criteria.

Conclusions In this audit the cancer yield per procedure was low and waiting times too long. The majority of procedures performed as red flag met with NICE/NICAN criteria.

Assessment of Bone Mineral Density and its Management at a General Liver Clinic

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Background – Osteoporosis is a well recognised complication of liver disease and is associated with significant morbidity through fractures resulting in pain, deformity and immobility. Cirrhotic patients, those with jaundice due to chronic cholestasis and those with general liver disease and other risk factors are all at risk of bone thinning.

Aims - To assess bone health surveillance in patients with liver disease with or without osteoporotic risk factors.

Methods - Data has been collected retrospectively from the records of 10 consecutive cirrhosis, 10 cholestasis and 10 general liver disease patients respectively attending a hepatology outpatient clinic at a regional centre. Local bone mineral density (BMD) scanner records, lab and radiology databases were searched. Results were compared to the British Society of Gastroenterology guidelines.

Results – Overall 19 of the patients required bone surveillance but only 6 (31.6%) patients received BMD scanning. 2 (20%) patients were treated with calcium and vitamin D3 as required. No patients with T score > -2.5 had BMD scan repeated at 2 years. Of the 6 confirmed osteoporotic patients, 5 (83.3%) had testing of thyroid function, 6 (100%) bone profile, 1 (16.7%) oestriadol/FSH/LH, none testosterone/SHBG ratio and 1 underwent lumbar/thoracic x-ray. One hypogonadal osteoporotic patient was not prescribed hormone replacement. 2 (33%) eugonadal osteoporotic patients were treated with bisphosphonate, calcitriol or calcitonin.

Interpretation – There is an insufficient level of surveillance, investigation and treatment of bone health in liver disease patients highlighting the need for greater compliance with recent guidelines to provide optimal care.

Gastrointestinal Pathology After Streptococcus Bovis Bacteraemia - Long-Term Outcomes

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Departments of Colorectal Surgery [1] and Microbiology [2], Royal Victoria Hospital, Grosvenor Road, Belfast and School of Life and Health Sciences [3], University of Ulster, Northern Ireland.

Background: Streptococcus bovis, a non-enterococcal group D streptococcus, is associated with colorectal carcinoma (CRC) and hepatic dysfunction. This study assessed the implications of *S. bovis* bacteraemia on long-term gastrointestinal pathology.

Methods: A retrospective cohort study of patients with *S. bovis* bacteraemia between January 2000 and March 2009 was performed in the Belfast Trust. Clinical records were reviewed for data regarding demographics, medical co-morbidities, clinical presentation, investigations, and surgical interventions. Follow-up general practitioner questionnaires were also used to ascertain final clinical outcomes.

Results: 61 positive *S. bovis* blood cultures from 42 patients were included (M=25, mean age 67.1, range 44-88 years and F=18, mean age 67.6, range 0.5-90 years). 33 patients had one positive *S. bovis* blood culture; 10 had more than one positive blood culture. Five patients had a previous diagnosis of a colorectal lesion prior to their bacteraemia (CRC=4, adenoma=1). Thirteen of the remaining 38 patients underwent colonoscopy on their index admission where 3 CRCs and 7 adenomas were diagnosed. Of the remaining 25 patients, only 1 colorectal carcinoma was detected in a subsequent admission. Although colonoscopic investigation correlated with a diagnosis of CRC, Kaplan Meier survival analysis demonstrated no significant difference in patient outcomes for patients who did and did not undergo colonoscopy (log-rank, p=0.16).

Conclusion: Gastrointestinal pathology was detected in 76.9% (10/13) of all patients who underwent index admission colonoscopy. Index admission colonoscopy is recommended for all patient

admitted with *S. bovis* bacteraemia, although there may be no long-term survival benefit. Patients who have had a normal colonoscopy do not require further colonic investigation in the absence of symptoms.

Audit of Hepatitis testing: Every penny counts!

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Causeway Hospital, Coleraine

Introduction: Viral hepatitis screen is one of the important tests in the evaluation of abnormal Liver Function Tests (LFTs). It is common practice to perform a 'liver screen' which includes Hepatitis B and C serology in hospitalised patients with abnormal liver function tests.

Methods: We reviewed LFTs and Ultrasound Scans of patients who had hepatitis serology performed between January 2009 - January 2010 at Causeway Hospital laboratory, (catchment population ~ 100, 000). The initial LFTs (pre-hepatitis testing) were evaluated and a decision was made on appropriateness of testing based on pattern of LFTS (Obstructive, Hepatitic or Mixed) and imaging. The appropriateness of testing was evaluated based on biochemical and radiological imaging.

Results: In total, 116 patients were tested for Hepatitis B and C. 11 patients were tested twice during the same admission. No patients tested positive for hepatitis B. Two patients were found to have antibodies against Hep C, but were PCR negative. Reasons for inappropriate testing included: obstructive LFTs, (n=28), no baseline LFTs(n=6), normal LFTs (n=20), rapidly improving LFTs (n=4), dilated CBD (n=5) and liver metastasis(n=5).

Discussion: The laboratory cost for hepatitis serology testing is £16, excluding consumables, labour and transportation. Based on this study £1264 laboratory costs and considerable inconvenience and expense at ward level could have been saved. Approximately £1m could be saved nationally (excluding primary care testing) by appropriate requesting of hepatitis serology

Laparoscopic resection of Gastric gastro-intestinal stromal tumours (GIST) is safe and effective

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Department of Surgery Royal Victoria Hospital Belfast Trust

Introduction Gastric Gastrointestinal Stromal Tumours (GIST's) are uncommon mesenchymal tumours of intermediate aggression. Laparoscopic resection is an attractive option as local resection without lymphadenectomy is the treatment of choice. This study reviews the results of patients undergoing laparoscopic resection of gastric GIST's in our institution.

Method A retrospective review was undertaken of all patients undergoing laparoscopic GIST resection at our institution. Information was obtained from theatre records, pathology reports and case notes.

Results All patients were discussed at a multidisciplinary team [MDT] meeting to develop a treatment strategy. One patient underwent neo-adjuvant imatinib therapy to render a large oesophago-gastric junction GIST amenable to resection. Twelve laparoscopic GIST excisions were undertaken on 11 patients. Mean age was 60.2 years (38-79, median 66); ASA grade I (3), grade II (7), grade III (2). Mean operating time was 87 minutes (55-121, median 83). Post-operative stay was 3.2 days (2-6, median 3). No patients required conversion to open surgery. One patient required a laparotomy to treat a reactionary haemorrhage and another suffered a port site infection. There were no mortalities. Mean tumour diameter was 3.8cm (2.4-5) and 11 tumours were classed as low risk using the Fletcher criteria, 1 was intermediate. Pathological margins were clear in all cases. C-Kit staining was positive in all cases. At mean follow-up of 23.6 months (4.5-42.5, median 21.7), one patient had a further GIST discovered incidentally, which was excised laparoscopically without complication.

Conclusion Laparoscopic resection of gastric GISTs is safe and effective in a specialist unit.

Magnetic endoscopic imager reduces colonoscopic procedure time

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Introduction: Colonoscopy using a magnetic endoscope imaging (MEI) is commonly employed as part of endoscopic training. It provides a 3 dimensional, real time view of endoscopic position which assists in loop resolution. We assessed whether MEI improved colonoscopic performance.

Method: We reviewed 346 colonoscopies performed across two sites over a 7 month period. 152 in Antrim Hospital (ANT) and 194 in Whiteabbey Hospital (WHA). Colonoscopies had to be either performed or supervised by one of two consultants who performed endoscopy in both sites. The MEI was available in WHA but not ANT. We compared procedure time, terminal ileal (TI)/caecal intubation, sedation/analgesia, polyp detection and comfort score (1-5) across the two sites.

Results:

		ANT	WHA	p
Mean procedure time (mins)		30	25	0.02
Mean comfort scores		1.68	1.55	0.19
Intubation (%)	TI	80	82	0.58
	Caecal	93	95	0.41
Polyp/tumour detection (%)	Without trainee	22	34	0.05
	With trainee	34	40	0.05

Conclusion: The use of MEI reduces procedure time on average by 5 minutes. Although not statistically significant there did appear to be a trend that it also improved comfort scores. Not surprisingly the level of discomfort was highest in colonoscopies where the trainer had to take over from the trainee. Interestingly polyp detection appears to be higher when trainees are present.

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Abstracts

Spring & Autumn Meetings of The Ulster Society of Internal Medicine

Ulster Society of Internal Medicine Spring meeting: 13th May 2011

CAUSEWAY HOSPITAL, COLERAINE

Rare Cause of Lymphocytic Colitis.

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This case report demonstrates an unusual cause of lymphocytic colitis.

A 56 year old male presented to a gastroenterology outpatient clinic with diarrhoea. It was a relatively mild presentation with 2-3 semiformed motions per day. He had no systemic upset, no weight loss and was still able to work as a dentist. He also complained of frequent coughs and colds. Respiratory, cardiovascular, abdominal and neurological examinations revealed no abnormalities. Bloods revealed normal inflammatory markers and a normal albumin. His total white cell count was just below normal at 3.3 (neutrophils 2.09, lymphocytes 0.62, monocytes 0.48). Most significantly, he had reduced immunoglobulins (IgG 4.39, IgA 0.7, IgM 0.22). Colonoscopy appeared normal apart from some minor erythema in the rectosigmoid mucosa. Colonic biopsies revealed lymphocytic colitis. An OGD was normal and duodenal biopsies were normal.

The patient was referred to an immunologist. Further investigations, including measurement of immunological response to vaccination were carried out. Subsequently, a diagnosis of Common Variable Immunodeficiency (CVID) was reached.

CVID is the most common form of severe antibody deficiency affecting both adults and children. The hallmark immunological defect is impaired B cell differentiation with resultant defective synthesis of immunoglobulin. The diagnosis should be considered in patients presenting with recurrent infections who have low immunoglobulin levels.[1]

This case provides some good teaching points. It illustrates the insidious and nonspecific nature of CVID. It also demonstrated a rare cause of lymphocytic colitis.

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Assessment of Cardiac CT Ca scores by allied health professionals.

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The 2010 NICE guidance[1] for the assessment of chest pain suggested an important "gatekeeper" role for coronary artery calcification (CAC) assessment. In the NICE algorithm calcium scores (CS) determine which further cardiac imaging techniques are required in low risk patients. The aim of this study was to determine the feasibility of radiographer's CS assessment. 63 patients with chest pain had Agatston scores prospectively determined by two experienced cardiac radiographers. All CS examinations were performed on a Philips Brilliance 64 detector system, using a standard non-contrast enhanced prospective gated protocol (120kV, 3mm slice thickness). All images were anonymised and transferred to an off-line workstation for interpretation. A semi-automated algorithm identified areas of CAC. The radiographers' assessments were compared to the scores obtained by an experienced consultant cardiologist.

The mean Agatston score was 376 (range 1.4 – 3900). A high degree of reliability was found between Calcium measurements by three observers, the average measure ICC was 0.988 and the 95% confidence interval was from 0.982 to 0.992%. There was a non-significant trend to score variance with increased CS, for those with scores >1000 ($p = 0.45$). Further analysis revealed that image noise contributed to 98% of this absolute score variance. Interestingly no significant difference was found in the calcium score quartile allocated to subjects. Radiographer assessment of coronary calcium scores is feasible and accurate. If the NICE guidance is to be implemented it is likely that there could be an extended role for radiographers.

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The role of placental p38-MAPKa, ERK and JNK nitration and antioxidant supplementation in the pathogenesis of type 1 diabetic pre-eclampsia in a sub-cohort of the Diabetes and Pre-eclampsia Intervention Trial (DAPIT)

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Aim: To examine the role of placental p38-Mitogen-Activated Protein Kinase α (p38-MAPKa), Extra Cellular-Signal Regulated Kinase (ERK) and c-Jun NH2-Terminal Kinase (JNK) nitration in the pathogenesis of type 1 diabetic pre-eclampsia, and their putative modulation by vitamin C and E supplementation.

Methods: Placental samples were obtained from a sub-cohort of the DAPIT study[1]: a randomised placebo-controlled trial of antioxidant supplementation to reduce pre-eclampsia in type 1 diabetic pregnancy. DAPIT placentae: placebo-treated normotensive (n=17), pregnancy induced hypertension (n=7) and pre-eclamptic (n=6): vitamin-treated, normotensive (n=20), pregnancy induced hypertension (n=4) and pre-eclamptic (n=3) were analysed. Protein tyrosine nitration was assessed by means of immunohistochemistry in paraffin-embedded tissue. Catalytic activity of placental MAPK's was measured by enzyme-linked immunosorbent assay (ELISA).

Results: Nitrotyrosine immunostaining was present in placebo-supplemented normotensive, pregnancy induced hypertension and pre-eclamptic placentae, with no significant difference observed between the groups. Vitamin supplementation did not change nitrotyrosine formation in normotensive or pre-eclamptic placentae. There was a non-significant trend towards decreased p38-MAPKa activity in pre-eclamptic vs normotensive placentae, but this was not augmented by vitamin supplementation in either group. ERK and JNK did not significantly differ amongst the three outcome groups and vitamin supplementation did not significantly alter their activity.

Conclusion: Nitrotyrosine immunopositivity in normotensive diabetic placentae indicates some degree of tyrosine nitration in uncomplicated diabetic pregnancy, possibly due to inherent oxidative stress and peroxynitrite production. Our results suggest that p38-MAPKa, ERK and JNK nitration is not directly involved in the pathogenesis of type 1 diabetic pre-eclampsia and is not modulated by vitamin-supplementation.

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Ulster Society of Internal Medicine Autumn meeting: 21st October 2011

CAUSEWAY HOSPITAL, COLERAINE

On-site percutaneous coronary intervention (PCI) at Altnagelvin Area Hospital has led to a significant reduction in time to PCI in patients presenting with NSTEMI and meets the ESC 2010 guidelines.

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The European Society of Cardiology (ESC) published guidelines in 2010 on the management of patients presenting with non-ST elevation MI (NSTEMI). They recommend that coronary angiography and revascularisation should be performed during the same hospital stay and preferably within 72 hours of admission.[1]

A dedicated on-site PCI service was introduced in the Western Health and Social Care Trust at Altnagelvin Area Hospital in February 2010 with emergency cardiac surgery support provided by the Belfast Trust. Prior to 2010, patients diagnosed with NSTEMI requiring PCI were transferred to Belfast.

The aim of this pilot study was to investigate if introduction of an on-site PCI service (1) is safe (2) decreases time spent in hospital (3) reduces time to revascularisation as recommended by the ESC.

A retrospective study was made comparing length of hospital stay and time to revascularisation between a randomly selected cohort of patients (n=23) who presented with NSTEMI in 2009 prior to introduction off on-site PCI and patients (n=45) who presented post on-site PCI in 2010. The results are tabulated (Table 1). A significant reduction in time to PCI from 7.54 days (+/- 5.46) to 2.1 days (+/-1.4) p=0.009 was shown with a concomitant reduction in hospital stay from 5.71 (+/-1.98) to 4.29 (2.62) p=0.1. Survival to discharge and 90 days was 100%.

The establishment of on-site PCI is safe and has significantly increased the proportion of patients receiving coronary artery revascularisation within the target 72 hours recommended by the ESC.

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Table 1

	Pre on-site PCI	Post on-site PCI	p-value
Patients (n)	23	45	
Age (Years) +/- SD	61 +/- 11	62 +/- 13	
Male (n) (%)	15(65%)	40 (89%)	
LOS (Nights) +/- SD (Excluding inpatient CABG (n=2))	8.73 +/- 10.28 (5.71 +/- 1.98)	4.29 +/- 2.62	0.0526 0.1
Time to Catheterisation (Days) +/- SD	3.22 +/- 2.79	2.16 +/- 1.20	0.0934
PCI performed (n) (%)	11 (48%)	28 (62%)	
Referred for CABG (n) (%)	3 (13%)	2 (4%)	
Referred for Medical Management (n) (%)	9 (40%)	15 (33%)	
Days to PCI +/- SD	7.54 +/- 5.46	2.1 +/- 1.4	0.0090
DES (n) (%)	7/11(64%)	19/28 (68%)	
Radial Access (n) (%)	7/11 (64%)	15/45 (33%)	
Alive to Discharge (n) (%)	22 (96%)	45 (100%)	
Alive at 90 Days (n) (%)	22 (96%)	45 (100%)	

Is it safe to send very low risk patients away? An assessment of NICE chest pain guidance.

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Recent National Institute of Clinical Excellence (NICE) guidance on the management of chest pain recommends risk stratification for coronary artery disease (CAD) prior to diagnostic testing. If risk is calculated at <10%, causes other than angina should be sought. The aim of this study was to assess whether this strategy is safe and accurate in clinical use. Secondly, to assess potential reduction in workload from EST referrals to rapid access chest pain clinics (RACPC).

The study prospectively assessed 132 consecutive patients referred to our RACPC in summer 2011. Subjects whose clinical data were incomplete were excluded. 101 patients were eligible. Risk stratification as per NICE guidelines was undertaken. Sometimes cholesterol level was not available but otherwise, the strictest interpretation of the strategy was employed.

Mean age of patients was 51±13 years. 46% were female. Mean risk score was 40%. All 23 patients (23%) who had a CAD risk <10% had negative ESTs. In contrast, of the 78 patients who had a risk ≥10%, 23 had either positive or inconclusive results.

The specificity of NICE's risk stratification is 1.00 (95% CI: 0.82-1.00) in this sample. Estimated annual cost-saving from sending very low risk patients away is £54,069 (£66 per EST) at this hospital.

Therefore, NICE guidelines seem to provide a safe means of risk-stratifying patients. General practitioners (GPs) should be asked to calculate CAD risk and refer only those patients with risk ≥10%. Introduction of an electronic referral form province-wide will facilitate this.

An audit of Acute Kidney Injury (AKI) following contrast coronary angiography.

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3720 coronary angiograms were performed in Northern Ireland in 2010. Coronary angiography and Primary Coronary Intervention (PCI) depend on the use iodinated contrast. Patients undergoing such intervention are at risk of contrast induced nephrotoxicity (CIN). CIN induced Acute Kidney Injury (AKI), defined as a creatinine rise >25% from baseline, begins within 24 hours of contrast administration. The strongest risk factor for CIN is the presence of pre-existent chronic kidney disease (CKD), the UK incidence of which is 5-8%. Other risk factors include increasing age, diabetes, hypertension and peripheral vascular disease[1]. CIN is associated with increased morbidity, mortality and duration of hospital stay. The rising incidence of atherosclerotic disease and requirement for angiography/PCI positions CIN as a major healthcare problem.

Patients undergoing coronary angiogram at CAH between 01/08/2010-01/02/2011 were selected. Renal function was recorded prior to angiogram. Patients identified with significant CKD (eGFR <60mls/min) had a follow up eGFR 48 hours post contrast to assess for AKI. 634 angiograms were performed. 77 patients (12.1%) had an eGFR<60mls/min. 9 patients (11.6%) developed AKI. Mean age was 77.1 years (range 69-85 years). Affected patients demographics and risk factors were recorded (figure 1).

Figure 1	No of patients eGFR<60 (%)
Developed AKI	9 (11.6)
CRF Stage 3	8 (88.8)
CRF Stage 4	1 (11.1)

Hypertension	6 (66.6)
Diabetes	1 (11.1)
Mean contrast dose (range)	132mls (100-190mls)
ACE –I / ARB	7 (77.7)
Diuretic	4 (44.4)
MACE at 6 months	2 Deceased (22.2)

CIN is common post angiography, exceeding 10% in CKD patients. The clinical consequences can be severe and there is no specific treatment once established. Unfortunately serum creatinine is a delayed marker of GFR decline[2], novel biomarkers to detect early CIN are urgently required. Such markers will be the focus of further study.

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Placental antioxidant enzyme analysis (glutathione peroxidase, glutathione reductase, superoxide dismutase and catalase) and antioxidant supplementation in the pathogenesis of Type 1 diabetic pre-eclampsia in a sub-cohort from the Diabetes and Pre-eclampsia Intervention Trial [DAPIT]

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Aim: To examine the role of placental antioxidant enzyme activities [glutathione peroxidase (GPX), glutathione reductase (GRED), superoxide dismutase (SOD) and catalase] in the pathogenesis of Type 1 diabetic pre-eclampsia, and their putative modulation by antioxidant supplementation.

Methods: Stored placental samples (central and peripheral tissue) were obtained from a sub-cohort of the DAPIT study: a randomised placebo-controlled trial of antioxidant supplementation to reduce pre-eclampsia in type 1 diabetic pregnancy. DAPIT placentae: placebo-treated normotensive (n=17), pregnancy induced hypertension (n=7) and pre-eclamptic (n=6): vitamin-treated, normotensive (n=20), pregnancy induced hypertension (n=4) and pre-eclamptic (n=3) were analysed. GPX, GRED and SOD activities were assessed by kinetic analysis using commercially available kits by clinical analyser ILAB 600. Catalase activity was measured by enzyme-linked immunosorbent assay (ELISA).

Results: There was no statistical differences in any of the antioxidant enzyme activities according to DAPIT outcomes in either central or peripheral placentae in placebo-supplemented subjects Vitamin-supplemented placental GPX was significantly lower in normotensive placentae (p=0.031) and significantly higher in peripheral pre-eclamptic placentae in comparison to placebo (p=0.022). Significantly lower levels of placental peripheral catalase was observed in vitamin-supplemented PIH placentae in comparison to placebo.

Conclusions: Our results, suggest that GPX, GRED, SOD and catalase are not directly involved in the pathogenesis of type 1 diabetic pre-eclampsia, however although antioxidant-supplementation did modulate some levels of antioxidant enzymes (GPX, catalase) overt evidence to discriminate antioxidant enzyme activity between any of the DAPIT outcome groups was not found.

Detection of Acute Coronary Occlusion in patients with Acute Coronary Syndromes presenting with Isolated ST-segment Depression.

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Aim: We hypothesized that 80-lead body surface potential mapping (BSPM) would improve detection of acute myocardial infarction (AMI) and occluded culprit artery in patients presenting with ST-segment depression (STD) only on 12-lead ECG.

Methods and Results: Consecutive patients presenting pre- and in-hospital between 2000-6 with acute ischaemic-type chest pain and an initial 12-lead ECG with STD only of ≥0.05mV in ≥2 contiguous leads were analyzed. Patients with ST-segment elevation (STE) or 12-lead ECG confounders were excluded. AMI was defined as cardiac troponin T (cTnT) ≥0.03μg/L. Flow in the culprit artery at angiography was graded using the TIMI flow grade (TFG) criteria.

Enrolled were 410 patients: of these, 240 (59%) had an occluded culprit artery (TFG 0/1) with AMI, 80 (19%) had a patent culprit artery (TFG 2/3) with AMI, 67 (16%) had TFG 2/3 with cTnT<0.03μg/L and 23 (6%) had TFG 0/1 with cTnT<0.03μg/L. BSPM STE occurred in 267 (65%) patients. For the diagnosis of TFG 0/1 in the culprit artery and AMI, BSPM STE had sensitivity 91% and specificity 72% with STE occurring most commonly in the posterior territory (60%). Patients with TFG 0/1 and AMI were significantly more likely to suffer death or nonfatal MI at 30-days than those with TFG 2/3 and cTnT<0.03μg/L (Adjusted Hazard Ratio 4.12, 95% CI 1.67 to 8.56, p = 0.003).

Conclusion: Among ACS patients presenting with only STD, BSPM identifies STE beyond the territory of the 12-lead ECG with sensitivity 91% and specificity 72% for diagnosis of occluded culprit artery with AMI.

Association of low serum concentrations of sex hormone binding globulin and insulin resistance is stronger in females and independent of body mass index.

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Introduction: Low circulating levels of sex hormone binding globulin (SHBG) have been shown to be a strong predictor of the risk of developing type 2 diabetes. Genetic studies suggest that this may be a primary causal abnormality and the mechanism might relate to effects on insulin resistance.

Methods: Insulin resistance was assessed using a two-step euglycaemic hyperinsulinaemic clamp in 92 (59 male and 33 female) overweight individuals (BMI = 27-35 kg/m^2) at elevated risk of cardiovascular disease (>20% ten-year risk as assessed by the Joint British Societies 2 guidelines). SHBG concentrations were measured using a solidphase, two-site chemiluminescent immunometric technique. Statistical analysis was performed using Pearson's correlation coefficients and linear regression.

Results: For the total group, a statistically significant positive correlation was apparent between SHBG and glucose infusion rate (GIR) ($r=0.421$, $p<0.001$). When analysed by gender, this correlation was stronger in females ($r=0.631$, $p<0.001$), than in males ($r=0.248$, $p=0.059$). Using a linear regression model, including potential anthropometric confounders (body mass index, waist circumference, waist:hip ratio) a doubling of SHBG was associated with a 21% (95%CI: 11%-32%) increase in GIR ($p<0.001$) in the total group; a 15% (95% CI: 1%-32%) increase ($p=0.04$) in males and a 27% (95%CI: 14%-42%) increase in GIR ($p<0.001$) in females.

Conclusions: Low serum SHBG concentration is associated with insulin resistance. This relationship is stronger in females and is unaffected by body mass index.

The case for routine HIV testing in internal medicine

EJ McCarty, Quah SP, Emerson C, Dinsmore WW

In the past there have been many misconceptions about offering HIV testing. Routine testing has been successfully established in many areas of medicine including antenatal screening. We wish to demonstrate the advantages of routine HIV testing using 5 examples in the last year.

1. 56 year old male with severe worsening pneumonia was diagnosed with HIV following a needle-stick injury to member of staff. Recovered following appropriate medical treatment in ICU.
2. 28 year old male was under investigation for respiratory sarcoid and receiving high dose steroids. He was admitted with acute respiratory failure and died in ICU shortly after HIV testing.
3. 21 year old male with sudden onset right sided weakness was treated with methylprednisolone for demyelination. He was subsequently diagnosed with HIV and progressive multifocal leukoencephalopathy.
4. 50 year old female was investigated for 6 stone weight loss with no cause identified. She was admitted with pneumonia and after prolonged hospital admission tested positive for HIV.
5. 23 year old female was under investigation for thrombocytopenia for several years. She was eventually admitted with pneumonia and subsequently diagnosed with HIV.

These cases highlight the problems of attempting to select "at-risk" individuals. The case in favour of routine testing in an era of highly effective treatment is now unanswerable. The consequences of delayed diagnosis are often fatal.

Kernohan's notch phenomenon.

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Kernohan's notch phenomenon is a rare presentation in patients with a supratentorial mass lesion and herniation. This occurs in approximately five percent of subdural haematomas[1].

We report on a forty-four year old woman who presented unresponsive with left sided hemiparesis and left pupil mydriasis.

An immediate computed tomography (CT) scan of her brain confirmed a five centimetre left frontal subdural haematoma with significant mass effect and midline shift. Her condition deteriorated with a reduction in Glasgow Coma Scale (GCS) and vomiting. She was accepted by neurosurgery and had a craniotomy with evacuation of the haematoma the next day.

A post-operative magnetic resonance imaging (MRI) brain showed abnormal signal intensity in the right cerebral peduncle. This was caused by lateral pressure from the left hemisphere compressing the contralateral cerebral peduncle against the tentorium causing it to notch[2]. This is known as Kernohan's notch. This compression stretches motor tracts and veins leading to the ipsilateral signs, known as Kernohan's notch phenomenon.

This diagnosis should be considered when patients present with motor deficit ipsilateral to a supratentorial mass lesion. Diagnosis is confirmed by MRI which may show a deformity or abnormal signal intensity in the contralateral cerebral peduncle.

Our patient's swallow improved and she regained some motor function. She continued her rehabilitation in the regional acute brain injury unit.

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Swallow assessment in stroke patients.

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Dysphagia is common after stroke and associated with poorer outcomes. Following national institute for health and clinical excellence (NICE) guidance[1] all stroke patients should have their swallow assessed on admission. Those with problems need specialist assessment within seventy-two hours but

preferably within twenty-four hours of admission.

This audit was a random selection of thirty-two patients from Craigavon and Lurgan stroke units. Criteria were selected from the national sentinel stroke audit[2]. We also recorded Glasgow Coma Scale (GCS), the admitting doctors plan regarding swallow and when referral to speech and language therapy (SALT) was made.

Twenty patients had a GCS of fourteen or more on admission. Of these only three were documented as having a safe swallow by the admitting doctor. Eleven had no comment made on their swallow and the remaining six were made nil by mouth (NBM).

Only one patient had their swallow assessed within four hours, twelve within twenty-four hours and fifteen within seventy-two hours. Five patients did not have their swallow assessed within seventy-two hours having been admitted before a weekend or bank holiday. Of the twenty-one patients who were referred to SALT only seven had been referred within twenty-four hours.

We conclude that doctors need to assess swallow using the water swallow test. Drowsy patients should be NBM and referred to SALT immediately. All stroke nurses should be trained in swallow assessment. Patients not receiving nutrition need a definitive plan before a weekend or bank holiday. All patients should receive nutrition within twenty-four hours.

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PFO with stroke – Aspirin vs warfarin vs closure the best management?

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Case1 - 73 year old male was admitted with left arm and left leg weakness. He had a past medical history of Hypertension, atrial fibrillation, previous Ischaemic stroke with full neurologic recovery and hypercholestolemia. His current list of medication included warfarin with target INR of two to three, ezemtibe 10 mg od, lisinopril 10 mg od, amlodipine 5 mg od, atorvostatin 20 mg od.On examination he had left pronator drift and rest of the neurologic examination and other systemic examination did not reveal any abnormalities. Investigations findings were CT brain (Image 1,2) with right frontal infarct and echocardiogram showing PFO with ASA(Image 3, 4).Case2 - 38 year old male was admitted with history of transient slurred speech resolving in twelve hours. He had no significant past medical history and not on any regular medications. No significant family history .His Investigations findings were CT head no abnormality, MRI had showed left temporal parietal small infract, echo showed PFO and no ASA . Management - Case 1 : PFO with ASA – PFO closure[1,2] Case 2 : PFO without ASA – warfarin[1,2]

Current evidence, based on PFO in Cryptogenic stroke study(PICSS)[1] and French PFO – ASA study[2] suggest that PFO without ASA treatment options suggest no clinical difference with aspirin and warfarin . PFO with ASA warfarin especially when stroke is a suitable treatment options .The device closure has no superior effect than warfarin but advantage over warfarin is significant bleeding risk reduction.

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ABBREVIATIONS:

PFO – Patent foramen ovale; ASA – Atrial septal aneurysm.

Warfarin to treat Hemorrhagic stroke

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A 65 year old lady was admitted with history right temporal headache, generalized tonic clonic seizures. Her medical history includes hypertension, migraine, chronic kidney disease .Medications - Lisinopril 10 mg, Ibuprofen PRN.

On neurological examination the Glasgow coma scale was 15/15, cranial nerve examination including fundus was normal, motor system examination showed increased tone in the right upper and lower limb with pronator drift, power of 4/5 in MRC scale and upgoing plantars.

Investigations revealed normal blood count, liver function, inflammatory markers and coagulation. CT scan (Image 1) revealed hemorrhage and infarct to both sides cerebral hemisphere and reverse delta sign on contrast CT (image 2) . MRI /MR Venogram which showed filling defect in superior saggittal sinus and hypoplastic right transverse sinus (image 5, 6).

Management of patient involved lifelong anticoagulation warfarin with target INR of two to three .She showed elevated IgM kappa paraproteinemia and negative urine for Bence Jones protein.. The final diagnosis is MGUS causing superior saggittal sinus thrombosis[1,2].

Mortality in untreated casesis13.8-48%, in treated cases 82% recovered completely . CT brain scan show infarctions often associated with haemorrhage bilaterally. The presence of both the delta(non contrast CT) and reverse delta(contrast CT) signs increases the likelihood of the diagnosis. MRI/ MRV is the best method of diagnosing cerebral venous thrombosis. MGUS of IgM serotypes are associated with risk of venous thromboembolism. We could not find any previous case reports of saggittal sinus thrombosis due to MGUS[1,2].

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So you want to be a **Paediatrician**

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Maybe you've always known child health was the career for you. Personally it was the first time that everything really made sense!

WHY SHOULD YOU CONSIDER CHILD HEALTH AS A CAREER?

No two days are ever the same as a trainee when you will assess and treat acutely ill children on the 'take in'. Paediatrics offers a chance to see how different branches of medicine can integrate both on a scientific and practical level. The inability of the young child to fully communicate their problem is seen as very challenging however working in partnership with a family and utilising your diagnostic acumen can be rewarding. Unlike adults children do not submit willingly to tests so as a doctor you need to choose carefully and wisely. One of the best aspects of children's medicine is the team approach to both diagnosis and long term care of the child and family.

Paediatrics is a challenging speciality in terms of the very genuine difficulty of dealing with a young child with a life limiting condition or a terrified parent of an acutely unwell infant. Those attracted to paediatrics require excellent communication skills. An ability to think outside the box and an interest in research is a must as many conditions are not yet fully understood and treatment is often evolving and changing. In practical terms working shifts in high pressure environments such as neonatal intensive care and children's emergency requires the ability to multi task, manage practical procedures and keep a cool head !

THE PATHWAY

As a student there are opportunities to learn about child health during formal placements or electives. Exposure to some other specialities such as genetics, neurology and immunology may also lead to an interest in how diseases manifest in childhood. Research projects as a student are another useful way to develop a more in depth understanding of a particular branch of paediatrics. Most universities including QUB have research opportunities for students.

During the Foundation years some Schools have placements in paediatrics. Foundation doctors can play an active role in the team. It is recommended that a number of cases are studied in detail in order to broaden the trainee's understanding of the holistic approach required and the long term impact of many conditions.

The entry point for speciality training is currently a national system. The Royal College of Paediatrics and Child Health website is a useful source of up to date information on the application process and training requirements.

http://www.rcpch.ac.uk/training-examinations-professional-development/recruitment-paediatrics/recruitment-paediatrics

During speciality training doctors will have the opportunity to work in subspeciality areas. This will be combined with core general paediatrics including emergencies. Community child health interfaces with primary and tertiary care at many levels. Trainees will engage in child development assessment and the safeguarding work that many community paediatricians are involved in. Community work allows trainees to develop an understanding of the effect of neurodisability and mental health issues affecting children and their families and perhaps most importantly the structures that are in place to help.

In the first three years doctors are currently expected to work toward their RCPCH Membership Exam. The process is a rigorous combination of written and clinical skills based assessment.

SUBSPECIALTY TRAINING IN CHILD HEALTH

The RCPCH provides a guidance document on the current training programmes in Paediatrics. It is advisable to seek advice early in your career as to which training programmes are accessible locally. Competition can be intense and trainees should be realistic about the career path they choose. Flexible and part-time training is available in many deaneries and can be a helpful option for trainees with additional commitments.

Academic paediatrics has a support structure via the RCPCH. A range of academic fellowships in various branches of paediatric medicine are offered throughout the UK each year. These posts generally offer an associated degree programme, typically a PhD. There are local and national training advisors who can be approached for advice.

COMPLETION OF SPECIALIST TRAINING AND BEYOND…

There are a range of options for doctors who wish to be paediatricians. Many hospitals have specialty doctor posts. These may involve subspecialty expertise and are highly skilled. The majority of doctors who go through the Specialty Training programme will become consultants. Most posts have a fairly similar template with the majority of time spent in direct clinical care on ward rounds or in clinics. Some will have an academic appointment. At this stage there may be opportunities to participate in shaping children's services nationally through organisations such as the RCPCH.

SUMMARY

Being a paediatrician is a privilege. It is an immensely rewarding job which presents a myriad of opportunities to practice high quality cutting edge medicine in an atmosphere of teamwork and humour. I hope it's the job for you.

THE ULSTER MEDICAL JOURNAL

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