~ Established 1867 ~

IMJ

Official Journal of the Irish Medical Organisation

Irish Medical Journal

MARCH 2015 ■ Volume 108 ■ Number 3

IRISH MEDICAL ORGANISATION
Ceardchumann Dochtúirí na hÉireann

The Wake

People come and go all day.
Rosaries are said. Tea made. Chat
about the weather. Nothing special.
One last chance to sit with you,
with the absence of your presence.

There is a quiet hour
in the late morning.
I lie on his bed, head to toe
with you in your hospital bed.
Beneath the gold satin eiderdown
my right palm rests
on your still-warm shin.

I see you breathe.
The body is a creature of habit.
My eyes cannot stop seeing,
certain as my own breath,
your breath.

I force my eyes to notice the shine
on the quilted satin, the way
it does not move, the pattern
of bright gold and dull gold
over your chest, your breasts.
The way it does not alter.

I lie beside you for an hour.
Each time I think I see you
breathe, I force my eyes
to relinquish their illusion;
to see the still, cold truth;

until the umbilical cord
of my faith in your breath,
unquestioned since the hour
I formed in your womb,
is severed.

M Corish

Subscriptions 2015
6 Month Subscription:
Ireland, UK, EU €125
Outside EU €200

Address: IMJ Editorial Office
IMO House, 10 Fitzwilliam Place, Dublin 2
Tel: (01) 676 7273. **Fax:** (01) 661 2758
E-mail: lduffy@imj.ie **Web:** www.imj.ie

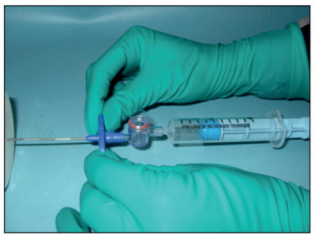
In this Month's IMJ

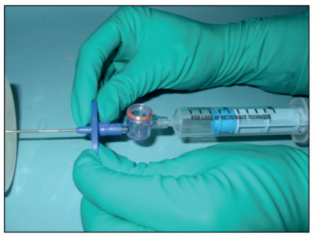
Diagnosis and treatment of sleep related breathing disorders in children: 2007 to 2011: Walsh et al highlight the issue of sleep related disorders in children. Obstructive sleep apnoea (OSA) occurs in 3% of children and is more common in conditions such trisomy 21, and cranio-facial disorders. A survey revealed that paediatricians have little training in OSA. The authors report that the demand for sleep studies has increased. It is pointed out that the use of overnight oximetry can reduce the need for polysomnography by 70%.

Table 1 Number of diagnostic tests performed and number of children on NIV in all centres in 2007 and 2011

Test	2007	2011	% increase
Polysomnography	190	259	136%
Oximetry	238	715	300%
TCO2	5	789	15780%
Total tests	433	1793	414%
WTE funded sleep posts	0	0	0%
Number on NIV	**2007**	**2011**	**% increase**
OLCHC Crumlin	9	86	955%
CUH Temple Street	8	29	262%
NCH Tallaght	10	28	180%
Cork	3	15	500%
Limerick	2	15	750%
Galway	0	10	
Total	31	185	627%
WTE funded NIV posts	0	0	0%

A randomised controlled trial using the epidrum for labour epidurals: Deighan et al have assessed the efficacy of the epidrum compared with the standard technique. There was a higher failure rate in the epidrum group. In 9 cases in the epidrum cohort, a second anaesthetist was required to site the epidural.





Medical specialty choice: does personality matter? Lyndon et al have examined personality type of doctors in relation to gender, level of training, and medical specialty. There doesn't appear to be a particular personality profile. The importance of conscientiousness is emphasised.

Table 1 Means and Standard Deviations For Each Trait Among The Whole Sample, Basic Medical Training Respondents, Post-internship Respondents, and British Norms Reported By Egan And Colleagues (2000).

	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
	M	SD	M	SD	M	SD	M	SD	M	SD
Whole sample	20.6	7.8	31.2	6.7	32.3	7.0	32.8	6.1	32.5	6.7
Basic Medical Training Respondents	21.1	8.1	31.1	6.6	32.4	6.6	33.1	5.8	31.4	6.7
Post-internship Respondents	19.9	7.5	31.3	6.9	32.2	7.7	32.6	6.4	33.8	6.5
British Norms[14]	19.5	8.6	27.1	5.9	26.5	6.5	29.7	5.9	32.1	6.6

Improving surgical site infection prevention practices through a multifaceted educational intervention: Owens et al describe a quality improvement programme to improve pre and post surgery antibiotic use. After the intervention, antibiotic prophylaxis increased from 54% to 68% and postoperative prescribing rose from 71% to 92%.

Table 1 Selected Breakdown of Patient and Procedure Characteristics

		Pre Intervention n = 50		Post Intervention n = 45	
		(n)	(%)	(n)	(%)
Gender Breakdown	Males	30	60	21	47
	Females	20	40	24	53
Mean Age in Years (Range):		44.2 (3 weeks - 84 years)		51.18 (7 - 88 years)	
Urgency Classification	Elective Procedures	23	46	17	38
	Emergency Procedures	27	54	28	62
Surgical Specialty	Breast	8	16	10	22
	Vascular	12	24	13	29
	Colorectal	4	8	2	4
	Other General	26	52	20	44
NAS Wound Classification	Clean	21	42	26	58
	Clean-contaminated	5	10	6	13
	Contaminated	24	48	13	29
Senior Operating Surgeon	Registrar	6	12	5	11
	Consultant	44	88	40	89
Closure Type	Suture Interrupted	8	16	5	11
	Suture Subcuticular	34	68	37	82
	Staples	7	14	2	4
	No Closure	1	2	1	2
Intra-operative Blood Loss	Minimal	21	42	16	36
	< 100 mls	8	16	1	2
	100 mls - 1500 mls	7	14	12	27
	> 1500 mls	1	2	0	0
	Not recorded	13	26	16	36

A less invasive approach to screening for early onset neonatal GBS: Glackin et al report on the more conservative approach to the management of asymptomatic infants with one risk factor for GBS. The new approach, as recommended by the RCOG and the CDC, has reduced the number of infants needing a septic evaluation/ antibiotics from 19% to 6.5%.

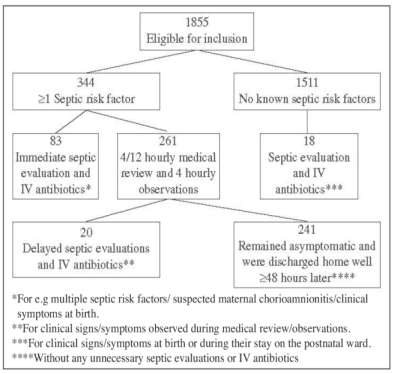


Figure 2 In the first 3 months following the introduction of the new protocol, there were 1855 term infants eligible for inclusion

An audit of prescribing practices for benzodiazepines and Z drugs: Cadogan and Ryder have audited the benzodiazepine prescribing practices. A total of 4,165 prescription records were examined. They found non-compliance with the benzodiazepine committee recommendations with just one fifth fulfilling all the assessment criteria. Over half had at least 2 discrepancies.

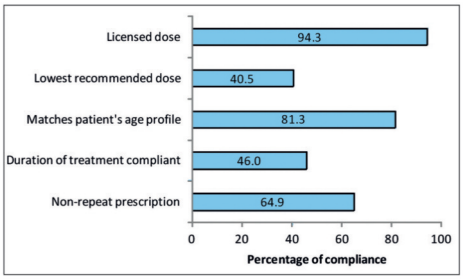


Figure 1 General analysis of prescription compliance (n=4165)

Prediction of hospital mortality by changes in the estimated glomerular filtration rate (eGFR): Berzan et al found that among 61964 patients, the change in eGFR during a clinical episode strongly predicted the outcome.

Table 2 Change in renal function and Odds Ratio for an in-hospital death by day 30

Group	Delta MDRD (ml/min)	*n*	Mortality (%)	OR (95% CI)	P <
0	Improved	32212	4.4		
1	0 to -4.9	14712	4.2	0.96 (0.87, 1.06)	0.40
2	-5 to -9.9	4738	6.6	1.54 (1.35, 1.74)	0.0001
3	-10 to -19.9	5094	9.4	2.74 (2.0, 2.52)	0.0001
4	-20 to -39.9	3088	15.7	4.06 (3.64, 4.54)	0.0001
5	-49 to -100	1120	24.5	7.08 (6.12, 8.19)	0.0001

Myocardial ischaemia following cocaine and adrenaline exposure in a child during an ophthalmological procedure: McGovern et al describe a child who developed cardiovascular complications following the topical administration of cocaine and adrenaline drops for an eye procedure. The child developed tachycardia and pulmonary oedema due to myocardial ischaemia.

Open access ultrasound referrals from general practice: Hughes et al address the issue of ultrasound access for GPs. The authors assessed 1,090 ultrasounds that were generated from general practice. There were 30.46% positive findings. The median waiting time was 56 days.

Table 1 The number of "positive" and "normal" studies by subtype according to body area

Body Region	Normal	Positive
Abdomen (N=276)	188 (68.12%)	88 (31.88%)
Pelvis (N=247)	189 (76.52%)	58 (23.48%)
Renal (N=131)	121 (92.37%)	10 (7.63%)
Transvaginal (N=112)	84 (75%)	28 (25%)
Testes (N=87)	37 (42.53%)	50 (57.47%)
Neck/ Thyroid (N=77)	38 (49.35%)	39 (50.65%)
Liver (N=51)	30 (58.82%)	21 (41.18%)
Soft Tissue / MSK (N=47)	23 (48.94%)	24 (51.06%)
Gallbladder (N=38)	27 (71.05%)	11 (28.95%)
Aorta (N=15)	13 (86.66%)	2 (13.34%)
Salivary Glands (N=6)	6 (100%)	0
Groin (N=3)	2 (66.67%)	1 (33.33%)
Totals (N=1090)	758 (69.54%)	332 (30.46%)

Community Acquired Pneumonia (CAP) in Children in the New Vaccination Era:

The introduction of H'Flu and Pneumococcal into the childhood immunisation programme has led to a significant reduction in the incidence of bacterial meningitis. The impact on childhood pneumonia is more difficult to quantify due to its multiple aetiology and its diagnostic challenges. Causation of pneumonia in children has to rely on indirect methods including blood cultures, and analysis of respiratory tract secretions.

Prospective studies are required in order to quantify the relative roles played by bacteria and viruses. Jain et al[1] have mounted an important, large, detailed causation analysis among 2354 children with radiological evidence of pneumonia. The chest x-rays showed consolidation (58%), infiltrate (51%), or an effusion (13%). The pathogen detection rate (expressed as number of cases per 10,000 children per year) was respiratory syncytial virus 4.6, human rhinovirus 4.1, human metapneumovirus 1.9, adenovirus 1.6, mycoplasma pneumoniae 1.4, influenza A or B 1.1, parainfluenzae virus 0.9, coronavirus 0.8, streptococcus pneumonia 0.5. The prominence of coronavirus was noted. It can act as a single pathogen or in combination with other organisms. The paper confirms that the vaccination programme has brought about a substantial reduction in cases of bacterial pneumonia. Viral causes of pneumonia have now increased in relative importance. The incidence of pneumonia was higher in younger children. Forty five per cent were under 2 years, 25% were 2-4 years, 18% were 5-9 years, and 12% were 10-17 years. Cough and fever were almost universal features while 75% had anorexia and 70% had dyspnea. Twenty one per cent needed PICU admission, 7% required ventilation, and 3 children (<1%) died. The Irish experience[2] is that the pneumococcal vaccine has greatly reduced invasive pneumococcal disease (IPD) in children. There has been a 91% decline in infection due to PCV7 serotype, 44% decline due to PCV 13-17. The benefits were concentrated in the under two's.

The World Health Organisation (WHO) states that tachypnea and retractions are the most accurate signs for the clinical diagnosis of pneumonia in children. It defines tachypnea as > 60 breaths/min in babies less than 2 months, >50 breaths/min in babies 2-12 months, >40 breaths/min in children 1-5 years, and >20 breaths/min in children over 5 years. Cough may not be an initial feature because the alveoli have few cough receptors[3]. Coughing becomes more prominent when the infection starts to irritate the cough receptors in the airways. Pointers towards a bacterial pneumonia include WBC >15x10^9/L and a CRP >30-60mgs/L. Blood cultures are positive in only 10% of children with pneumonia. Bacteria isolated from the nasopharynx are difficult to interpret because they may simply reflect the normal upper respiratory flora. Obtaining suitable sputum samples is difficult because young children under 5 years swallow sputum. A suitable sputum sample is one with <10 epithelial cells and >25 polymorphonuclear leucocytes.

Some children can present with atypical features particularly abdominal pain. Abdominal pain can be the presentation in children with basilar pneumonia and accounts for nearly 2% of cases. Grunting when present is a worrying sign, and is indicative of severe disease and impending respiratory failure.

Oxygen saturation should always be measured in children with respiratory distress. An oxygen saturation <96% is 3 times more likely in children with pneumonia. An oxygen saturation <92% is an indication of severity and the need to administer oxygen. The indications for transfer to intensive care are- failure to keep oxygen saturation >92% with an inspired oxygen concentration >60%, rising respiratory and pulse rate, apnoea or slow, irregular breathing, and shock.

Influenza A and B have emerged as important causes of pneumonia in children of all age groups particularly in those over 5 years. 'Flu vaccination is recommended for children with chronic disorders. The issue of flu vaccination for healthy children is a matter of debate. It is effective when there is a good match between the vaccine and the circulating influenza strains. When the match is good the protection can be over 70%, but when the match is poor the protection can be as low as 20%. A Cochrane review[4] concluded that vaccination is effective in preventing influenza in children over 2 years but there is lack of evidence about its efficacy in the under twos. Thus there is a paucity of data on influenza vaccination efficacy in children. Canadian data suggests universal 'flu vaccination reduced hospital admissions, ED attendances, and GP visits. The US recommends 'flu vaccination for all children over 6 months old.

The UK experience regarding CAP has been similar to the US. Thompson and Harris[5] point out that in the pre-pneumococcal vaccine era the incidence of CAP was 33/10,000 in children under 5 years. Pneumococcal vaccination was introduced in 2007 and by 2008 the admission rate for CAP had reduced by 20%. In clinical practice it is commonly assumed that chest x-rays showing alveolar infiltration indicate a bacterial cause, while diffuse interstitial infiltrates are suggestive of atypical bacterial or viral infections. The data would suggest that there is overlap and that it is difficult to assign infective causation from the chest x-ray in isolation. A persisting fever despite antibiotic administration should raise the suspicion of an empyema. When an effusion is present and the child has a persistent pyrexia, the child should be referred for drainage[6].

CAP remains a major cause of morbidity in children leading to large numbers of hospital admissions annually. The epidemiology is changing with an increased preponderance of viral causes.

JFA Murphy
Editor

1. Jain S, Williams DJ, Arnold SR, et al. Community Acquired pneumonia requiring hospitalization among US children N Engl J Med 2015;372:835-45.
2. Barson WJ. Community acquired pneumonia in children: clinical features and diagnosis. 2015 www.uptodate.com
3. Cotter S. Impact of pneumococcal vaccine in Ireland. www.hpsc.ie/hpsc/A-Z/vaccine preventable/pneumococcal disease.
4. Jefferson T, Rivetti A, et al. Vaccines for preventing influenza in healthy children 2012. Cochrane review.
5. Thomson A, Harris M. Community acquired pneumonia in children: what's new? Thorax 2011;66:927-8
6. Harris M, Clark J, Coote N, Fletcher P et al. British Thoracic Society guidelines for the management of community acquired pneumonia in children: update 2011. Thorax 2011;66:1-23

Vaginal Breech Delivery at Term: The Doctors' Dilemma

"When an operation is once performed, nobody can ever prove that it was unnecessary". The Craze for Operations from The Doctor's Dilemma: Preface on Doctors by George Bernard Shaw, 1909*.

Breech presentation complicates 3-4% of deliveries at term and it is associated with an increased risk of perinatal mortality and morbidity[1,2]. The increased fetal risks may be due to the hypoxia or trauma associated with a vaginal delivery, but this can be minimised if cases suitable for vaginal delivery are carefully selected and labour is supervised by experienced clinical staff[2,3]. The increased fetal risk may also be due to other causes, such as congenital malformations, which are independent of the mode of delivery. Before 2000, the elective caesarean section (CS) rate for breech presentation had been rising as obstetricians attempted to avoid the fetal risks associated with vaginal delivery.

The Term Breech Trial was an international randomised controlled trial from 121 hospitals in 26 countries which reported that a policy of planned vaginal delivery for selected breech presentations at term was associated with a higher rate of perinatal mortality and neonatal morbidity compared with a planned CS[4]. It found no differences in maternal mortality or morbidity between the two arms of the study. The publication of the Trial in the Lancet in 2000 led quickly to a series of professional guidelines advocating elective CS for breech presentation at term and to a further escalation of CS rates[5,6]. As a result, in many maternity units in developed countries only about one in ten babies presenting by the breech at term are now delivered vaginally. In some cases of vaginal breech delivery labour is so advanced there is not time to undertake a CS, although a CS had been planned.

The Term Breech Trial, however, was seriously flawed[1,7]. In particular, some of the adverse perinatal outcomes were in cases which should have been excluded from the study. Furthermore, the details published of the adverse fetal outcomes were limited and were not analysed by parity or previous CS. More detailed scrutiny shows that the risks of an adverse fetal outcome was remarkably low in multigravidas who were randomised to a planned vaginal delivery in a trial that included hospitals from both developed and developing countries[1]. Soon after new international guidelines were published, the long-term clinical outcomes of the Trial were reported which found no difference between the two arms of the trial in terms of morbidity or mortality "in contrast to our earlier report"[7,8]. A secondary analysis from the Trial showed that the risks were higher if the CS was performed late in labour, and highest if the baby was delivered vaginally[1]. The intrapartum factors that were associated with higher fetal risk included augmentation of labour and/or prostaglandins ($p<0.01$), the duration of the second stage of labour ($p<0.001$) and birth weight ($p=0.02$). In the planned vaginal birth group, 49.8% had labour augmented, which is surprisingly high. This all suggests that the fetal risks of breech presentation are more strongly associated with labour than with the mode of delivery.

The lack of discernment in rushing to alter clinical practice in response to the Term Breech Trial has had consequences that received little consideration in 2000. The increase in CS for breech presentation in the index pregnancy has meant that there has been an increase in repeat CS, particularly as the number of women in developed countries undergoing a trial of labour after one prior CS has also plummeted dramatically. The increase in CS rates in turn increases the number of catastrophic obstetric complications such as uterine rupture and peripartum hysterectomy[9,10]. Well-intended attempts to improve fetal outcomes with breech presentation may have come at a cost for the mother's long-term reproductive health, as well as increasing the financial costs of providing maternity care due mainly to the increased length of stay associated with CS[9].

Even if a CS is planned for all cases of breech presentation at term, some women deliver vaginally. In the Trial, only 90% of planned CS had a CS. A downside of the changes in obstetric practice has been the loss of clinical skills and experience among obstetricians in performing a vaginal breech delivery at term, which also compromises their ability to deliver a breech presentation either in the setting of a preterm labour or after vaginal delivery of the first twin. This loss of clinical skills will be exacerbated as obstetricians who trained before 2000 retire from labour ward duties. As a priority we now need to introduce simulation training for obstetricians in Ireland to teach vaginal breech delivery techniques, as has been necessary in other developed countries[7]. Fourteen years on, an editorial in The Lancet recognises the unintended serious consequences of the Trial, particularly in low-resource settings[10]. The authors believe that the increase in CS for breech presentation at term is dangerous, unnecessary and needs to be reversed[10]. They urge the global health community to consider the unintended, serious consequences of the policy changes following the 2000 publication in The Lancet, including the impact on already over-stretched maternity services.

The 'knee-jerk' response of the national organisations of obstetricians to the original study should also lead us to reconsider how we respond in general to the publication of clinical obstetric papers in high-impact general medical journals, and the influence they have had in changing the face of contemporary maternity care globally[5,6]. It highlights the risks of unquestioned international consensus, where individual errors of clinical judgement may be superseded by collective errors of judgement on a grand scale, potentially causing harm to large numbers of patients[1].

*George Bernard Shaw was born at home on 26 July 1856 by vaginal breech delivery conducted by the Master of the Coombe Lying-In Hospital, Dr John Ringland. Shaw subsequently won the Nobel Prize for Literature in 1925 and an Academy Award (Best Screenplay) for the film Pygmalion in 1939. He died in England at the age of 94 in 1950.

MJ Turner, PJ Maguire
Department of Obstetrics and Gynaecology, UCD Centre for Human Reproduction, Coombe Women and Infants University Hospital, Dublin 8
Email: michael.turner@ucd.ie

References

1. Turner MJ. The Term Breech Trial: Are the clinical guidelines justified by the evidence? J Obstet Gynaecol 2006; 26: 491-94.
2. Toivonen E, Palomäki O, Huhtala H, Uotila J. Selective vaginal breech delivery at term - still an option. Acta Scand Gynecol Obstet 2012; 91: 1177-83.
3. Alarab M, Regan C, O'Connell MP, Keane DP, O'Herlihy C, Foley ME. Singleton vaginal delivery at term: still a safe option. Obstet Gynecol 2004; 103: 407-12.
4. Hannah ME, Hannah WJ, Hewson SA, Hodnett ED, Saigal S, Willan AR for the Term Breech Trial Collaborative. Planned caesarean section versus planned vaginal birth for breech presentation at term: a randomised multicentre trial. Lancet 2000; 356: 1375-83.
5. American College of Obstetricians and Gynecologists (ACOG). Mode of term singleton breech delivery. Obstet Gynecol 2001; 98: 1189-90.
6. Royal College of Obstetricians and Gynaecologists (RCOG). The management of breech presentation. RCOG Green Top Guidelines: Guideline 20. London 2001.
7. Lawson GW. The term breech trial ten years on: primum non nocere? Birth 2012; 39: 3-9.
8. Whyte H, Hannah ME, Saigal S, Hannah WJ, Hewson S, Amankwah K et al. and the Term Breech Trial Collaborative Group: Outcomes of children at 2 years after planned cesarean birth versus planned vaginal birth for breech presentation at term: the international randomized Term Breech Trial. Am J Obstet Gynecol 2004; 191: 864-71.
9. Grivell RM, Dodd JM. Short- and long-term outcomes after cesarean section. Expert Rev Obstet Gynecol 2011; 6: 205-15.
10. Van Roosmalen J, Meguid T. The dilemma of vaginal breech delivery worldwide. Lancet 2014; 383: 1863-64.

Take Home Naloxone for Ireland

In 2011 more people died in Ireland from opiate overdose (211)[1] than in road accidents (186)[2]. Neither toll is acceptable and both figures conceal great sadness and loss. However, a key difference between them is that while road safety has rightly become a national and societal priority for action, virtually nothing is being done about deaths from opiate overdose.

Overdose prevention can be attempted in many ways including overdose education for users, their friends and families; sheltered drug using sites; better access to opiate substitution therapy or planned prison releases. 'Take home naloxone' is a further option and has reasonable evidence to suggest that it has value[3]. Naloxone is an effective opiate antagonist with an excellent safety profile; it works rapidly to reverse the respiratory depression which generally is the immediate cause of death – but it must therefore be given within minutes of the overdose. Naloxone is widely used by health and emergency services in Ireland to good effect[4] but is not currently available for use by lay people. Community based schemes to provide naloxone training and kits have been established throughout the US since the mid-90s and more recently in Wales, Scotland and elsewhere.

Naloxone is given by intravenous, intramuscular or subcutaneous routes by health care professionals; internationally, most community schemes have provided kits for intramuscular injection by drug users or other lay rescuers. The recent use of intranasal naloxone is increasingly recognised as an alternative to the parenteral route, with important advantages – it is needleless, simple to use and has been shown to reduce deaths at a population level[5]. Intranasal nalaoxone is given using the parenteral preparation administered through a nozzle-shaped Mucosal Atomiser Device. Legal (prescription-only medicine) and pharmaceutical (parenteral preparation used by intranasal route) concerns exist and have been addressed in 10 US states and several other countries to enable this medicine to be held and used by lay people[6]. A customised nasal spray is reportedly in development by at least one pharmaceutical company.

What's happening in Ireland to address the genuine crisis of almost two deaths from opiate overdose every three days? Very little, at least in official circles. A HSE working group reviewed opioid overdose issues in 2013; the report has been submitted but not published. The Department of Health says that it is examining the issue, consulting with stakeholders and was to publish its plans by the end of 2014[7]. In the meantime, it indicates that its regulations are not compatible with 'Take Home Naloxone' schemes, whether they involve parenteral or intranasal naloxone. The Pre-Hospital Emergency Care Council has published a Clinical Practice Guideline enabling lay people qualified in basic life support to use intranasal naloxone, if trained – however this cannot be implemented until prescribing regulations are changed by the Department of Health.

The voluntary sector and individual clinicians and agencies are working hard to help those at highest risk; Safety net, the Merchant's Quay Project and the Ana Liffey Drug Project are excellent examples. However in the absence of straightforward regulatory change by the Department of Health, little can happen to enable trials of schemes to provide Take Home Naloxone to drug-users, their families or to the many lay people who provide support services.

Here is an excellent opportunity for focused, high-level action to save lives, at very little cost. Are the leaders of our health system sufficiently interested in a marginalised group to take action?

G Bury
Academic General Practice, SMMS, UCD

References

1. Drug related deaths and deaths among drug users in Ireland. 2011 figures from the NDRDI. Health Research Board, 2014.
2. 2011 road death and injury statistics. Road Safety Authority, 2012. http://www.rsa.ie/Documents/Road%20Safety/Road_deaths_2011.pdf
3. Clark AK, Wilder CM, Winstanley EL. A systematic review of community opioid overdose prevention and naloxone distribution programs. J Addict med 2014;8:153-63.
4. Community-Based Opioid Overdose Prevention Programs Providing Naloxone — United States, 2010. Centre for Disease Control. MMWR 2012;61:101-105.
5. Klimas J, O'Reilly M, Egan M,Tobin H, Bury G. Urban overdose hotspots: a 12-month prospective study in Dublin ambulance services. Am J Emerg Med. 2014 Jul 31 (epub).
6. Walley AY, Xuan Z, Hackman HH, Quinn E, Doe-Simkins M, Sorensen-Alawad A, Ruiz S, Ozonoff A. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. BMJ.2013 Jan 30;346.
7. Hewlett L, Wermeling DP. Survey of naloxone legal status in opioid overdose prevention and treatment. J Opioid Manag. 2013 Sep-Oct;9(5):369-77.
8. Sunday Times, 21st September 2014.

Diagnosis and Treatment of Sleep Related Breathing Disorders in Children: 2007 to 2011

A Walsh[1], F Phelan[1], M Phelan[1], M Ryan[1], F Healy[2], DM Slattery[2], B Elnazir[3], P Greally[3], B Linnane[4], M Ní Chróinín[5], D Mullane[5], M Herzig[6], DW Cox[1], S Javadpour[1], P McNally[1]
[1]Our Lady's Children's Hospital, Crumlin, Dublin 12
[2]Children's University Hospital, Temple St, Dublin 1
[3]National Children's Hospital, Tallaght, Dublin 24
[4]University Hospital Limerick, Dooradoyle, Co Limerick
[5]Cork University Hospital, Wilton, Cork
[6]University Hospital Galway, Newcastle Rd, Galway

Abstract
Sleep related breathing disorders (SRBD) have historically been under-recognised and under-treated. Obstructive sleep apnoea(OSA) affects approximately 3% of children. In line with the increased recognition of SRBD there has been an increase in demand for diagnostic services. We determined the awareness of SRBD amongst Irish paediatricians, examined the provision of sleep services to children throughout the country between 2007 and 2011 and audited diagnostic sleep services in a tertiary centre in 2011. Amongst respondents there was an awareness of SRBD but a poor understanding of diagnostic evaluation with 31/46 (67) referring to inappropriate services. There has been a sharp increase in both diagnostic sleep tests (433-1793 [414]) and in the use of non-invasive ventilation (NIV) (31-186 [627]) for treatment of SRBD between 2007 and 2011. Paediatric sleep services are organized in an ad-hoc manner nationally with significant service variation. The use of domiciliary overnight oximetry reduced the requirement for more formal polysomnography by 70%.

Introduction

Sleep related breathing disorders (SRBD) have a high prevalence in the paediatric population, and as awareness of SRBD has increased, demand has increased on existing sleep services[1]. The commonest type of SRBD in children is obstructive sleep apnoea (OSA) which has a prevalence of approximately 3%[2] and is more common in certain high risk groups such as those with trisomy 21 (50-70%)[3], craniofacial disorders[4], sickle cell anaemia[5], mucopolysaccharidoses[6], and neuromuscular disorders[7]. OSA in children is associated with impaired neurobehavioural functioning, long term cardiac morbidity, impaired academic performance and increased health care utilisation, all of which improve with treatment[8]. The investigation and management of OSA can be very resource intensive and expensive[9]. Nocturnal polysomnography (PSG) in a sleep laboratory represents the gold standard for the diagnosis of OSA but is costly and time-consuming[10,11]. Pulse oximetry is an increasingly used abbreviated testing modality for the evaluation of children with suspected OSA[12-14]. Overnight oximetry is cheap, easily performed at home and is a useful diagnostic test for OSA in some circumstances[9]. A subset of children diagnosed with OSA will go on to require treatment with non-invasive ventilation (NIV), usually over the long term[2]. The need for NIV is more commonly seen in children with pre-existing medical conditions[15]. With increasing awareness of the high prevalence of SRBD and increasing demand for diagnostic testing, more children will be diagnosed with OSA and will require treatment. This will impact on paediatric ENT services and also lead to an increase in the number of children requiring ongoing NIV. In young children, treatment with NIV involves intensive follow up and support. In light of the increased demand on paediatric sleep services and variations in the approach to SRBD across the country, we sought to assess the awareness of the investigation and management of SRBD in children among paediatricians, and determine the level of service provision in the area over the last number of years. We further sought to examine in detail the provision of diagnostic sleep services in a single tertiary centre and formally assess the utility of domiciliary overnight oximetry to obviate more formal testing in our patient population.

Methods

A survey on awareness of SRBD in children and the referral pathways used was designed and emailed to consultant paediatricians registered with the Royal College of Physicians in Ireland. Data on the provision of paediatric sleep services between 2007 and 2011was gathered directly from respiratory physicians in all centres that provide services. An audit of diagnostic sleep services at Our Lady's Children's Hospital Crumlin (OLCHC) during 2011 was performed with particular emphasis on the effectiveness of screening oximetry. Information was gathered from patients' medical notes, sleep files and hospital databases. First line diagnostic tests were included in the audit providing full clinical information was available. Studies with incomplete datasets, follow up studies, NIV titration studies and monitoring studies were excluded. The data were analysed using Microsoft Excel.

Results

Awareness of SRBD and sleep services among paediatricians
The response rate to the survey was 20% (46/230). The majority (36/46[78%]) had no training in SRBD. The majority (28/46 [61%]) correctly identified the prevalence of OSA in children, with 35/46 (76%) knowing the prevalence of OSA in children with trisomy 21. The majority (31/46[67%]) said that they 'always' or 'often' ask about sleep as part of systems review. A third of respondents (15/46 [33%]) were working in hospitals where downloadable oximetry was available. Most respondents (31/46[67%]) referred to ENT when a child presented with a history suggestive of OSA.

National Services
As of 2011 six centres in Ireland (OLCHC, Children's University Hospital, Temple Street [TSH], National Children's Hospital, Tallaght [NCH], Cork University Hospital [CUH], University Hospital Galway [UHG], University Hospital Limerick [UHL]) were providing some level of structured paediatric sleep service. All centres could provide overnight oximetry and/or oximetry/capnography combined (TCO2). Three of these centres also perform abbreviated polysomnography, two of which have the ability to perform full polysomnography. None of the centres provided multiple sleep latency testing (MSLT). The number of studies performed nationally has increased significantly in recent years; from 433 diagnostic sleep tests in 2007 to 1793 studies in 2011 (414% increase). There was also a 627% increase in the number of children on NIV nationally from 31 in 2007 to 185 in 2011 (Table 1). There were no funded posts in any of the centres for the delivery of paediatric sleep services. Clinicians in all centres reported a progressive increase in the proportion of their practice dedicated to paediatric sleep problems over the course of the four years. Marked differences in approach to diagnostic testing and service provision were seen across the country.

Diagnostic sleep service in OLCHC

We looked in detail at the provision of diagnostic sleep services in OLCHC, which carried out 1001 of the 1793 studies (56%) that were performed nationally in 2011. In OLCHC there was a 380% increase in the number of tests performed from 208 in 2007 to 1001 in 2011. Two hundred and forty five charts were reviewed. Two hundred and thirty four first line diagnostic studies had full clinical information available and were suitable for inclusion in the audit (127 oximetry, 53 TCO2 and 54 abbreviated polysomnography). The median wait time for an outpatient test was four months (range one day–sixteen months). The service was accessed by all subspecialty groups (Figure 1). The indication for the majority of the studies (206/234 [88%]) was to assess for OSA. Other indications included assessment of hypoventilation (19/234 [8%]), central apnoeas (4/234 [2%]), hypoxia (1/234 [0.4%]) and a combination of these (4/234 [2%]). Of the total number of studies 123/234 (53%) were performed in the child's home. Most oximetries (111/127 [87%]) were performed at home, with most abbreviated polysomnographies (42/54 [78%]) and all TCO2s (53/53 [100%]) being performed in hospital.

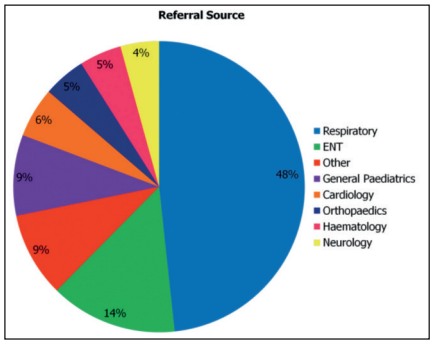


Figure 1

Referral source for first line diagnostic sleep tests in OLCHC 2011

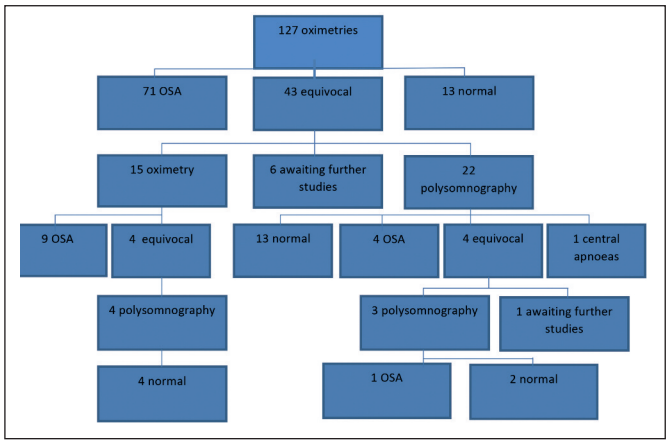


Figure 2 The fate of children undergoing first line diagnostic oximetry in OLCHC in 2011

Most children (154/234 [66%]) had an underlying medical condition (Table 2). Of children without an underlying diagnosis 45/80 (56%) had OSA, and in children with an underlying medical condition 71/154 (46%) had OSA. Figure 2 details the clinical pathway of the 127 children who had oximetry performed. Most children (71/127 [56%]) were diagnosed with OSA following a first oximetry and required no further testing. Overall 80 of 127 children (63%) were diagnosed with OSA following testing with oximetry and this figure rose to 85/127 (67%) following a combination of oximetry and abbreviated polysomnography (Figure 2). By utilising overnight oximetry as a screening tool for OSA the number of polysomnography studies required was reduced by 70%. In parallel to increased diagnostic testing we saw a striking increase over the study period in the number of children on NIV at OLCHC from 9 in 2007 to 86 in 2011. Of the cohort of children who had a first line diagnostic test in 2011, the majority of children diagnosed with OSA were referred to ENT (74/85 [87%]), and of these 9 (12%) required treatment with NIV. Three children (4%) were treated with NIV without being referred to ENT.

Discussion

We describe the provision of paediatric diagnostic sleep services in Ireland. We have no local prevalence data for OSA and are using international data which quotes a prevalence of 1-5%[2]. This suggests that there are approximately 10-50,000 children in Ireland with OSA[16]. The proportion of children that are being referred for investigation and treatment is very low. The increasing awareness and recognition of SRBD in Ireland has resulted in an increased demand on services which mirrors the increased awareness and demand that is being seen internationally[1]. As recognition of SRBD further increases it is likely that this will result in further increases in referrals to paediatric respiratory and ENT services. The survey response rate was poor, likely reflecting some degree of discomfort with the subject matter. Among respondents there was a good awareness of SRBD, again this is likely to be biased, however understanding of diagnostic evaluation and of available sleep services was poor with many referring to inappropriate services or locations. There was a significant increase in all types of diagnostic tests over the period of the study. This was most marked with TCO2, likely partly related to its increasing availability over the duration of the study. The lowest increase in numbers was seen with polysomnography. This likely reflects both the resource intensive nature of the test, thus the limited scope to increase numbers and the increasing use of screening tests with their relative ease of use and lower cost. In OLCHC there was a wide spectrum of disorders among the group of children with pre-existing medical conditions, underlining the need for awareness of, and concentrated expertise in, paediatric sleep medicine in tertiary centres looking after children with complex medical conditions.

Table 1 Number of diagnostic tests performed and number of children on NIV in all centres in 2007 and 2011

Test	2007	2011	% increase
Polysomnography	190	259	136%
Oximetry	238	715	300%
TCO2	5	789	15780%
Total tests	433	1793	414%
WTE funded sleep posts	0	0	0%
Number on NIV	**2007**	**2011**	**% increase**
OLCHC Crumlin	9	86	955%
CUH Temple Street	8	29	262%
NCH Tallaght	10	28	180%
Cork	3	15	500%
Limerick	2	15	750%
Galway	0	10	
Total	31	185	627%
WTE funded NIV posts	0	0	0%

Table 2 Underlying diagnosis of children with pre-existing medical conditions undergoing first line diagnostic sleep testing in OLCHC in 2011

Underlying Diagnosis	
Trisomy 21	24 (13%)
Other	22 (12%)
Congenital heart disease	21 (11%)
Asthma	17 (9%)
Scoliosis	17 (9%)
Sickle cell anaemia	13 (7%)
Ex prematurity	10 (5%)
CF	9 (5%)
CNS disorders	9 (5%)
Obesity	8 (4%)
Cerebral Palsy	7 (4%)
Neuromuscular diseases	7 (4%)
Pierre Robin Sequence	5 (3%)
Developmental delay	5 (3%)
Prader Willi Syndrome	3 (2%)
Craniofacial abnormalities	3 (2%)
Airway malacia	3 (2%)
Achondroplasia	2 (1%)
Spina bifida	2 (1%)
Hurler Syndrome	2 (1%)

The Royal College of Paediatrics and Child Health (RCPCH) published evidence-based recommendations for the diagnosis and management of disorders of sleep physiology and respiratory control in children, and the organisation of such services nationally in the UK in 2009[8]. No similar recommendations exist in Ireland at present. Currently there is a good national network providing testing for SRBD in Ireland and this network has the potential to expand and consolidate. The majority (1469/1793 [82%]) of studies in Ireland in 2011 were carried out in Dublin. This distribution of caseload is incongruous with a situation where the disorder has a very high prevalence, with the large majority of children likely to have no underlying medical condition. For paediatric OSA, a more efficient system would ensure high

volume, low complexity work is carried out locally with more low volume high complexity work directed to tertiary services. The use of oximetry as a screening tool for OSA has been increasing worldwide. Oximetry has been shown to have a high positive predictive value for OSA[12] and shorten the diagnostic and treatment process for those with severe OSA[17]. Our audit in OLCHC shows that oximetry was heavily used as a screening tool for OSA in all children, leading to a marked reduction in the need for formal inpatient sleep studies and saving considerable resources. Further studies are needed comparing oximetry with polysomnography as a screening tool for OSA as our audit was not designed to assess this. Our audit was carried out in a tertiary centre with a high proportion of children with an underlying medical condition (66%) which may not reflect the national situation accurately. One would expect the test to perform as well or better within a cohort of otherwise healthy children. We have also seen an increase in the use of NIV in line with the increased testing. In our study, 14% of children diagnosed with OSA went on to need NIV. There are no co-ordinated services in place to look after the current number, or the expected increase in future numbers of children on NIV.

In conclusion, we report for the first time on the provision of diagnostic sleep services to children in Ireland. Ireland has a good network of centres capable of providing this service but the provision of services is currently disorganised and variable across the country. The use of oximetry screening has the potential to reduce the demand for polysomnography and provide an effective and affordable service to a greater number of children closer to their homes.

Correspondence: A Walsh
Department of Neonatology, The Coombe Women and Infants University Hospital, Cork St, Dublin 8
Email: aislingwalsh@hotmail.com

References

1. Wise MS, Nichols CD, Grigg-Damberger MM, Marcus CL, Witmans MB, Kirk VG, D'Andrea LA, Hoban TF. Executive summary of respiratory indications for polysomnography in children: an evidence-based review. Sleep. 2011;34:389–98.
2. Marcus CL, Brooks LJ, Draper KA, Gozal D, Halbower AC, Jones J, Schechter MS, Ward SD, Sheldon SH, Shiffman RN, Lehmann C, Spruyt K; American Academy of Pediatrics. Diagnosis and management of Childhood Obstructive Sleep Apnea Syndrome. Pediatrics. 2012;130;e714.
3. Rosen D. Management of obstructive sleep apnea associated with Down syndrome and other craniofacial dysmorphologies. Curr Opin Pulm Med. 2011 Nov;17:431-6.
4. Luna-Paredes C, Anton-Pacheco JL, Garcia Hernandez G, Martínez Gimeno A, Romance García AI, García Recuero II. Screening for symptoms of obstructive sleep apnea in children with severe craniofacial anomalies: assessment in a multidisciplinary unit. Int J Pediatr Otorhinolaryngol. 2012 Dec;76:1767-70.
5. Rogers VE, Lewin DS, Winnie GB, Geiger-Brown J. Polysomnographic characteristics of a referred sample of children with sicklecell disease. J Clin Sleep Med. 2010 Aug 15;6:374-81.
6. Leighton SE, Papsin B, Vellodi A, Dinwiddie R, Lane R. Disordered breathing during sleep in patients with mucopolysaccharidoses. Int J Pediatr Otorhinolaryngol. 2001 Apr 27;58:127-38.
7. Gozal D. Pulmonary manifestations of neuromuscular disease with special reference to Duchenne muscular dystrophy and spinal muscular atrophy. Pediatr Pulmonol. 2000;29:141-150.
8. Working Party on Sleep Physiology and Respiratory Control Disorders in Childhood Standards for Services for Children with Disorders of Sleep Physiology. RCPCH Report. September 2009.
9. Pavone M, Cutrera R, Verrillo E, Salerno T, Soldini S, Brouillette RT. Night-to-night consistency of at-home nocturnal pulse oximetry testing for obstructive sleep apnea in children. Pediatric Pulmonology. 2013 ;Mar 26 .
10. American Academy of Paediatrics. Clinical practice guideline: diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics. 2002;109:704–712.
11. American Thoracic Society. Standards and indications for cardiopulmonary sleep studies in children. Am J RespirCrit Care Med. 1996;153:866–878.
12. Brouillette RT, Morielli A, Leimanis A, Waters KA, Luciano R, Ducharme FM. Nocturnal pulse oximetry as an abbreviated testing modality for pediatric obstructive sleep apnea. Pediatrics. 2000;105:405–412.
13. McKenzie SA, Bhattacharya A, Sureshkumar R, Joshi B, Franklin A, Pickering R, Dundas I. Which obese children should have a sleep study? Respir Med. 2008;102:1581–1585.
14. Mason DG, Iyer K, Terrill PI, Wilson SJ, Suresh S. Pediatric obstructive sleep apnea assessment using pulse oximetry and dual RIP bands. ConfProc IEEE Eng Med Biol Soc. 2010;2010:6154–6157.
15. Massa F, Gonsalez S, Laverty A, Wallis C, Lane R. The use of nasal continuous positive airway pressure to treat obstructive sleep apnoea. Archives of Disease in Childhood. 2002;87:438-443.
16. Central Statistics Office. Statistical Yearbook of Ireland 2013. 11-13.
17. Nixon GM, Kermack AS, Davis MG, Manoukian JJ, Brown KA, Brouillette RT. Planning Adenotonsillectomy in Children with Obstructive Sleep Apnea: The Role of Overnight Oximetry. Pediatrics. 2004;113;e19.

A Randomised Controlled Trial Using the Epidrum for Labour Epidurals

M Deighan, D O Briain, H Shakeban, D O'Flaherty, H Abdulla, A Al-Jourany, S Ash, S Ahmed, R McMorrow
National Maternity Hospital, Holles St, Dublin 2

Abstract
The aim of our study was to determine if using the Epidrum to site epidurals improves success and reduces morbidity. Three hundred parturients requesting epidural analgesia for labour were enrolled. 150 subjects had their epidural sited using Epidrum and 150 using standard technique. We recorded subject demographics, operator experience, number of attempts, Accidental Dural Puncture rate, rate of failure to site epidural catheter, rate of failure of analgesia, Post Dural Puncture Headache and Epidural Blood Patch rates. Failure rate in Epidrum group was 9/150 (6%) vs 0 (0%) in the Control group (P= 0.003). There were four (2.66%) accidental dural punctures in the Epidrum group and none in the Control group (P=0.060), and 2 epidurals out of 150 (1.33%) in Epidrum group were re-sited, versus 3/150 (2%) in the control group (P=1.000). The results of our study do not suggest that using Epidrum improves success or reduces morbidity.

Introduction
Neuraxial analgesia is widely recognised as the most effective form of pain relief during labour.[1] Whilst generally safe, it has potential complications. After inadequate analgesia, the most common one is Accidental Dural Puncture (ADP) with a quoted incidence of 0.19% - 3.6% of obstetric epidurals.[2] Following ADP, the incidence of Post Dural Puncture Headache (PDPH) is quoted as anything from 50% to 81%.[3,4] It is often severe and

CPD available online at www.imj.ie and questions on page 95.

incapacitating, prolonging hospital stay, and can have a detrimental effect on maternal-infant interaction.[5] Identification of the epidural space is crucial to the provision of epidural analgesia. Over the years various methods have been described, such as Loss of Resistance (LOR) to air or 0.9% Saline and the 'hanging drop' technique.[6] Since the development of modern LOR syringes, the LOR technique has become the technique of choice. A survey of epidural technique among obstetric anaesthetists in 2001 showed that up to 70% of respondents were using a LOR to Saline (LORS) technique.[7] The Epidrum (Exmoor Innovations Ltd. Taunton, Uk) is an optimal, constant, low pressure air operated LOR device developed to facilitate identification of the epidural space. It comprises of a plastic drum like cylinder with a thin silicone diaphragm. When placed between the Tuohy needle and syringe the user injects the Epidrum with 1ml of air to expand the diaphragm in a balloon like manner. This allows the operator to use two hands to control the epidural needle whilst providing continuous low pressure at the needle tip. After careful advancement of the needle, sudden collapse of the diaphragm signifies LOR and identification of the epidural space. It has been proposed that using the Epidrum may improve identification of the epidural space, reduce associated morbidity and provide teaching opportunities, as observers can also identify the moment of LOR. The aim of our pilot study was to determine if using the Epidrum improves success and reduces morbidity when compared to LORS technique.

Methods

After ethical approval and written informed consent, 300 parturients requesting epidural analgesia for labour, were enrolled in our study. Patients younger than 18 or those unable to give informed consent were excluded. The 300 subjects were randomised into two groups using computer generated numbers. One group (Epidrum group) received epidural analgesia using the Epidrum and the other group (Control group) received epidural analgesia using standardised LORS technique. All epidurals were performed by seven trainee anaesthetists rotating through the hospital during the period of the study. The experience of our operators in anaesthesia ranged from 1.5 to 8 years. All the trainee anaesthetists who participated in the study were trained in using the Epidrum device (via a simulated LOR device provided by Exmoor Innovations Ltd.) prior to using it on patients. All epidurals were carried out with subjects in the sitting position, using an 18 gauge Tuohy needle with the bevel facing cephalad. After location of the epidural space, the epidural catheter was advanced 4 cm into the epidural space in all subjects. A standardised test dose and maintenance infusion was used in all subjects. If the trainee failed to site the epidural after three attempts, a second anaesthetist was called to carry out the procedure,using their technique of choice.

We recorded the following variables in the labour ward: subject demographics, anaesthetic experience of the operator in years, dural puncture, number of attempts taken to site epidural, failure (defined as being unable to site the epidural catheter after three attempts) to site epidural requiring a second operator, and failure of epidural analgesia (defined as failure to obtain a sensory block after initial local anaesthetic loading dose, resulting in the epidural catheter being re-sited). The subjects were followed up in the next 24-48 hours by an anaesthetist who was blinded as to group allocation in order to detect the occurrence of PDPH in the first 48 hours. The performance of epidural blood patches (EBP) on any of the subjects was also recorded. In addition the subjects were followed up with a telephone interview at 6 weeks to ensure we had not missed any atypical delayed onset PDPH. Data were compared using an independent samples t-test for continuous measures. For categorical measures Pearson's chi-squared test was used. A Fisher's exact test was used to compare the data in variables were the expected frequency was less than 5 in greater than 25% of the subjects; need for second operator, accidental dural puncture, failure of analgesia, PDPH and EBP. All comparisons were made with a level of significance of 0.05.

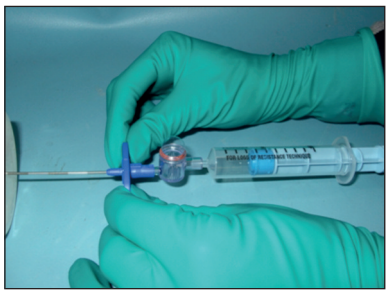


Figure 1

Epidrum with silicone diaphragm inflated with 1ml air, placed between the Tuohy needle and syringe

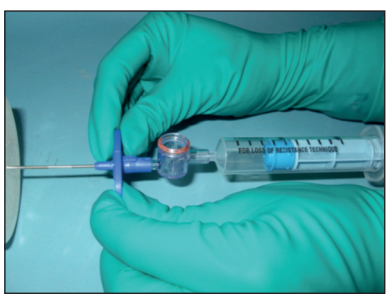


Figure 2

Epidrum with silicone diaphragm collapsed, signifying loss of resistance has occurred and epidural space has been located

Results

There were no significant differences between the two groups for age, height, weight, BMI, parity or anaesthetic experience (Table 1). There were no significant differences between techniques except for failure to site the epidural requiring a second operator. In 9 out of 150 epidurals (6%) in the Epidrum group a second anaesthetist was required to site it, compared to none in the Control group (P=0.003) (Table2). There were four accidental dural punctures in the Epidrum group and none in the Control group (P=0.060). Two of these subjects suffered from a PDPH as a result. One subject was managed conservatively and the other received an epidural blood patch. In the Epidrum group two out of 150 epidurals were re-sited, versus three out of 150 epidurals in the control group (P=1.000).

Discussion

Our pilot study showed that use of Epidrum to site epidurals was equivalent to LORS,except for failure to site the initial epidural where LORS was superior. It is the first study using the Epidrum to look specifically at morbidity as a primary outcome. It is also the largest study so far comparing Epidrum[8,9] to standard LOR techniques. The principle aim of our pilot study was to estimate population rates of adverse events in each group. Therefore the number of participants (150 per group) was selected not to sufficiently power any hypothesis tests, but to attempt to observe sufficient numbers of events to adequately estimate the rates, given the time and resources available. We note that 150 individuals undergoing a procedure with a 3.6% adverse event rate (as per ADP) would be expected to return 5.4 events on average, or 4 or more events with 80% probability, giving tight 95% confidence intervals for the rate of approximately +/- 2 to 2.5 percentage points. By adverse event we mean ADP, PDPH and EBPs. The published adverse event ranges are broad (0.2%to 3.6% for ADP, 0.1% to 2.9% for PDPH), but centred around a 1-2% rate. Powering a study to detect even a 1 or 2 percentage point shift between groups would require a sample with at least twice as many participants as the present study, ranging up to several thousand participants per group. This was not feasible in the present study, nor justifiable given the uncertainty surrounding the rates of adverse events in this population, and with each of the devices. We hope to have addressed some of this uncertainty with the present study.

We additionally note that the actual power for a comparison of binary event rates is critically dependent on the actual observed rate, an unknown until the study is completed. In our case we

observed an unexpectedly low rate of ADP and PDPH (0%) in one group, which improved our power considerably, and is mostly likely responsible for the "nearly significant" p-values reported. One confounding factor in our study is that the mean experience of our trainees was high, 5.54 years and 5.95 years in the Control and Epidrum groups respectively. There may also have been individual operator bias. Some of our investigators enthusiastically adopted the new device whilst others preferred their usual LOR technique. The small number of investigators in the study (n=7) may have provided an opportunity for individual bias to skew the results in favour of one technique over another. As such, it would seem prudent when designing a future randomised controlled trial to engage anaesthetic operators of a similar experience, preferably novice as in the pilot study we found experienced operators were less enamoured with the new device.

Our results differ somewhat from two previous studies carried out comparing the Epidrum to standard LOR techniques.[8,9] Both these studies found the Epidrum to be superior to conventional LOR techniques, however they focused more on the time taken to carry out the procedure and ease of use, while our study looked primarily at morbidity and clinical endpoints. While our results did not show the Epidrum to offer any real advantage to LORS for siting epidurals, it may have a useful role to play in the teaching of the epidural procedure. It is often difficult for an anaesthetist teaching a trainee to determine whether there is a true loss of resistance simply by observing the procedure. If used correctly the Epidrum provides a very obvious visual signal that the epidural space has been reached, thus removing operator and observer subjectivity. In conclusion, the results of our pilot study do not suggest that using Epidrum compared to the standard LORS technique improves success or reduces morbidity associated with labour epidurals. All comparisons are from within our study.

Correspondence: M Deighan
National Maternity Hospital, Holles St, Dublin 2
Email: mairead.deighan@icloud.com

Acknowledgements
Thanks Exmoor Innovations Ltd. Taunton, and R Segurado and CSTAR School of Public Health, Physiotherapy and Population Science, University College Dublin, for their help with this study.

References

1. Van de Velde M. Modern neuraxial labor analgesia: options for initiation, maintenance and drug selection. Rev Esp Anestesiol Reanim. 2009; 56: 546-61.
2. Hollister N, Todd C, Ball S, Thorp-Jones D, Coghill J. Minimising the risk of accidental dural puncture with epidural analgesia for labour: a retrospective review of risk factors. Int J Obstet Anesth. 2012; 21: 236-41.
3. Lybecker H, Djernes M, Schmidt JF. Post dural puncture headache (PDPH): Onset, duration, severity, and associated symptoms. An analysis of 75 consecutive patients with PDPH. Acta Anaesthesiol Scand. 1995; 39: 605-12.
4. Paech M, Banks S, Gurrin L. An audit of accidental dural puncture during epidural insertion of a Tuohy needle in obstetric patients. Int J Obstet Anesth. 2001; 10: 162-7.
5. Van de Velde M, Schepers R, Berends N,Vandermeersch E, De Buck F. Ten years of experience with accidental dural puncture and post-dural puncture headache in a tertiary obstetric anaesthesia department. Int J Obstet Anesth. 2009; 17: 329-335.
6. Van de Velde M. Identification of the epidural space: Stop using the loss of resistance to air technique! Acta Anaesthiol Belg. 2006; 57: 51-4.
7. Cowan CM, Moore EW. A survey of epidural technique and accidental dural puncture rates among obstetric anaesthetists. Int J Obstet Anesth. 2001; 10: 11-16.
8. Sawada A, Kii N, Yoshikawa Y, Yamakage M. Epidrum: A new device to identify the epidural space with an epidural Tuohy needle. J Anesth. 2012; 26: 292-5.
9. Kim SW, Kim YM, Kim SH, Chung MH, Choi YR, Choi EM. Comparison of loss of resistance technique between Epidrum and conventional method for identifying the epidural space. Korean J Anesthesiol. 2012;62: 322-6.

Medical Speciality Choice: Does Personality Matter?

S Lydon[1], P O'Connor[2], T McVeigh[3], G Offiah[4], D Byrne[3]
[1]School of Psychology, Trinity College Dublin, College Green, Dublin 2
[2]Department of General Practice, National University of Ireland, Galway
[3]Galway University Hospital, Newcastle Rd, Galway
[4]Beaumont Hospital, Beaumont, Dublin 9

Abstract
There has been increasing interest in the personalities of doctors. This study examined whether personality differed based upon gender, level of training or medical speciality among 200 physicians and 134 medical students. Post-internship doctors scored significantly higher on conscientiousness (p=.001) than those pursuing basic medical training. Among those pursuing basic medical training, females scored significantly higher than males on agreeableness (p<.001) and conscientiousness (p=.001). Among post-internship respondents, females scored significantly higher on agreeableness (p=.004). There were no personality differences between post-internship doctors working in different specialities. However, among those pursuing basic medical training, those interested in person-focused medical specialities scored significantly higher on extraversion (p<.001), conscientiousness (p=.001), and lower on neuroticism (p=.01) than those who had no strong preference. These results suggest that there is no unique personality profile associated with medical practice, or medical speciality. Instead, it appears that medical school may shape personality.

Introduction

Interest in the "non-cognitive" traits of physicians, such as professionalism, personality, and empathy, has increased in recent years[1]. Research has identified relationships between personality and acceptance into medical school[2], success in medical school[3], clinical performance[4-6], and physician wellbeing[7,8]. Research has also examined whether personality may predict medical speciality choice. The identification of such an association would be relevant to career counselling, assignment of clinical placements, predicting future distribution of medical speciality choices, and medical selection[5,9,10]. A recent review of the literature suggested that the relationship between personality and medical speciality is less clear than that between personality and academic and clinical performance[1]. This literature is clouded by the use of a myriad of personality measures, many of which are now considered outdated or not useful. Borges and Savickas have synthesised this research using the five-factor model of personality and suggest some potential associations between certain medical specialities and personality traits[11]. For example, general practitioners (GPs) appeared characterised by agreeableness and conscientiousness while surgeons were characterised by openness and extraversion. The current study sought to investigate personality among a

sample of Irish medical students and doctors, to examine whether personality differed according to gender, level of training or medical speciality.

Methods

The sample was composed of 334 physicians and medical students. The medical students attended a single Irish medical school while the physicians worked across eight different hospitals in Ireland. Of these participants, 134 (40%) were medical students, 43 (12.8%) were interns, 47 (14%) were senior house officers, 45 (13.4%) were registrars, 34 (10.1%) were consultants, 23 (6.9%) were trainee GPs, 5 (1.5%) were GPs, and 3 (0.9%) were medical researchers. A total of 165 females (49.3%) participated and 131 males (39.1%). Data on gender were not available for 39 participants (11.6%). The majority of participants were Irish (n=230; 68.7%) although 14 (4.2%) were from other European Union countries and 50 (14.9%) from non-European Union countries. Data on nationality were not available for 40 participants (11.9%). For analyses, participants were categorised by level of training and medical speciality choice or interest. For level of training, participants were divided into two groups: basic medical training respondents[12] (BMTR) which comprised medical students and interns, or post-internship respondents (PIR) which included all physician grades senior to interns. Participants were also categorised on the basis of their speciality choice, in the case of PIR, or their intended speciality choice, in the case of BMTR. Medical speciality categorisation was based on that of Taber and Colleagues[10] whose classification system describes person-focused specialities as "specialties with an inclination towards people and the entire patient" and includes general practice, internal medicine, obstetrics and gynaecology, paediatrics, and psychiatry among these. Other specialities, such as anaesthesiology, dermatology, pathology, radiology, or surgery, are described as technique-focused or "focus[ed] on technical skills, instruments, and techniques related to patient care". In the case of BMTR, it was also possible to report "no strong preference" for medical speciality.

The NEO Five Factor Index[13] (NEO-FFI) was used to assess personality. This instrument consists of 60 items which assess neuroticism, extraversion, openness, agreeableness, and conscientiousness. Neuroticism refers to an individual's tendency to experience negative emotions such as anxiety, depression, or anger[13]. Extraversion refers to an individual's engagement with others and the outside world[13]. Openness relates to an individual's interest in the outside world and new experiences[13]. Agreeableness refers to an individual's ability to co-operate with, and relate to, other people[13]. Conscientiousness is related to an individual's reliability, organisation, and dutifulness[13]. NEO-FFI items are rated on a 5-point likert scale which ranges from 0 (strongly disagree) to 4 (strongly agree). The construct validity and reliability of the instrument have been demonstrated[13]. Participation in this study was voluntary. For medical students, the opportunity to participate was presented during class time. GPs and GP trainees were invited to participate during GP training day sessions which took place during the recruiting period. Hospital doctors were invited to participate via email. The researchers then distributed copies of the questionnaire among those that expressed an interest in participating. Across all recruitment methods, the response rate was found to be 26.1%. Ethical approval was obtained for the research, and all participants provided written informed consent.

Results

As outlined in Table 1, respondents scored in the average ranges of neuroticism, extraversion, agreeableness, and conscientiousness, while scoring in the high ranges for openness, as per NEO-FFI norm values[13]. However, respondents did not comprise a homogenous group; instead, t-scores (standardized scores on each dimension with 50 representing the mean score on that dimension) on all NEO-FFI dimensions spanned from the absolute minimum to the maximum possible. Differences in personality between the various subgroups, see Table 2 for information on these, within the sample were subsequently examined in an attempt to elucidate potential sources of the observed heterogeneity.

Table 2 Participants' Level of Training and Medical Speciality Interest or Choice

	Basic Medical Training Respondents	Post-internship Respondents
n	177	157
Person-focused speciality	27	88
Technique-focused speciality	6	86
No strong preference or data not provided	144	1

As outlined in Table 3, a series of independent *t*-tests were used to examine differences in personality between the subgroups in our sample. The limited number of BMTR intending to pursue technique-focused specialities prevented the comparison of this subgroup with others. With all comparisons, a Bonferroni correction was applied to control for the use of multiple univariate comparisons and alpha was set at .01. A number of significant differences in the five personality factors were identified between BMTR and PIR, males and females, and between BMTR intending to pursue person-focused medical specialities and BMTR reporting no strong preference (see Table 3). Further, PIR who were identified as outliers, scoring either very high or very low as per the NEO-FFI t-score interpretation guide, on any of the personality dimensions were further examined in order to determine whether any of these strong personality traits were related to medical speciality. However, a chi-square analysis revealed that those scoring very high or very low on any of the traits did not appear to cluster in any speciality type.

Discussion

While research has consistently demonstrated a link between personality and academic and clinical performance[3-6], the relationship between personality and medical speciality choice has been less clear[1]. The current study examined whether personality differed according to medical speciality, level of training, or gender, among a sample of doctors and medical students. While a number of the analyses were limited by the small number of participants in some of the subgroups (e.g., BMTR intending to pursue technique-focused specialities), and the high proportion of BMTR expressing no strong preference with regards medical speciality, a number of significant findings were nonetheless observed. It is perhaps surprising to find that the sample was so heterogeneous in personality. A comparison of PIR and British norms for the NEO-FFI[14] revealed few notable differences although PIR did score several points higher on extraversion, openness and agreeableness. Given the years of training required to qualify, and the responsibilities of a senior doctor, the similarity in conscientiousness levels between PIR and British norms is perhaps unexpected. However, previous research has also suggested that medical students or doctors do not have particularly different personality profiles from other

Table 1 Means and Standard Deviations For Each Trait Among The Whole Sample, Basic Medical Training Respondents, Post-internship Respondents, and British Norms Reported By Egan And Colleagues (2000).

	Neuroticism		Extraversion		Openness		Agreeableness		Conscientiousness	
	M	SD	M	SD	M	SD	M	SD	M	SD
Whole sample	20.6	7.8	31.2	6.7	32.3	7.0	32.8	6.1	32.5	6.7
Basic Medical Training Respondents	21.1	8.1	31.1	6.6	32.4	6.6	33.1	5.8	31.4	6.7
Post-internship Respondents	19.9	7.5	31.3	6.9	32.2	7.7	32.6	6.4	33.8	6.5
British Norms[14]	19.5	8.6	27.1	5.9	26.5	6.5	29.7	5.9	32.1	6.6

Table 3 Summary Of Comparisons Conducted via Independent t-test and Statistical Outcomes

Comparison	Trait	Outcome
Basic medical training respondents and post-internship respondents	Neuroticism	ns
	Extraversion	ns
	Openness	ns
	Agreeableness	ns
	Conscientiousness	Pre-registration doctors: *M*= 31.4, *SD*= 6.7 Registered doctors: *M*= 33.8, *SD*=6.5 ***t*(331)=-3.31, *p*=.001, *d*=.36**
Females with basic medical training and males with basic medical training	Neuroticism	ns
	Extraversion	ns
	Openness	ns
	Agreeableness	Female pre-registration doctor: *M*=35.7, *SD*=5.3 Male pre-registration doctor: *M*=30.6, *SD*=5.2 ***t*(137)= -5.56, *p*<.001, *d*=.96**
	Conscientiousness	Female pre-registration doctor: *M*=32.8, *SD*=6.9 Male pre-registration doctor: *M*=29, *SD*=6.3 ***t*(137)=-3.31, *p*=.001, *d*=.58**
Post-internship females and post-internship males	Neuroticism	ns
	Extraversion	ns
	Openness	ns
	Agreeableness	Female registered doctor: *M*=33.8, *SD*=6.7 Male registered doctor: *M*=31.2, *SD*=5.8 ***t*(155)=-2.66, *p*=.009, *d*=.42**
	Conscientiousness	ns
Post-internship respondents working in person-focused specialities and post-internship respondents working in technique-focused specialities	Neuroticism	ns
	Extraversion	ns
	Openness	ns
	Agreeableness	ns
	Conscientiousness	ns
Post-internship respondents working in person-focused specialities and basic medical training respondents intending to pursue person-focused specialities	Neuroticism	ns
	Extraversion	ns
	Openness	ns
	Agreeableness	ns
	Conscientiousness	ns
Basic medical training respondents intending to pursue person-focused specialities and basic medical training respondents with no strong preference	Neuroticism	Person-focused: *M*=17.6, *SD*= 8.4 No strong preference: *M*=22.1, *SD*= 7.8 ***t*(174)=-2.85, *p*=.005, *d*=.56**
	Extraversion	Person-focused: *M*=33.7, *SD*= 3.6 No strong preference: *M*=30.4, *SD*= 6.8 ***t*(85.22)=3.85, *p*<.001, *d*=.51**
	Openness	ns
	Agreeableness	ns
	Conscientiousness	Person-focused: *M*=35.2, *SD*= 5.7 No strong preference: *M*=30.5, *SD*= 6.6 ***t*(174)=3.7, *p*<.001, *d*=.73**

Note: "ns"= non-significant, alpha set at .01

occupational groups[15,16]. Comparisons such as these suggest that there is not a unique "doctor" personality but that those working in the field are largely similar to other adults.

A key finding of the current paper is the significant difference in conscientiousness between PIR and BMTR. Conscientiousness has been implicated as the personality trait most strongly related to successful medical study and practice[1] and has been found to be correlated with professionalism[17]. Given that this dimension comprises traits such as self-discipline, sense of duty, and behavioural regulation, it is perhaps unsurprising that PIR would score highly and surprising than BMTR would not. Previous research by Mustaffa and colleagues[18] demonstrated improvements in medical students' conscientiousness across the years of medical school. The authors proposed that medical school may shape personality, rather than simply attracting individuals with a similar personality types in the beginning[18]. Such findings are important as Lievens et al[19] have demonstrated that the predictive validity of conscientiousness for academic performance increases throughout medical school. The authors hypothesised that conscientiousness becomes of greater importance when a student begins to work in clinical settings as a variety of traits associated with conscientiousness, including dependability, persistence, attention to detail, are highly important when engaging in patient care. Jin and colleagues[20] have also suggested that medical practice, and the social pressures involved, may shape or reconstruct the identity of surgeons, strengthening adaptive traits for surgical practice. In this way, conscientiousness may be shaped by the changing requirements of medical school and the emergence of the new demands and requirements of clinical placement. Such suggestions may explain why PIR in our sample, caring for patients daily, differ from BMTR, some of whom may were in the early years of medical school where the focus is primarily on theoretical learning. These results suggest that the targeting of conscientiousness during medical training may lead to increases in this trait, in academic and clinical performance, and professionalism.

The findings of higher agreeableness and conscientiousness among female BMTR, and higher agreeableness among female PIR are also of interest. Previous research has also identified higher agreeableness and conscientiousness among female medical students than among their male counterparts[18]. British Norms for the NEO-FFI[14] also indicate higher scores on agreeableness for females than males which suggests that the findings of the current study are not unique to our sample. The findings of a significant gender differences in conscientiousness for BMTR but not PIR further supports the suggestion that conscientiousness develops over the course of medical training. Our data, which suggest little correspondence between personality and medical speciality choice, contribute to the body of evidence suggestive of little association between these variables[1]. While Borges and Savickas'[11] review suggested some potential associations between specific medical specialities and personality, the authors emphasised that there appeared to be greater intra-speciality variation than inter-speciality differences. Findings of significant personality differences between BMTR intending to pursue person-focused specialties and those reporting no preference with regards medical speciality are difficult to explain. Given the lack of differences between PIR working in the different types of specialities, it is likely that there are factors unrelated to personality which mediate the relationship observed. Previous research has identified a myriad of factors which impact upon medical speciality choice[21]. Further, the BMTR category included individuals studying at a variety of levels. In this way, it may be that those who report an intention to pursue person-focused specialities, as opposed to those who had no strong preference, were at a later stage of training, possibly involving greater degrees of patient care which may impact on personality[19], and that this may account for personality differences.

Overall, the results of the current study suggest that there is not a personality profile which is common to all doctors, or to particular medical specialities. The results suggest that the use of personality measures to "select" medical students or interns may be misguided. Instead, it is perhaps more appropriate to seek the skills which are requirements for the job. For example, those seeking to pursue surgical careers should have leadership skills and perform optimally under pressure. The current study also revealed that conscientiousness, a key predictor of academic and clinical performance and professionalism, appears to develop throughout medical training. Interventions targeting conscientiousness may thus be a potential means of improving academic performance and clinical practice.

Correspondence: P O' Connor
Department of General Practice, National University of Ireland, Galway
Email: paul.oconnor@nuigalway.ie

Acknowledgements
The assistance of DP Mojiun, M O'Sullivan, and L Lenihan in data collection for this study.

References

1. Hojat M, Erdmann JB, Gonnella JS. Personality assessments and outcomes in medical education and the practice of medicine: AMEE guide no. 79. Med Teach. 2013; 35; e1267-e1301.
2. Jerant A, Griffin E, Rainwater J, Henderson M, Sousa F, Bertakis KD, Fenton JJ, Franks P. Does applicant personality influence multiple mini-interview performance and medical school acceptance offers? Acad Med. 2012; 87; 1250-1259.
3. Lievens F, Coetsier P, De Fruyt F, De Maeseneer J. Medical students' personality characteristics and academic performance: a five-factor model perspective. Med Educ. 2002; 36; 1050-1056.
4. Ferguson E, James D, O'Hehir F, Sanders A, McManus IC. Pilot study of the roles of personality, references, and personal statements in relation to performance over the five years of a medical degree. BMJ. 2003; 326; 429-431.
5. Manuel RS, Borges NJ, Gerzina HA. Personality and clinical skills: any correlation? Acad Med. 2005; 80; S30-S33.
6. Haight SJ, Chibnall JT, Schindler DL, Slavin SJ. Associations of medical student personality and health/wellness characteristics with their medical school performance across the curriculum. Acad Med. 2012; 87; 476-485.
7. Newbury-Birch D, Kamali F. Psychological stress, anxiety, depression, job satisfaction, and personality characteristics in preregistration house officers. Postgrad Med J. 2001; 77; 109-111.
8. Tyssen R, Dolatowski FC, Røvik JO, Thorkildsen RF, Ekeberg Ø, Hem E, Gude T, Gronvold NT, Vaglum P. Personality traits and types predict medical school stress: a six-year longitudinal and nationwide study. Med Educ. 2007; 41; 781-787.
9. Markert RJ, Rodenhauser P, El-Baghdadi MM, Juskaite K, Hillel AT, Maron BA. Personality as a prognostic factor for specialty choice: a prospective study of 4 medical school classes. Medscape J Med. 2008; 10; 49-54.
10. Taber BJ, Hartung PJ, Borges NJ. Personality and values as predictors of medical choice. J Vocat Behav. 2011; 78: 202-9.
11. Borges NJ, Savickas ML. Personality and medical speciality choice: a literature review and integration. J Career Assess. 2002; 10; 362-380.
12. Irish Medical Council. Internships and certificates of experience-impact upon registration opportunities in Ireland and EU [Internet]. 2014 [cited 2014 Jun 4]. Available from: http://www.medicalcouncil.ie/Education/Career-Stage-Intern/Internships-Q-A-sheet_final-131213-pdf.pdf.
13. Costa PT, McCrae RR. The NEO-PI/NEO-FFI manual supplement. Odessa, FL: Psychological Assessment Resources; 1989.
14. Egan V, Deary I, Austin E. The NEO-FFI: Emerging British norms and an item-level analysis suggest N, A and C are more reliable than O and E. Pers Indiv Differ. 2000; 29; 907-920.
15. Rubinstein G, Strul S. The Five Factor Model (FFM) among four groups of male and female professionals. J Res Pers. 2007; 41; 931-937.
16. Chibnall JT, Blaskiewicz RJ, Detrick P. Are medical students agreeable? an exploration of personality in relation to clinical skills training. Med Teach. 2009; 31; 311-315.
17. Kelly M, O'Flynn S, McLachlan J, Sawdon MA. (2012). The clinical conscientiousness index: a valid tool for exploring professionalism in the clinical undergraduate setting. Acad Med. 2012; 87; 1218-1224.
18. Mustaffa MB, Nasir R, Khairudin R, Zainah AZ, Wah Shahrazad WS, Syed Salim SS. Understanding the personality traits of medical students using the five factor model. Asian Soc Sci. 2012; 8; 17-22.
19. Lievens F, Ones DS, Dilchert S. Personality scale validities increase throughout medical school. J Appl Psychol. 2009; 94; 1514-1535.
20. Jin CJ, Martimianakis MA, Kitto S, Moulton CE. Pressures to "measure up" in surgery: managing your image and managing your patient. Ann Surg. 2012; 256(6); 989-993.
21. Ko HH, Lee TK, Leung Y, Fleming B, Vikis E, Yoshida EM. Factors influencing career choices made by medical students, residents, and practising physicians. BC Med J; 2007; 49; 482-289.tt

Improving Surgical Site Infection Prevention Practices Through a Multifaceted Educational Intervention

P Owens, S McHugh, M Clarke-Moloney, D Healy, F Fitzpatrick, P McCormick, E Kavanagh
University Hospital Limerick, Dooradoyle, Co Limerick

Abstract
As part of the National Clinical Programme on healthcare-associated infection prevention, a Royal College of Surgeons in Ireland (RCSI) and Royal College of Physicians of Ireland (RCPI) working group developed a quality improvement tool for prevention of surgical site infection (SSI). We aimed to validate the effectiveness of an educational campaign, which utilises this quality improvement tool to prevent SSI in a tertiary hospital. Prior to the SSI educational campaign, surgical patients were prospectively audited and details of antibiotic administration recorded. Prophylactic antibiotic administration recommendations were delivered via poster and educational presentations. Post-intervention, the audit was repeated. 50 patients were audited pre-intervention, 45 post-intervention. Post-intervention, prophylaxis within 60 minutes prior to incision increased from 54% to 68% (p=0.266). Appropriate postoperative prescribing improved from 71% to 92% (p=0.075). A multifaceted educational program may be effective in changing SSI prevention practices.

Introduction

Healthcare associated infection (HCAI) causes considerable morbidity and mortality. The total number of patients acquiring HCAI in Europe each year is estimated at 4.1 million, equating to an average prevalence of 7.1%[1]. A 2012 study reported prevalence of HCAI in Ireland of 5.2%, with SSI being the most common infection reported, accounting for 18.2%[2]. Numerous studies have documented independent risk factors associated with increased SSI incidence. These include increasing age, presence of co-morbid disease, obesity, smoking and increased National Academy of Sciences (NAS) wound classification index[3,4]. Patients who develop SSI have a 60% increased risk of requiring intensive care, are five times more likely to be readmitted to hospital, and are twice as likely to die compared to patients without a SSI5. Furthermore, overall costs are substantially increased for patients with SSI[5-8]. It is estimated that up to 30% of HCAI are preventable through improved infection prevention practices[9,10]. Educational interventions have previously been multifaceted, utilising educational posters, feedback of audit data, lectures and provision of online information[11-15]. These varied

CPD available online at www.imj.ie and questions on page 95.

initiatives have been successful in improving adherence to guidelines. However, although the benefits of surgeon-led SSI prevention educational interventions have been previously demonstrated[16], there exists a paucity of infection prevention programmes aimed directly at surgeons[17]. We aimed to utilise a multifaceted educational intervention targeting surgical teams to improve SSI prevention processes. As part of the National Clinical Programme for HCAI prevention, the Royal College of Surgeons in Ireland (RCSI) and the Royal College of Physicians of Ireland (RCPI) established a working group in 2012 to develop a quality improvement tool for SSI prevention (Figure 1). The tool outlined a number of evidence-based recommendations to optimise practice (pre, intra and post-operatively). These included measures of appropriate surgical antibiotic prophylaxis, additional dosing if longer duration of surgery or excessive blood loss, and a minimum period for wound dressings to remain in situ post-operatively. The aim of this prospective study was to assess the effectiveness of our educational intervention in improving adherence to these recommendations.

Methods

This five week study was carried out in a single tertiary centre and included surgical patients from vascular, breast, colorectal and general surgery specialties. Patients were selected via consecutive sampling. We performed an initial two weeks audit to establish baseline compliance with the key recommendations, followed by a week long educational initiative , before re-auditing for a further two weeks to determine effectiveness. The educational initiative continued during this post-intervention audit period. Education included both poster campaign and face to face educational sessions. The newly developed SSI quality improvement tool was printed as a laminated poster and placed in high visibility areas within general surgery theatres and on all surgical wards (Figure 1). The posters were positioned following feedback regarding locations for optimal poster visibility from surgeons and nursing staff. The key recommendations from the SSI quality improvement tool, against which the authors assessed compliance following the education programme, included the following: Prophylaxis given within 60 minutes before skin incision; Single dose prophylaxis used unless there is intra-operative blood loss greater than 1.5L in adults or otherwise indicated; and Wound dressings to remain in-situ for a minimum of 48 hours post-operatively unless clinically indicated.

The study was highlighted at surgical grand rounds, where the evidence base for the quality improvement tool and rational for SSI prevention was presented. Also, single informal teaching sessions were provided by the audit group to the relevant consultants and their surgical teams. Education sessions were delivered to theatre Nurse Managers. Awareness was raised with nursing staff on surgical wards via meetings and the placing of posters in high visibility areas. Initial baseline audit results were presented at the hospital surgical morbidity and mortality meeting, and implications for SSI acquisition discussed. The SSI quality improvement tool was used at each educational opportunity to illustrate the SSI prevention guidelines. The pre-and post-intervention audit was carried out by a single observer (PO). Patient and procedural demographics were recorded, in addition to antibiotic prophylaxis use, timing and duration. Surgical dressings were inspected at 24 and 48 hours post-procedure and patient notes reviewed with regard to whether they remained in-situ for the initial 48 hours post-surgery as recommended. All data were collected prospectively, both at the time of surgery and by reviewing the anaesthetic and operative notes immediately post-procedure supported by discussion with the operating surgeons and anaesthetists. Data was collated on Microsoft Excel 2007 and exported to SPSS Version 20 for statistical analysis. Chi squared and independent samples t-test analyses were performed as appropriate and in accordance with Levene's Test for Equality of Variances, with $p<0.05$ considered statistically significant.

Results

Patient and procedure characteristics are outlined in Table 1. Of the 50 patients assessed pre-intervention, 24 (48%) received antibiotic prophylaxis, while 25 out of 45 patients (56%) in the post-intervention group received antibiotic prophylaxis. There were no significant differences between pre and post-intervention patient or procedural demographics with regard to age, gender, urgency of the procedure or National Academy of Sciences wound classification index (clean, clean-contaminated, contaminated or dirty) ($p=0.177$, $p=0.193$, $p=0.418$, $p=0.162$ respectively). Pre-intervention, 13 (54%) of patients received antibiotics within 60 minutes prior to incision, with seven (29%) receiving prophylaxis at incision and the remaining four (17%) post-incision. Of those who didn't receive antibiotic prophylaxis, it was not indicated in two patients (4%) and 24 had been previously commenced on intravenous antibiotic therapy. Following the educational initiative, 17 (68%) received antibiotics within 60 minutes prior to incision, seven (28%) at incision, with one patient (4%) receiving prophylaxis post-incision. This represents a 14% improvement in the appropriate timing of antibiotic administration (54% pre-intervention, 68% post-intervention) ($p=0.266$).

In terms of appropriate antibiotic duration, 14 patients (58%) in the pre-intervention group received single dose prophylaxis, seven (29%) received antibiotics for up to 24 hours post-operatively, and the remainder (n=3, 13%) for more than 24 hours. 17 patients (71%) received the recommended duration of antibiotic prophylaxis. This compares to 22 patients (88%) in the post-intervention group, who received single dose antibiotic prophylaxis, two patients (8%) who received antibiotics for up to 24 hours post-surgery and one remaining patient (4%) who received greater than 24 hours of antibiotics. 23 out of 25 patients (92%) in the post-intervention group were prescribed antibiotic prophylaxis for the appropriate duration, representing an overall improvement of 21% ($p=0.075$). In the pre-intervention cohort, 43 of 50 (86%) patient's wound dressings were left in-situ for greater than 48 hours as compared with 39 of 45 (87%) patients in the post-intervention group.

Discussion

This is the first trial of the RCSI/RCPI national quality improvement tool for SSI prevention in Ireland. Though not statistically significant, we report encouraging trends over a short period of time with respect to improvements in appropriateness

Table 1 Selected Breakdown of Patient and Procedure Characteristics

		Pre Intervention n = 50		Post Intervention n = 45	
		(n)	(%)	(n)	(%)
Gender Breakdown	Males	30	60	21	47
	Females	20	40	24	53
Mean Age in Years (Range):		44.2 (3 weeks - 84 years)		51.18 (7 - 88 years)	
Urgency Classification	Elective Procedures	23	46	17	38
	Emergency Procedures	27	54	28	62
Surgical Specialty	Breast	8	16	10	22
	Vascular	12	24	13	29
	Colorectal	4	8	2	4
	Other General	26	52	20	44
NAS Wound Classification	Clean	21	42	26	58
	Clean-contaminated	5	10	6	13
	Contaminated	24	48	13	29
Senior Operating Surgeon	Registrar	6	12	5	11
	Consultant	44	88	40	89
Closure Type	Suture Interrupted	8	16	5	11
	Suture Subcuticular	34	68	37	82
	Staples	7	14	2	4
	No Closure	1	2	1	2
Intra-operative Blood Loss	Minimal	21	42	16	36
	< 100 mls	8	16	1	2
	100 mls - 1500 mls	7	14	12	27
	> 1500 mls	1	2	0	0
	Not recorded	13	26	16	36

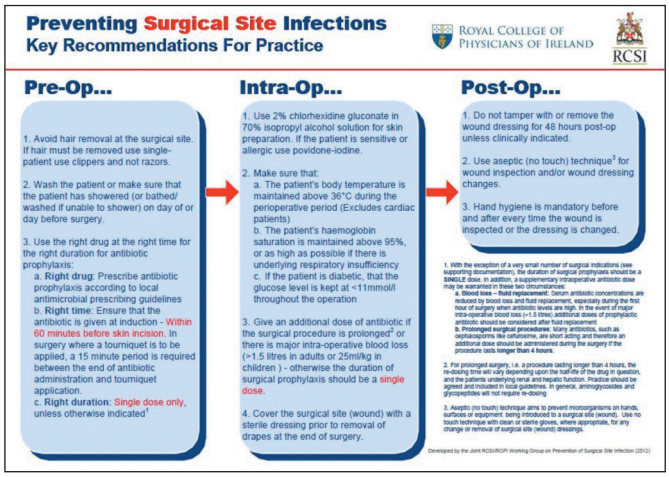


Figure 1 Reproduction of the poster based upon the SSI prevention bundle developed by the joint RCSI/RCPI working group on prevention of surgical site infection

(timing and duration) of surgical antibiotic prophylaxis. A 2001 UK study reported the consequences of SSI to be an average additional hospital stay of 6.5 days at a cost of £3,246 per patient[18]. One review estimates the annual cost to the UK National Health Service as over one billion British pounds in revision surgeries, nursing care, medicines and dressings[19]. Extrapolating from this data on a population basis, implies a cost to the Irish Healthcare System of approximately €73,000,000 per annum. Multiple previous education programmes have been reported in peer-reviewed literature. Educational posters have also previously been used as an effective part of educational interventions. A study by Lange et al combined posters with teaching sessions in an intensive care unit (ICU) in an effort to decrease catheter-related bloodstream infection (CRBSI)[20]. As a result, CRBSI rates among infants on surgical services decreased from 15.46 to 6.67 BSI per 1000 catheter days. Similarly, an educational initiative to decrease ventilator associated pneumonia (VAP) utilised educational posters to effect a decrease in VAP rate in a surgical ICU by 50%[21].

A study by McHugh et al reported on the impact of a poster campaign with an online educational platform specific to SSI prevention[16]. In this study, authors noted a significant improvement in the administration of prophylactic antibiotics administered prior to incision and a significant decrease in inappropriate dressing changes during the initial 48 hours following surgery. Our educational intervention utilised similar methods employing both a high visibility poster campaign supported with face to face educational sessions. There are many modifiable parameters to consider when assessing best practice in relation to SSI prevention. A systematic review of meta-analyses published between 1990 and 2006 concluded that compliance with antibiotic prophylaxis policies was an accurate surrogate marker for SSI prevention, while being reasonably independent of the type of surgery[22]. As a result, we focused particularly on antibiotic prophylaxis in our educational initiative, with repeated emphasis on giving the "right drug, at the right time, for the right duration". Improvements in key areas of practice were demonstrated in the post-intervention audit. The percentage of patients receiving prophylaxis in the 60 minutes prior to incision increased from 54% to 68%. Furthermore there was an improvement from 71% to 92% in prescribing antibiotics for the appropriate post-operative duration. Our poster design was taken from the RCSI/RCPI working group on SSI prevention, a group developing national SSI guidelines for those working in Irish hospitals. Traditionally, Ireland has utilised international SSI prevention guidelines[23-25], however, there is a requirement for the production and implementation of guidelines specific to the needs of our own healthcare system.

The authors acknowledge a number of limitations associated with this work. Notably, this study was undertaken in a single centre, is prospective in nature and all observations were recorded by a single observer. We report relatively smaller numbers to those being reported in international literature. While we accept that our results were not statistically significant, the recorded improvement in practice is promising. However, this is a novel pilot study providing preliminarily reports on the use of a planned national quality improvement tool designed to reduce rates of SSI in Ireland. Further audit, with an increased sample size, in collaboration with other Irish sites, is required to contribute conclusive evidence towards the efficacy of this multifaceted educational intervention. To conclude, national guidelines are necessary for prevention of SSI in an Irish hospital setting. A multifaceted educational intervention, comprising educational posters and face to face educational sessions may be effective in improving SSI prevention practices.

Correspondence: P Owens
University Hospital Limerick, Dooradoyle, Co Limerick
Email: patrickowens1@gmail.com

References

1. Annual Epidemiological Report 2008: Focus on Healthcare-Associated Infections. ECDC (European Centre for Disease Prevention and Control) pp17-38.
2. Burns K, Foley M, Donlon S. HPSC Point Prevalence Survey of Hospital Acquired Infections & Antimicrobial Use in European Acute Care Hospitals, May 2012 – Republic of Ireland National Report: November 2012.
3. Surgical Site Infection: Prevention and Treatment of Surgical Site Infection. London: National Collaborating Centre for Women's and Children's Health. Oct 2008.
4. Neumayer L, Hosokawa P, Itani K, El-Tamer M, Henderson WG, Khuri SF. Multivariable predictors of postoperative surgical site infection after general and vascular surgery: results from the patient safety in surgery study. Journal of the American College of Surgeons. 2007 Jun 204:1178-87.
5. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol. 1999 Nov 20:725-30.
6. Hollenbeak CS, Murphy D, Dunagan WC, Fraser VJ. Nonrandom selection and the attributable cost of surgical-site infections. Infect Control Hosp Epidemiol. 2002 Apr;23:177-82.
7. Burke JP. Infection control - a problem for patient safety. N Engl J Med. 2003 Feb 13;348:651-6.
8. Perencevich EN, Sands KE, Cosgrove SE, Guadagnoli E, Meara E, Platt R. Health and economic impact of surgical site infections diagnosed after hospital discharge. Emerg Infect Dis. 2003 Feb;9:196-203.
9. Haley RW, Culver DH, White JW, Morgan WM, Emori TG, Munn VP, Hooton TM. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. Am J Epidemiol. 1985 Feb;121:182-205.
10. Harbarth S, Sax H, Gastmeier P. The preventable proportion of nosocomial infections: an overview of published reports. J Hosp Infect. 2003 Aug;54:258-66; quiz 321.
11. Pittet D, Mourouga P, Perneger TV. Compliance with handwashing in a teaching hospital. Infection Control Program. Ann Intern Med. 1999 Jan 19;130:126-30.
12. Goetz AM, Kedzuf S, Wagener M, Muder RR. Feedback to nursing staff as an intervention to reduce catheter-associated urinary tract infections. Am J Infect Control. 1999 Oct;27:402-4.
13. Sherertz RJ, Ely EW, Westbrook DM, Gledhill KS, Streed SA, Kiger B, Flynn L, Hayes S, Strong S, Cruz J, Bowton DL, Hulgan T, Haponik EF. Education of physicians-in-training can decrease the risk for vascular catheter infection. Ann Intern Med. 2000 Apr 18;132:641-8.
14. Coopersmith CM, Rebmann TL, Zack JE, Ward MR, Corcoran RM, Schallom ME, Sona CS, Buchman TG, Boyle WA, Polish LB, Fraser VJ. Effect of an education program on decreasing catheter-related

bloodstream infections in the surgical intensive care unit. Crit Care Med. 2002 Jan;30:59-64.
15. Warren DK, Cosgrove SE, Diekema DJ, Zuccotti G, Climo MW, Bolon MK, Tokars JI, Noskin GA, Wong ES, Sepkowitz KA, Herwaldt LA, Perl TM, Solomon SL, Fraser VJ. A multicenter intervention to prevent catheter-associated bloodstream infections. Infect Control Hosp Epidemiol. 2006 Jul;27:662-9.
16. McHugh SM, Corrigan MA, Dimitrov BD, Cowman S, Tierney S, Hill AD, Humphreys H. Preventing infection in general surgery: improvements through education of surgeons by surgeons. Journal of Hospital Infection. 2011 8//;78:312-6.
17. McHugh SM, Hill AD, Humphreys H. Preventing healthcare-associated infection through education: have surgeons been overlooked? The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland. 2010 Apr;8:96-100.
18. Plowman R. The socioeconomic burden of hospital acquired infection. Euro surveillance : bulletin europeen sur les maladies transmissibles (European communicable disease bulletin). 2000 Apr;5:49-50.
19. Bagnall NM, Vig S, Trivedi P. Surgical-site infection. Surgery (Oxford). 2009 10;27:426-30.
20. Lange BJ, Weiman M, Feuer EJ, Jakobowski D, Bilodeau J, Stallings VA, Hirschl R, Bell LM, Harper J, Cnaan A. Impact of changes in catheter management on infectious complications among children with central venous catheters. Infection control and hospital epidemiology : the official journal of the Society of Hospital Epidemiologists of America. 1997 May;18:326-32.
21. Ross A, Crumpler J. The impact of an evidence-based practice education program on the role of oral care in the prevention of ventilator-associated pneumonia. Intensive & critical care nursing : the official journal of the British Association of Critical Care Nurses. 2007 Jun;23:132-6.
22. Bowater RJ, Stirling SA, Lilford RJ. Is antibiotic prophylaxis in surgery a generally effective intervention? Testing a generic hypothesis over a set of meta-analyses. Annals of surgery. 2009 Apr;249:551-6.
23. NICE. Surgical site infection - Prevention and treatment of surgical site infection. National Institute for Health and Clinical Excellence. 2008 (Clinical guideline #74).
24. SIGN. Antibiotic Prophylaxis in Surgery. Scottish Intercollegiate Guidelines Network. 2008.
25. Anderson DJ, Kaye KS, Classen D, Arias KM, Podgorny K, Burstin H, Calfee DP, Coffin SE, Dubberke ER, Fraser V, Gerding DN, Griffin FA, Gross P, Klompas M, Lo E, Marschall J, Mermel LA, Nicolle L, Pegues DA, Perl TM, Saint S, Salgado CD, Weinstein RA, Wise R, Yokoe DS. Strategies to prevent surgical site infections in acute care hospitals. Infection control and hospital epidemiology : the official journal of the Society of Hospital Epidemiologists of America. 2008 Oct;29 Suppl 1:S51-61.

A Less Invasive Approach to Screening for Early Onset Neonatal GBS

S Glackin, J Miletin, AM Deasy
Coombe Women & Infant's University Hospital, Cork St, Dublin 8

Abstract
Recent recommendations for the management of an asymptomatic term infant with one septic risk factor for Group B Streptococcal (GBS) invasive disease have advised a clinical approach.[1] Following a previous audit in our unit which showed that high numbers of asymptomatic infants were receiving antibiotics, a new protocol was introduced which emphasised the importance of clinical examination. This study assessed the safety and efficacy of this new protocol through chart review of 1855 eligible infants. We found a statistically significant decrease (P<0.0001) from 444 (19%) to 121 (6.5%) in the total number of term infants who underwent septic evaluations and received antibiotics. 241 asymptomatic infants with one septic risk factor were managed conservatively. No eligible infants had GBS invasive disease during the three month study period. The new protocol is a safe and effective tool for evaluating infants at risk of GBS invasive disease.

Introduction

Neonatal sepsis is a devastating condition associated with significant morbidity and mortality most commonly caused by GBS. The incidence for early onset GBS (EOGBS) invasive disease varies from 0.35/1000 live births in the U.S to 0.5/1000 live births in the U.K and Ireland.[1,2]15-40% of pregnant women are colonised with GBS.[3] Case fatality rate is approximately 2-3% for EOGBS disease in term infants.[1] The risk of sepsis in an asymptomatic infant with risk factors for sepsis is low but clinically significant (0.5-1.0%).[4] However, most infants (approx. 90%) who develop EOGBS invasive disease will be symptomatic within 24 hours after birth. Only 65% of these infants will have had at least one perinatal septic risk factor.[5] In 2012 a survey of the different guidelines used in the UK showed little consensus on this issue with 125 different guidelines identified for 157 neonatal units.[6] The RCOG guidelines recommend that infants with one GBS septic risk factor and no clinical signs should be carefully observed for the first 24 hours.[5] In 2010 the Centre for Disease Control and prevention (CDC) changed their guidelines to improve the management of asymptomatic infants at risk for invasive EOGBS disease and thereby decrease unnecessary evaluation, antibiotic exposure and separation of mother and infant.[1]

Many units use broad-spectrum intravenous (IV) antibiotics such as Penicillin to cover GBS and Gentamicin to cover E-coli. The toxic effects of Gentamicin are well known including ototoxicity and nephrotoxicity. A single dose of a Gentamicin can cause permanent hearing loss in genetically predisposed individuals.[12] Broad-spectrum antibiotics can also increase the risk of resistant bacteria at a later stage. Early infant antibiotic exposures have also been linked to increased risk of wheezing in children,[13] and can affect the developing intestinal microbiome, increasing the risk of gastrointestinal disease,[14] as well as intussusception and autoimmune diseases. However in the case of suspected neonatal invasive disease, these antibiotics are the most effective. In 2011 a retrospective audit on septic evaluations was performed in our neonatal unit. Following this, a new protocol, Figure 1, was introduced for the management of term infants with septic risk factors. This emphasised the importance of clinical examination and highlighted that for suspected maternal chorioamnionitis or in a symptomatic infant, a septic evaluation and antibiotics are always indicated. However, in infants with one septic risk factor who are asymptomatic, the new protocol recommended that four hourly clinical observations be performed by the nursing staff and that four and twelve hourly medical reviews be performed for 48 hours by the senior house officer (SHO).

The primary outcome of this study was the number of septic evaluations performed and antibiotic exposure in asymptomatic term infants with one septic risk factor following introduction of the new protocol. We hypothesised that we had performed less unnecessary blood tests and given fewer unnecessary antibiotics.

Our secondary outcomes included identifying any symptomatic infants on the postnatal ward with a septic risk factor from observations and medical review, comparing these with the number of symptomatic infants identified on the postnatal ward without a septic risk factor, and analysing the economic cost implications of our new protocol.

Methods

Two independent reviewers performed a retrospective chart review of the babies born at term (= 37+0 weeks of gestation) from 1st July to 30th September 2012 in our tertiary maternity centre (Coombe Women and Infants University Hospital). We excluded infants with significant congenital defects such as congenital heart disease, spina bifida, and surgical gastrointestinal conditions which would increase their risk of sepsis. Details of birth gestation, mode of delivery, presence or absence of septic risk factors, maternal antibiotics, Apgar scores, clinical symptoms, blood tests performed, blood results and duration of any antibiotics were recorded. The clinical symptoms observed and identified as symptoms of suspected sepsis are listed in Table 1. Neither written informed consent nor research ethic committee approval was sought as this was an audit of the changed clinical practice in our centre. The data was analyzed using a PC-based statistics package (StatsDirect version 3.0.97). The data was analysed using a PC-based statistics package (StatsDirect version 3.0.97). Descriptive statistics and Fisher exact test were used for the outcomes as appropriate.

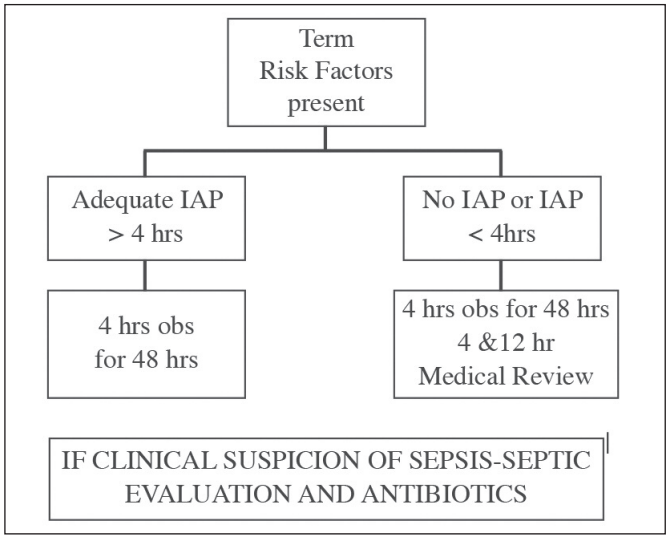


Figure 1 Policy for evaluation of an asymptomatic term infant ≥37 weeks with one septic risk factor for sepsis present Term risk factors include: Prolonged rupture of membranes (PROM) ≥18 hours; maternal GBS positive high vaginal swab (HVS) during current or previous pregnancy; maternal GBS positive urinalysis during pregnancy; previous infant with GBS invasive disease; fetal tachycardia in labour; maternal pyrexia in labour.

Results

The results of the primary audit showed that 444 (19%) out of 2375 term infants born in the Coombe Hospital in the three month audit period in 2011 had septic evaluations which included an FBC, a serum CRP and a blood culture performed and received IV antibiotics. This was similar to International data (approx. 15%). Of these 444 septic evaluations, 242 (54.5%) were asymptomatic infants with one septic risk factor such as prolonged rupture of membranes (PROM) or maternal GBS positive high vaginal swab (HVS). The other 202 (45.5%) were performed on symptomatic infants with suspected invasive disease or those with multiple septic risk factors. Of the total septic evaluations performed, 2.5% (11) had positive blood cultures, 1.2% (5) of which were GBS positive and only one of whom had a septic risk factor. All of these GBS positive infants were clinically symptomatic. They concluded that the 4 (80%) of GBS positive infants had no known septic risk factors and that the 0% (0 of 242) asymptomatic infants who had septic evaluations and antibiotics for one septic risk factor had a positive blood culture or raised CRP. The annual incidence of EOGBS in our hospital ranged from 0.45/1000 live births to 0.68/1000 live births between 2009 and 2011. Following the introduction of the new protocol, Figure 1, a re-audit was performed. 1855 charts of infants who were eligible for inclusion were reviewed from the time period.

Table 1 Clinical Symptoms of invasive GBS disease

Respiratory symptoms
Pallor
Lethargy
Irritability
Poor feeding
Early onset jaundice
Seizures
Temperature instability
Tachycardia
Abdominal distention
Significant vomiting including bilious vomiting

Table 2 Total number of infants with septic risk factors at delivery=344. Total number of infants who had no known septic risk factors at birth=1511

	Infants with septic risk factors who had an immediate septic evaluation.	Infants with septic risk factors who had 4/12 hourly medical review and 4 hourly observations	Infants with septic risk factors who had a delayed septic evaluation	Infants with no known septic risk factors who had a septic evaluation
Number of Infants	83 (4.5% cohort)	261	20 (1.1% of cohort, 7.7% of review group)	18
Blood C/S positive (sepsis)	0	N/A	0	0
Blood C/S positive (contaminant)	0	N/A	0	1
Raised CRP	2	N/A	6	2
Antibiotics >48 hours	5	N/A	6	3
GBS positive	0	N/A	0	0

We found that 344 infants had septic risk factors and of these infants, 83 (4.5%) had septic evaluations and received IV antibiotics immediately after delivery. See Figure 2. Of the initial septic evaluations, two had a raised CRP while none had a positive blood culture. Of these infants, five were clinically unwell and received antibiotics for >48 hours despite their negative blood cultures. 261 infants with one septic risk factor were allocated as per the new protocol to four hourly observations for 48 hours if the mother had received adequate intrapartum antibiotics (IAP) (i.e >2 doses or 1 dose > 4 hours before delivery) or four hourly observations and a four and twelve hourly medical review for 48 hours if the mother had received inadequate IAP. 241 infants

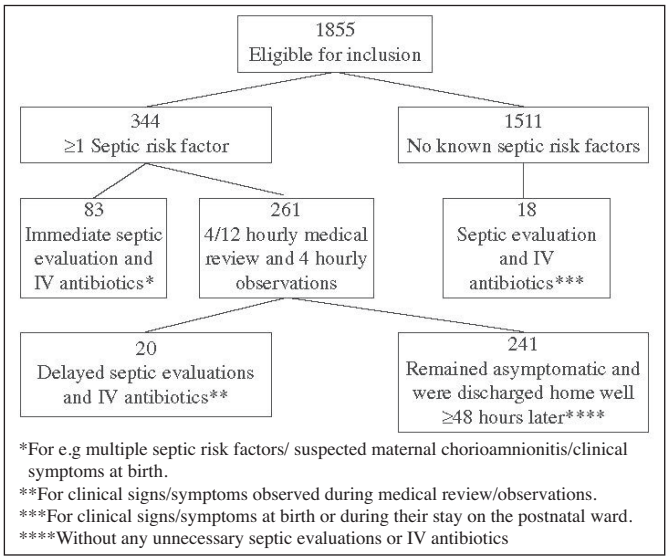


Figure 2 In the first 3 months following the introduction of the new protocol, there were 1855 term infants eligible for inclusion

remained asymptomatic. 20 infants were identified as symptomatic on the postnatal ward. These infants all had septic evaluations performed on identification and received IV antibiotics. None of these infants were blood culture positive however 6 had raised CRPs and received >48 hours IV antibiotics. See Table 2. 1511 infants in this time period had no septic risk factors. 18 infants were identified as having clinical symptoms of sepsis either at birth or during routine observations/ checks on the postnatal ward. None had a blood culture positive sepsis, however one had a blood culture positive suspected as contamination. Two other infants with raised CRPs had >48 hours IV antibiotics. We calculated that at least eleven thousand five hundred euro was saved by the unit in this three month audit period due to less on call blood tests being performed and analysed, which equates to annual savings of nearly fifty thousand euro.

Discussion

As previously mentioned, the RCOG and the CDC have recently changed their guidelines encouraging a more clinical and less invasive approach to infants with one septic risk factor. We confirmed our hypothesis that we are performing less septic evaluations and giving fewer courses of antibiotics. We reduced the numbers of septic evaluations performed and antibiotics given from 19% to 6.5% ($p<0.001$), of the total number of term babies born in those three months. In 2011, 242 (10%) of all term infants had septic evaluations and received antibiotics immediately after birth for one septic risk factor despite being asymptomatic, while in 2012, 241(13%) asymptomatic infants with one septic risk factor were safely managed conservatively. We also showed that four hourly clinical observations and four and twelve hourly medical reviews of infants with one septic risk factor successfully identified symptomatic infants. There was no difference between the numbers of infants with and without septic risk factors that were identified as symptomatic on the postnatal ward. No infants became significantly unwell and there were no known morbidities and no mortalities. We cannot calculate a sensitivity or specificity of our screening tool as we do not have any blood culture confirmed sepsis during this period. It could be argued that we could not definitively state that no unwell infants had been missed, however as all infants get a postnatal check before discharge, a symptomatic infant would have been identified. In the US and in many European countries, all mothers are screened for GBS antenatally, with a positivity rate of 15-40%.[3] The policy is that these mothers should be covered with IAP, usually in the form of a Penicillin. However, it has been found that even with adequate IAP, EOGBS infection in term infants in these countries is still a significant burden.[1,8,9] In Ireland and in the UK, screening is not performed routinely. IAP are recommended in certain situations in our hospital such as intrapartum pyrexia >38°C, previous baby with GBS disease or delivery at < 37 weeks with PROM >18 hours. However, the evidence for this is inconsistent.[9] Some centres perform 18 hour CRP measurement as an indication of sepsis in infants. This has a 64% sensitivity and 56% specificity with a negative predictive value (NPV)of 93% and a positive predictive value (PPV) of 14%.[10] However, many diagnostic tests for neonatal sepsis have a poor PPV. The use of procalcitonin can also be used in the evaluation of sepsis.[11]

We did not evaluate late onset GBS (LOGBS) invasive disease, which has an incidence of 0.24 per 1000 live births for term infants.[15] Most mothers in these cases are GBS carriers and IAP have been associated with delayed presentation of symptoms and milder late onset sepsis. However, neither septic evaluations nor early antibiotics have been shown to prevent infants from developing LOGBS invasive disease. Our study shows that we were able to perform less septic evaluations and give fewer antibiotics to asymptomatic term infants with 1 septic risk factor without compromising the safety of infants who became symptomatic or unwell. We calculated that nearly fifty thousand euro per year were saved with this new protocol. We interviewed the SHOs who performed the frequent medical reviews. Subjectively they advised that the collective time performing the medical reviews was less than the collective time and stress it would take to perform septic evaluations on these infants. We suggest that this new protocol, Figure 1, of observational and medical review could be introduced in other hospitals who are performing septic evaluations and giving antibiotics unnecessarily to well term infants with one septic risk factor. We emphasise the importance of clinical exam in all cases whether or not septic risk factors are known.

Correspondence: S Glackin
Our Lady's Children's Hospital, Crumlin, Dublin 12

References

1. Verani JR, McGee L, Schrag SJ. Prevention of perinatal group B streptococcal disease. Morbidity and Mortality Weekly Report (MMWR), Revised Guidelines from CDC, Recommendations and Reports. 2010;59:1-32.
2. NHS U. The UK NSC policy on Group B Streptococcus screening in pregnancy. nhs.uk: NHS; 2012.
3. Stoll BJ, Hansen NI, Sánchez PJ, Faix RG, Poindexter BB, Van Meurs KP, Bizarro M, Goldberg R, Ivan F, Hale E. Early onset neonatal sepsis: the burden of group B Streptococcal and E. coli disease continues. Pediatrics. 2011;127:817-26.
4. Polin RA, Papile L-A, Baley JE, Bhutani VK, Carlo WA, Cummings J, Kumar P, Tan R, Wang K, Watterberg K. Management of neonates with suspected or proven early-onset bacterial sepsis. Pediatrics. 2012;129:1006-15.
5. RCOG. The Prevention of Early-onset Neonatal Group B Streptococcal Disease. 2012.
6. Behjati S, Prentice P, Rennie J. Management of Group B streptococcal sepsis risk in well, term newborns. Acta Paediatrica. 2012;101:128-31.
7. Escobar GJ, Li D-k, Armstrong MA, Gardner MN, Folck BF, Verdi JE, Xiong B, Bergen R. Neonatal sepsis workups in infants= 2000 grams at birth: a population-based study. Pediatrics. 2000;106:256-263.
8. Schrag SJ, Verani JR. Intrapartum antibiotic prophylaxis for the prevention of perinatal group B streptococcal disease: Experience in the United States and implications for a potential group B streptococcal vaccine. Vaccine. 2013;31:D20-D6.
9. Ohlsson A, Shah VS. Intrapartum antibiotics for known maternal Group B streptococcal colonization. Cochrane Database Syst Rev. 2013;1.
10. Lacaze-Masmonteil T, Rosychuk RJ, Robinson JL. Value of a single C-reactive protein measurement at 18 h of age. Archives of Disease in Childhood-Fetal and Neonatal Edition. 2014;99:F76-F9.
11. Stocker M, Hop WC, van Rossum AM. Neonatal Procalcitonin Intervention Study (NeoPInS): Effect of Procalcitonin-guided decision making on Duration of antibiotic Therapy in suspected neonatal early-onset Sepsis: A multi-centre randomized superiority and non-inferiority Intervention Study. BMC pediatrics. 2010;10:89.
12. Bitner-Glindzicz M, Pembrey M, Duncan A, Heron J, Ring SM, Hall A, Rahman S. Prevalence of mitochondrial 1555A? G mutation in European children. New England Journal of Medicine. 2009;360:640-2.
13. Alm B, Erdes L, Möllborg P, Pettersson R, Norvenius SG, Åberg N, Wennergren, G. Neonatal antibiotic treatment is a risk factor for early wheezing. Pediatrics. 2008;121:697-702.
14. Torrazza RM, Neu J. The developing intestinal microbiome and its relationship to health and disease in the neonate. Journal of Perinatology. 2011;31:S29-S34.
15. Berardi A, Rossi C, Lugli L, Creti R, Reggiani MLB, Lanari M, Memo L, Pedna MF, Venturelli C, Perrone E. Group B streptococcus late-onset disease: 2003–2010. Pediatrics. 2013;131:e361-e8.

An Audit of Prescribing Practices for Benzodiazepines and Z-Drugs

C Cadogan[1,2], S Ryder[1]
[1]School of Pharmacy and Pharmaceutical Sciences, Trinity College, Dublin 2
[2]School of Pharmacy, Queen's University, Belfast, Northern Ireland

Abstract
Concerns persist over the use of benzodiazepines and Z-drugs in Ireland. A prospective prescription audit was conducted in 81 community pharmacies across Ireland over a four week period. The study sought to assess the level of prescription compliance with key components of benzodiazepine and Z-drug prescribing guidelines. 28% of audit booklets issued were returned, yielding data on 4,418 prescriptions. The findings suggest that little progress has been made in improving the prescribing of benzodiazepines and Z-drugs in Ireland in the decade since publication of the Benzodiazepine Committee's report. Fewer than one fifth of prescriptions (18.8%) were fully compliant with the assessment criteria and the majority (53.7%) had multiple discrepancies. This study highlights the importance of monitoring and auditing benzodiazepine and Z-drug prescribing practices. Interventions involving patients, prescribers and pharmacists are required to improve the prescribing and use of these medications in Ireland.

Introduction

Despite publication of the Benzodiazepine Committee's report[1] and good practice guidelines[2] in 2002, there is evidence that inappropriate benzodiazepine prescribing (i.e. prescribing for durations in excess of 2-4 weeks) persists in Ireland in both general practice[3] and residential care settings[4]. There are also ongoing concerns over the extent to which benzodiazepines are implicated nationally in cases of problem drug use[5] and deliberate self-harm[6]. The use of Z-drugs (e.g. zopiclone, zolpidem) has reportedly increased over time in Ireland[1] and other European countries[7]. Any trend towards increased use of Z-drugs over benzodiazepines would not constitute a favourable development as there is no compelling evidence of a clinically useful difference between benzodiazepines and Z-drugs in terms of their effectiveness or potential for adverse effects, dependence or abuse[8]. The Benzodiazepine Committee stated that its recommendations applied equally to benzodiazepines and Z-drugs owing to similarities in the two drug classes' pharmacology[1]. The lack of any distinct difference in clinical benefit between the two classes is further reflected by the addition in 2012 of Z-drugs to the Beers criteria, some of the most widely used criteria for assessing potentially inappropriate prescribing in older patients[9].

The Benzodiazepine Committee recommended the introduction of a system for auditing benzodiazepine prescribing in Ireland[1]. It was intended that prescribing practices would be reviewed regularly and that appropriate support and advice would be provided to prescribers where required. However, it took almost a decade for this recommendation to be acted upon[10]. This study was conducted prior to implementation of the national auditing system. The aim of the study was to assess benzodiazepine and Z-drug prescribing practices in terms of the level of prescription compliance with key components of the relevant prescribing guidelines[2] relating to prescribed dose, duration and patients' age profile. Previous evaluations[11,12] have focused on estimating general parameters such as prevalence of use from prescription claims data as opposed to assessing the quality of individual prescriptions. As amendments to the existing Misuse of Drugs Regulations are currently being considered by government[13] which, if passed into law, will have significant implications for the prescribing of benzodiazepines and Z-drugs in Ireland, it is timely to report the results of this assessment.

Methods

An audit of benzodiazepine and Z-drug prescriptions was conducted prospectively by a convenience sample of community pharmacists over a four week period in 2011. Pharmacists were recruited using a randomised and geographically stratified quota sampling method. A total of 290 pharmacists across the Republic of Ireland agreed to receive an audit booklet with a view to possible participation. The study was entirely anonymous. Pharmacists were issued a booklet in which they could evaluate up to 120 prescriptions using a questionnaire-styled system with Yes/No response options. Evaluation was based on prescription compliance with key guideline recommendations[2] relating to prescribed dose, patient age and treatment duration (see Table 1). The audit questions were designed to assess prescribing practices while simultaneously being quick and easy to complete. No distinctions were made between health schemes. It was intended that all benzodiazepine and Z-drug prescriptions would be evaluated prospectively by participating pharmacists as they were presented in the pharmacy over a continuous four week period. Data validation and analysis were undertaken using SPSS v.18 (SPSS Inc., Chicago, IL, USA). Ethical approval was granted by the Faculty of Health Sciences Research Ethics Committee, Trinity College Dublin.

Table 1. Prescription evaluation questions

1. Does the prescribed dose comply with the licensed dose?
2. Is the prescribed dose the lowest recommended dose?
3. Does the prescribed dose match the patient's age profile? (i.e. in the case of elderly patients the recommended dose for the majority of these drugs is half the adult dose)
4. Is the duration of treatment compliant with the recommended period of not longer than two to four weeks?
5. Does the prescription specify that the prescription can be repeated?

Results

Response rate

81 booklets with usable data were returned, yielding a response rate of 28%. Data were received from at least one pharmacy in each county in the Republic of Ireland with the exception of counties Clare and Westmeath. A further 7 booklets were returned that did not specify the county in which they were completed.

General analysis

Data were collected on a combined total of 4,418 prescriptions. Following validation of the dataset, 253 (5.7%) prescriptions were either incompletely assessed (n=28) or deemed to have at least one conflicting response (n=225), such as stating that the dose was both unlicensed and the lowest recommended. These prescriptions were excluded from detailed analysis, yielding 4,165 valid prescription records. Summary statistics of the number of prescriptions per evaluation booklet are shown in Table 2. Excluding the small number of invalid records had no significant impact on the

Table 2 Number of prescriptions per evaluation booklet

	All prescriptions (n=4418)	Valid prescriptions (n=4165)
Mean	54.5	51.4
Std. Deviation	36.2	33.8
Median	43	41
IQR	24– 83	24 - 74
Mode	120*	43
Minimum	9	8
Maximum	120	119

*6 booklets were received with data recorded for the maximum number of prescriptions

overall results. Analysis of the 4,165 valid records is presented in Figure 1.

The compliant prescription

Figure 2 shows that fewer than one fifth (18.8%) of prescriptions complied with all the assessment criteria. The majority of prescriptions (53.7%) had at least two discrepancies and more than a quarter (27.3%) had three or more discrepancies.

Discussion

The results indicate that benzodiazepines and Z-drugs continue to be widely and frequently prescribed in Ireland, as data were collected on a large volume of prescriptions over a relatively short period. If prescriptions were assessed over the intended four week timeframe, and taking the average number of prescriptions evaluated (n = 54.5) across the 81 participating pharmacies, this would yield an average of approximately two prescriptions presented in each pharmacy daily. This is consistent with the findings of our previous research[14], as well as annual reports of national reimbursement claims data published by the Primary Care Reimbursement Service which have repeatedly shown that benzodiazepines and Z-drugs feature among the most commonly dispensed medications on both public and private health schemes in Ireland[15]. The findings also indicate that there is not uniform adherence to the recommendations and prescribing guidelines published by the Benzodiazepine Committee more than a decade ago. For example, fewer than one in five prescriptions (18.8%) complied with all the key guideline criteria[2] and the majority of prescriptions (53.7%) had at least two discrepancies. The most commonly identified problems were that the lowest recommended dose was not prescribed (59.5% of cases) and the duration of treatment was non-compliant with the recommended period (54.1% of cases). These findings are consistent with previous related research[11,12,16]. For example, the percentage of prescriptions that were non-compliant in terms of treatment duration (54.1%) closely mirrors the findings of Henman et al.[11] who reported that in 2002 almost half (48.9%) of General Medical Services (GMS) patients in the former North Eastern Health Board region receiving benzodiazepines or Z-drugs were obtaining them for extended periods (i.e. longer than 3 months). While there may have been cases where prescribers were justified in deviating from guideline recommendations for reasons not immediately apparent to participating pharmacists, it is unlikely that such cases could have accounted for the high level of discrepancies identified in the current study. Overall, the findings suggest that little progress has been made in improving the prescribing of these medications in Ireland since publication of the Benzodiazepine Committee's report.

The interim National Drugs Strategy[17] noted that implementation of the Benzodiazepine Committee's recommendations had been slow and among the issues relating to the Committee's report needing to be addressed were the monitoring of prescribing practices, inappropriate use/supply and guideline implementation. Subsequent to this study there have been a number of important developments with direct implications for the prescribing of benzodiazepines and Z-drugs in Ireland. An auditing system of prescribing practices has been implemented nationally[10] and self-auditing has been endorsed by the Irish College of General Practitioners, with guidance available to GPs on completing the various stages of a benzodiazepine prescribing audit cycle[18]. In addition, amendments to the existing Misuse of Drugs Regulations are currently being considered by government[13]. However, these measures alone are unlikely to be sufficient in effecting the changes necessary to improve benzodiazepine and Z-drug prescribing practices. Audit coupled with feedback can be effective in improving professional practice but the effects are generally small to moderate[19]. Furthermore, experience from implementing additional legislative measures has found that some degree of reduction in benzodiazepine use can be achieved but with the potential for unintended consequences, such as

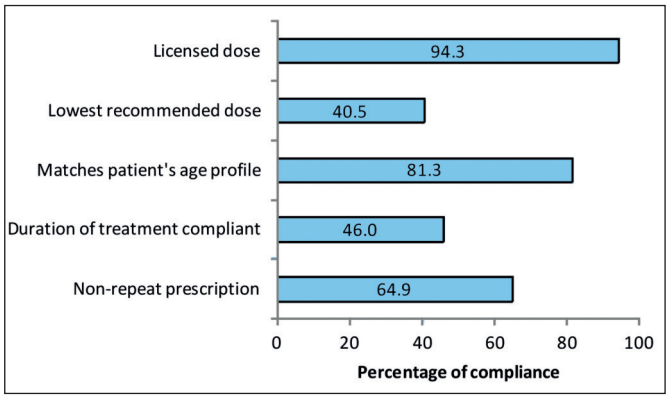


Figure 1 General analysis of prescription compliance (n=4165)

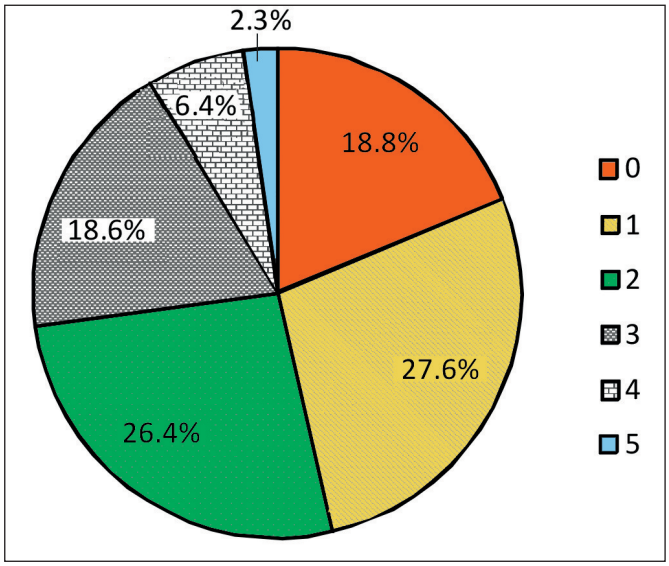


Figure 2 Number of prescribing guideline discrepancies per prescription (n=4165)

benzodiazepines being replaced with less favourable drug alternatives[20].

The current study has a number of strengths. Firstly, participation was entirely voluntary and no form of incentive was offered. This supports the findings as an objective and unbiased assessment of benzodiazepine and Z-drug prescribing practices in Ireland. The relatively low proportion (5%) of overall prescriptions that had conflicting responses indicates that participating pharmacists were both capable and reliable in carrying out the assessment correctly and consistently. Owing to the sampling method employed and the 28% response rate, the possibility of response bias cannot be excluded. However, the participation rate was comparable to or greater than that in other benzodiazepine prescribing evaluations[21-23] which relied on voluntary GP participation. A high volume of prescription data was obtained from a wide geographical spread which strengthens the findings as an assessment of prescribing practices on a national scale. In designing the evaluation questions, it was felt that it that would be more practical to have one set of assessment questions with relatively universal applicability to all prescription types, rather than making distinctions based on individual health schemes. Based on the volume of prescriptions on which data were collected, as well as informal feedback, it would appear that this held true in practice. However, this carried an inherent limitation for the study insofar as the assessments made relating to duration of treatment and repeat prescribing were curtailed by the health scheme set-up in Ireland and are likely to represent an underestimate. This is because GMS prescriptions are typically issued for a maximum duration of four weeks. Despite the existence of specific repeat

GMS prescription forms, it is not uncommon for repeat supplies to be issued on identical single prescription forms that have been forward dated. This means that single GMS prescriptions, when assessed on an individual basis, could appear to comply with the recommended duration. However, without actually specifying repeat supply, post-dated GMS prescriptions could effectively facilitate it. Thus the actual proportion of prescriptions that were non-compliant in terms of treatment duration and repeat supply is likely to be higher than reported.

As was acknowledged by the Benzodiazepine Committee[1], any single initiative is limited in the extent of the contribution it can make to address the problems associated with the use of drugs such as benzodiazepines and Z-drugs. However, evaluations of prescribing can provide valuable insights which are important in the process of changing prescribing practices[24]. As already noted, the use of community pharmacists for this study meant prescriptions were reviewed in the absence of information from prescriber-patient consultations that might have influenced prescribing decisions, hence the factors underlying deviations from guidelines could not be explored. However, the detected frequency of extended duration and repeat prescriptions, in particular, reveals the potential scope for other forms of intervention such as brief interventions[25], which have shown considerable promise in reducing long-term benzodiazepine use. The study also shows the importance of, and necessity for, ongoing national monitoring and auditing of prescribing practices for benzodiazepines and Z-drugs. Based on the findings, interventions involving patients, prescribers and pharmacists should be pursued to improve the prescribing and use of benzodiazepines and Z-drugs in Ireland.

Correspondence: S Ryder
School of Pharmacy and Pharmaceutical Sciences, Trinity College, Dublin 2
Email: sryder@tcd.ie

Acknowledgements
The researchers are grateful to all of the community pharmacists who participated in this study.

Funding
C Cadogan was supported in undertaking this research by an Ussher Fellowship awarded by TCD.

References

1. Ireland. Benzodiazepine Committee, Report of the Benzodiazepine Committee 2002, Dublin: Department of Health and Children.
2. Ireland. Department of Health and Children, Benzodiazepines: Good practice guidelines for clinicians. 2002, Dublin: Department of Health and Children.
3. Ryan C, O'Mahony D, Kennedy J, Weedle P, Byrne S. Potentially inappropriate prescribing in an Irish elderly population in primary care. Br J Clin Pharmacol, 2009. 68: 936-47.
4. Ryan C, O'Mahony D, Kennedy J, Weedle P, Cottrell E, Heffernan M, O'Mahony B, Byrne S. Potentially inappropriate prescribing in older residents in Irish nursing homes. Age Ageing, 2013. 42: 116-20.
5. Bellerose D, Lyons S, Carew AM, Walsh S, Long J. Problem benzodiazepine use in Ireland: treatment (2003 to 2008) and deaths (1998 to 2007). HRB Trends Series 9, 2010, Health Research Board: Dublin.
6. National Suicide Research Foundation, National Registry of Deliberate Self Harm Annual Report 2011, 2012, National Suicide Research Foundation: Cork.
7. Reed K, Bond A, Witton J, Cornish R, Hickman M, Strang J. The changing use of prescribed benzodiazepines and Z-drugs and of over-the-counter codeine-containing products in England: a structured review of published English and international evidence and available data to inform consideration of the extent of dependence and harm, 2011 The National Addiction Centre, King's College London and the School of Social and Community Medicine, University of Bristol.
8. National Institute for Health and Clinical Excellence, Guidance on the use of zaleplon, zolpidem and zopiclone for the short-term management of insomnia. 2004.
9. American Geriatrics Society 2012 Beers Criteria Update Expert Panel, American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc, 2012. 60: 616-31.
10. Shannon, J. HSE benzodiazepine letters to encourage quality prescribing. 2012; Available from: http://www.medicalindependent.ie/page.aspx?title=hse_benzodiazepine_letters_to_encourage_quality_prescribing.
11. Henman M, Vivero L, Gustafsson A, Mulvenna K. Benzodiazepine usage in the North Eastern Health Board region of the Republic of Ireland, 2004, Trinity College Dublin.
12. Flynn, K., Minor tranquillisers and sedatives: Use and misuse in the West of Ireland, 2009, Western Region Drugs Task Force: Galway, Ireland.
13. Department of Health (Ireland), Consultation draft: Misuse of Drugs (Amendment) Regulations, 2013 to amend the Misuse of Drugs Regulations, 1988 as amended, 2013.
14. Cadogan CA, Ryder SA. Community pharmacists' views on benzodiazepine prescribing and supply. Int J Clin Pharm, 2012. 34: 238.
15. Primary Care Reimbursement Service. Annual reports of statistical analysis of claims and payments (2005-2011). Available from: http://www.hse.ie/eng/staff/PCRS/PCRS_Publications/.
16. Cahir C, Fahey T, Teeling M, Teljeur C, Feely J, Bennett K. Potentially inappropriate prescribing and cost outcomes for older people: a national population study. Br J Clin Pharmacol, 2010. 69: 543-52.
17. Ireland. Department of Community Rural and Gaeltacht Affairs, National Drugs Strategy (interim) 2009-2016, 2009, Department of Community, Rural and Gaeltacht Affairs: Dublin.
18. Irish College of General Practitioners. Benzodiazepine prescribing: Sample audit. 2012; Available from: http://www.icgp.ie/speck/properties/asset/asset.cfm?type=Document&id=E9A952A6-19B9-E185-8327C068C400C284&property=document&filename=BENZODIAZEPINE_PRESCRIBING_060613.pdf&revision=tip&mimetype=application%2Fpdf&app=icgp&disposition=attachment.
19. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD. Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database Syst Rev, 2012. 6: p. CD000259.
20. Fisher J, Sanyal C, Frail D, Sketris I. The intended and unintended consequences of benzodiazepine monitoring programmes: a review of the literature. J Clin Pharm Ther, 2012. 37: 7-21.
21. Hughes IM, Holden JD, Tree AM. Audit as a method of reducing benzodiazepine prescribing in general practice. Journal of Clinical Effectiveness, 1997. 2: 79-82.
22. Pimlott NJ, Hux JE, Wilson LM, Kahan M, Li C, Rosser WW. Educating physicians to reduce benzodiazepine use by elderly patients: a randomized controlled trial. CMAJ, 2003. 168: 835-9.
23. Baker R, Farooqi A, Tait C, Walsh S. Randomised controlled trial of reminders to enhance the impact of audit in general practice on management of patients who use benzodiazepines. Qual Health Care, 1997. 6: 14-8.
24. de Vries CS, Tromp TF, Blijleven W, de Jong-van den Berg LT. Prescription data as a tool in pharmacotherapy audit (I). General considerations. Pharm World Sci, 1999. 21: 80-4.
25. Mugunthan K, McGuire T, Glasziou P. Minimal interventions to decrease long-term use of benzodiazepines in primary care: a systematic review and meta-analysis. Br J Gen Pract, 2011. 61: e573-8.

Prediction of Hospital Mortality by Changes in the Estimated Glomerular Filtration Rate (eGFR)

E Berzan, G Mellotte, B Silke
Division of Internal Medicine, St James's Hospital, James's St, Dublin 8

Abstract
Deterioration of physiological or laboratory variables may provide important prognostic information. We have studied whether a change in estimated glomerular filtration rate (eGFR) value calculated using the (Modification of Diet in Renal Disease (MDRD) formula) over the hospital admission, would have predictive value. An analysis was performed on all emergency medical hospital episodes (N= 61964) admitted between 1 January 2002 and 31 December 2011. A stepwise logistic regression model examined the relationship between mortality and change in renal function from admission to discharge. The fully adjusted Odds Ratios (OR) for 5 classes of GFR deterioration showed a stepwise increased risk of 30-day death with OR's of 1.42 (95% CI: 1.20, 1.68), 1.59 (1.27, 1.99), 2.71 (2.24, 3.27), 5.56 (4.54, 6.81) and 11.9 (9.0, 15.6) respectively. The change in eGFR during a clinical episode, following an emergency medical admission, powerfully predicts the outcome.

Introduction

St James' Hospital (SJH) is a tertiary referral centre for various specialties, but is on continuous call for emergency medical admissions. In 2002 there was a major reorganisation of acute care with the establishment of an Acute Medical Admissions Unit (AMAU). Following this system change, key quality markers including hospital length of stay; hospital emergency department 'wait-times' [1], in-hospital mortality and readmissions were improved[2,3]. Further improvement in the outcomes for unselected emergency medical admissions may be achieved by closer monitoring and early detection of deteriorating patient. Previous studies have shown that deterioration in the clinical status of patients can be anticipated by changes in physiological parameters[4] and laboratory variables[5,6]. Much work had been completed in this field, focusing on both physiological- and laboratory-derived variables, alone or in combination[6,7]. This has led to the development of Early Warning Systems tools for ward based patients to identify patients at risk and prevent further deterioration[7,8].

Emergency medical patients have frequent blood and biochemistry analyses; on our electronic patient record, there is an automated calculation of the GFR value following each creatinine determination. A more robust estimate of the glomerular function can be made using the Modification of Diet in Renal Disease (MDRD) formula, which was devised in 1999.[9] It uses six variables—age, race, gender, serum creatinine, urea and albumin levels. The MDRD formula to estimate GFR has not been validated in acute kidney injury[9], however, standing alone; some of the variables used in these equations have been independently shown to predict mortality in an acute setting[10,11]. We have previously demonstrated that admission eGFR can predict the in-hospital mortality in emergency medical admissions[12]. Used in the latter context, the eGFR represents an aggregate predictive score with significant evidence for these[8,13,14]. The aim of this study therefore, was to explore how the eGFR value might change during an acute hospital admission, and whether it could be used to predict in-hospital mortality. The setting was a study of all unselected acute medical emergencies admitted to a large university teaching hospital over a 10-year period between January 2002 and December 2011.

Methods

An anonymous dedicated patient database was created in 2002 to characterise emergency admitted patients, using components from the administration system (PAS), the emergency department database, and the hospital biochemical, haematology and microbiological databases; some discharge and procedural codes were derived from the hospital in-patient enquiry (HIPE) scheme (Table 1). The admission and discharge eGFR values were used to calculate the delta GFR value, the change during the hospital episode. The extended MDRD equation (MDRD Value = 170 x Sr. Creatinine–0.999 x Age–0.176 x [0.742 if Female] x [1.210 if Black] x BUN–0.176 x Albumin+0.318) was utilized. We categorised patients by any improvement in delta GFR (Group I) or of this variable over the clinical episode: deteriorations were of <= 5 (Group II), > 5 <=10 (Group III), 10 <=20 (Group IV), 20 <=40 (Group V) and > 40 ml/min-1/m^2 (Group VI). Mortality was any in-hospital death at a designated cut-offs; we examined the association of change in eGFR from admission, at designated cut-offs of 24 hr, 72 hr, 7 day, 14 and 30 days on mortality by that point. Descriptive statistics for baseline demographic data included, as appropriate, means / standard deviations (SD), medians / inter-quartile ranges (IQR) or percentages. Comparisons between categorical variables and mortality were with Chi-square tests. We examined the association between mortality at cut-offs (24 hr, 72 hr, 7 day, 14 day and 30 day) and the following predictor variables: age, change in eGFR over the hospital episode, the O2 saturation and troponin status (all at time of presentation in the Emergency Department).

Table 1 Details of emergency medical admissions 2002 – 2011

Variable	
Gender	
Male	30298 (48.9%)
Female	31666 (51.1%)
Total	61964 (100%)
Age (years)	
Median (IQ range)	63.8 (43.2 – 78.0)
Length stay (days)	
Median (IQ range)	5.9 (2.4 – 12.9)
Charlson Co-morbidity Index	
0	30957 (50.0 %)
1	18030 (29.1 %)
2	12977 (20.9 %)

Results

Renal function over time

The median GFR at admission was 75.3 ml/min/1.73m2 (IQR: 53.8, 97.7); the grouped data suggested an increase following admission being at 24 hr – 87.4 ml/min/1.73m2 (IQR: 67.2, 107.6), at 72 hr – 85.7 ml/min/1.73m2 (IQR: 64.7, 106.8), at 7 day – 80.8 ml/min/1.73m2 (IQR: 59.9, 101.8) and at 30 days – 72.5 ml/min/1.73m^2 (IQR: 52.9, 93.2). However, as patients had different lengths of hospital stay; direct comparisons must be done to establish whether on a paired basis patients dropped their MDRD value over time. Most patients showed small improvements in MDRD value; the change from baseline to discharge or death value were respectively +1.3, +2.6, +2.8 and +2.2 ml/min/1.73m^2 at the sample points of 24, 72 hr, 7 day and 30 days. Patients who died had a much lower GFR at admission 48.9 ml/min/1.73m2 (IQR: 30.4, 69.7) but showed a crucial difference with a substantial fall by day 2 – 33.5 ml/min/1.73m2 (IQR: 19.9, 59.4) with little further change thereafter – 3 day 36.3

Table 2 Change in renal function and Odds Ratio for an in-hospital death by day 30

Group	Delta MDRD (ml/min)	*n*	Mortality (%)	OR (95% CI)	P <
0	Improved	32212	4.4		
1	0 to -4.9	14712	4.2	0.96 (0.87, 1.06)	0.40
2	-5 to -9.9	4738	6.6	1.54 (1.35, 1.74)	0.0001
3	-10 to -19.9	5094	9.4	2.74 (2.0, 2.52)	0.0001
4	-20 to -39.9	3088	15.7	4.06 (3.64, 4.54)	0.0001
5	-49 to -100	1120	24.5	7.08 (6.12, 8.19)	0.0001

ml/min/1.73m2 (IQR: 20.6, 64.7) - 7 day 38.4 ml/min/1.73m^2 (IQR: 20.1, 64.5) and 30 days – 40.2 ml/min/1.73m2 (IQR: 21.1, 64.1). For patients who died, the change from baseline to discharge or death value were respectively -3.9, -3.7, -4.2 and -7.5 ml/min/1.73m2 at the sample points of 24, 72 hr, 7 day and 30 days.

Changes in GFR by group and mortality risk (Figure 1)
We analysed the GFR value by the change over the clinical episode. We categorised patients based on the variation of GFR from admission in 6 groups: as any improvement in delta GFR (Group I) or a deterioration of one of five categories: <= 5 (Group II), > 5 <=10 (Group III), 10 <=20 (Group IV), 2 <=40 (Group V) and > 40 ml/min-1/m2 (Group VI). These groups respectively contained 53.6%, 23.7%, 8.2%, 7.7%, 5.0% and 1.8% of the patients with mortalities of 4.4%, 4.2%, 6.6%, 9.4%, 15.7 and 24.5%. The unadjusted OR for a 30-day death for the five groups with declines of <5, >=5 < 10, >=10 < 20, >=20 < 40 and >=40 ml/min/1.73m2, compared with the baseline of an improved GFR, were 0.96 (0.87, 1.06), 1.54 (1.35, 1.74), 2.74 (2.0, 3.52), 4.06 (3.64, 4.54) and 4.06 (3.64, 4.54) respectively.

Risk prediction based on lab data and change in GFR (Figure 2)
We identified an efficient model using only four predictors of 30-day outcome; these were age, change in GFR between admission and end of the hospital episode, troponin status (negative or positive) and O2 saturation level at time of admission. The fully adjusted Odds Ratios for each of the classes of GFR deterioration showed a stepwise increase in risk of 30-day death, compared with those showing no change or an improvement. The prediction was of a high order at each of the time points assessed of 24 hr, 72 hr, 7 days, 14 days and 30 days. The Area under the Receiver Operator Curve at each of these prediction time points were 24 hr 0.94 (0.92, 0.96), 72 hr 0.93 (0.91, 0.94), 7 days 0.91 (0.90, 0.92), 14 days 0.90 (0.89, 0.90) and 30 days 0.88 (0.87, 0.89). The fully adjusted for each deteriorating group vs. improvers at 30 days were OR's of (Group II) 1.42 (95% CI: 1.20, 1.68), (Group III) 1.59 (1.27, 1.99), (Group IV) 2.71 (2.24, 3.27), (Group V) 5.56 (4.54, 6.81), and (Group V) 11.9 (9.0, 15.6) The model fit across each of the deciles assessed was good, as evidenced by the Hosmer-Lemeshow chi^2 statistic = 8.5 and a non-significant p value of 0.58 – indicating no significant deviation between the predicted and observed observations within each of the deciles (Figure 2).

Discussion

Acute kidney injury is not uncommon in emergency medical admission; what our data emphasises is that, for emergency medical admissions, homeostasis of the internal environment is the norm. Blood tests are routinely collected (often daily) in emergency hospitalised medical patients; therefore there is an opportunity to deploy these as a monitoring and an early warning system. A combination of markers, when formalized, then constitute an aggregate score system. Hucker et al suggested that a combination of clinical and biochemical measurements in the accident and emergency department proved the best predictors of hospital mortality based on the logistic regression analyses rather than each of them taken individually[15]. These results were supported by Prytherch et al and Asadollahi et al, both confirming the relationship between admission abnormal laboratory data and a predicted worse outcome in general medical patients[13,14]. The difficulty is that these studies could require specific knowledge of different scoring system, complex calculation or additional adjustments for age of clinical variables in order to predict the outcome.

Others agree that there are major ramifications for changes in renal function in specific contexts and that even small alteration can have important consequences. Grigorian Shamagian et al demonstrated that renal dysfunction was a powerful predictor of mortality and morbidity in patients hospitalized for CHF, irrespective of left ventricular systolic function[16]. Similarly, Gottlieb et al and Smith et al demonstrated increase in mortality and length of stay with even very small increases in creatinine in patients admitted with congestive heart failure[17,18]. The limitation of these

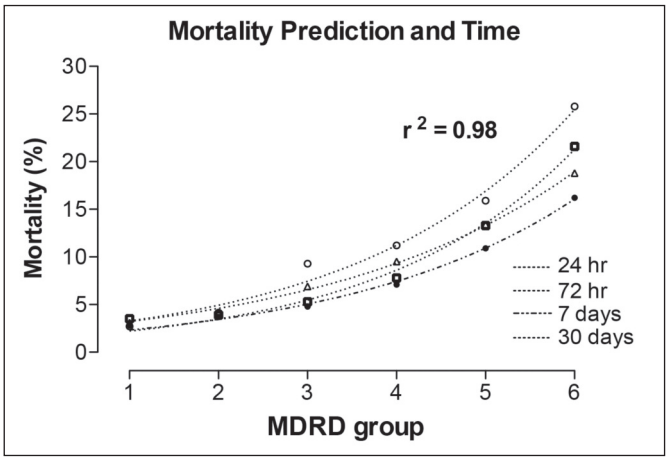


Figure 1 eGFR Improved (Group I), eGFR deteriorated <= 5 ml/min^{-1}/m^2 (Group II), > 5 <=10 ml/min^{-1}/m^2 (Group III), 10 <=20 ml/min^{-1}/m^2 (Group IV), 20 <=40 ml/min^{-1}/m^2 (Group V) and >= 40 ml/min^{-1}/m^2 (Group VI). The relationship between group and outcome is an exponential increase in mortality. Higher mortality estimates occurred at earlier time points

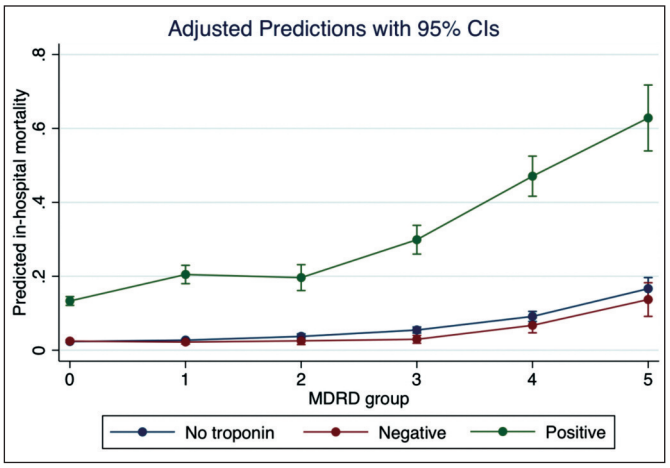


Figure 2 The effect of deteriorating GFR class was determined by calculating its average marginal effect on in-hospital mortality at the three classes of troponin (no request, negative or positive), while controlling for other variables in the model. Marginal statistics are adjusted predictions, where the probability of some event occurring can be computed, while controlling for other variables in the model

studies is that they were performed on selected groups rather than with unselected medical emergencies. In contrast, this study was performed on an unselected group of patients, representing all emergency medical admissions over a 10 yr period. Therefore the findings can be applied to all medical patient groups. Nearly 80% of patients, the eGFR will either show no change or improve over the course of the admission. For the remaining 20% of patients, the drop in renal function is exponentially related to the risk of an in-hospital death. It is important to note that we are not considering patients with advanced or deteriorating renal function; as the average eGFR value on admission was 74 ml/min/1.73m^2 (IQR 54 – 98), a threshold cut-off of 5 ml/min/1.73m^2 (Group I) represents a change of 6.7% from baseline. This variation would be at the level that might be considered important in a clinical context. There has been debate about whether absolute decline in renal function or relative decrease (for example 25%) would provide a better discriminator[19]. This in our view would be a high threshold as only 5.8% of our patients encountered such a deficit, but with a mortality of 50.7% and an OR of 15.5 (95% CI: 13.9 – 17.3) for a 30-day in-hospital death. Thus any significant deterioration in GFR, following an emergency medical hospital admission, must be considered a high-risk event and mandate closer monitoring.

We have previously shown that admission eGFR is a reliable tool to predict mortality following acute medical admission. This study expands on this work by demonstrating any deterioration in the

admission eGFR value is an indicator of increased risk of death during that admission. The hope is that a move to standardise of National Early Warning Systems will provide a basis to detect early deterioration in perturbed physiology, initiate corrective action and further improve clinical outcomes[20]. As patients frequently have biochemistry determinations during such an admission, algorithms could be devised to 'track and trigger' with such deterioration. The impact of an automatic laboratory based alerting system, providing feedback to the clinical care process, would be of great interest.

Correspondence: E Berzan
Division of Internal Medicine, St James's Hospital, James's St, Dublin 8
Email: ecaterinaberzan@yahoo.com

Acknowledgements
Our consultant medical colleagues and the non-consultant members of the 'on-call' teams without which the AMAU initiative could not have been progressed; and the contribution of S Donnelly, her Clinical Nurse Managers and the ancillary professions related to medicine (SCOPE).

References

1. Moloney E, O'Riordan D, Silke B, Bennett K, Smith D: Impact of an acute medical admission unit on length of hospital stay, and emergency department 'wait times', Quarterly Journal of Medicine, 2005. 98: 283-9.
2. Rooney T, O'Riordan D, Silke B, Moloney E, Bennett K: Impact of an acute medical admission unit on hospital mortality: a 5-year prospective study, Quarterly Journal of Medicine, 2008. 101:457-65.
3. Scott I, Vaughan L, Bell D: Effectiveness of acute medical units in hospitals: a systematic review, International Journal for Quality in Health Care, 2009. 21:397-407.
4. Kause J, Parr M, Flabouris A, Hillman K, Smith G, Prytherch D: A comparison of antecedents to cardiac arrests, deaths and emergency intensive care admissions in Australia and New Zealand, and the United Kingdom—the ACADEMIA study, Resuscitation, 2004. 62: 275-82.
5. Froom P, Shimoni Z: Prediction of hospital mortality rates by admission laboratory tests, Clinical Chemistry, 2006. 52: 325-8.
6. Asadollahi K, Gill G, Hastings I, Beeching N: Laboratory risk factors for hospital mortality in acutely admitted patients, Quarterly Journal of Medicine, 100: 501-507.
7. Physicians RCo. National Early Warning Score (NEWS): Standardising the assessment of acute- illness severity in the NHS. Report of a working party. 2012 [cited; Available from: www.rcplondon.ac.uk/national-early-warning-score.
8. Smith G, Prytherch D, Schmidt P, Featherstone P. Review and performance evaluation of aggregate weighted 'track and trigger' systems, Resuscitation, 2008. 77:170-9.
9. Levey A, Bosch J, Lewis J, Greene T, Rogers N, Roth D. A more accurate method to estimate glomerular filtration rate from serum creatinine: a new prediction equation. Modification of Diet in Renal Disease Study Group, Annals of Internal Medicine, 1999. 130:461-70.
10. Lyons O, Whelan B, Bennett K, O'Riordan D, Silke B. Serum albumin as an outcome predictor in hospital emergency medical admissions. European Journal of Internal Medicine 2010. 21:17-20.
11. Whelan B, Bennett K, O'Riordan D, Silke B. Serum sodium as a risk factor for in-hospital mortality in acute unselected general medical patients, Quarterly Journal of Medicine, 2009. 102: 175-82.
12. Chin J, O'Dowd S, Wan Md Adnan W, Bennett K, O'Riordan D, Mellotte J. Using the MDRD value as an outcome predictor in emergency medical admissions. Nephrology Dialysis Transplantation, 2011. 26:3155-9.
13 Prytherch D, Sirl J, Schmidt P, Featherstone P, Weaver P, Smith G. The use of routine laboratory data to predict in-hospital death in medical admissions, Resuscitation, 2005. 66: 203-7.
14. Asadollahi K, Hastings I, Gill G, Beeching N. Prediction of hospital mortality from admission laboratory data and patient age: a simple model, Emergency Medicine Australasia 2011. 23:354-63.
15. Hucker T, Mitchell G, Blake L, Cheek E, Bewick V, Grocutt M. Identifying the sick: can biochemical measurements be used to aid decision making on presentation to the accident and emergency department, British Journal of Anaesthesia, 2005. 94: 735-41.
16. Grigorian Shamagian L, Varela Roman A, Pedreira Perez M, Gomez Otero I, Virgos Lamela A, Gonzalez-Juanatey J. [Renal failure is an independent predictor of mortality in hospitalized heart failure patients and is associated with a worse cardiovascular risk profile]. Revista Española de Cardiología, 2006. 59: 99-108.
17. Gottlieb S, Abraham W, Butler J, Forman D, Loh E, Massie B. The prognostic importance of different definitions of worsening renal function in congestive heart failure, Journal of Cardiac Failure, 2002. 8: 136-141.
18. Smith G, Vaccarino V, Kosiborod M, Lichtman J, Cheng S, Watnick S. Worsening renal function: what is a clinically meaningful change in creatinine during hospitalization with heart failure? Journal of Cardiac Failure, 2003. 9: 13-25.
19. Metr M, Nodari S, Parrinello G, Bordonali T, Bugatti S, Danesi R. Worsening renal function in patients hospitalised for acute heart failure: clinical implications and prognostic significance, European Journal of Heart Failure, 2008. 10: 188-195.
20. M. Jones, NEWSDIG: The National Early Warning Score Development and Implementation Group, Clinical Medicine, 2012. 12: 501-503.

Myocardial Ischaemia Following Cocaine and Adrenaline Exposure in a Child during an Ophthalmological Procedure

E McGovern, E Moylett, CJ McMahon
Cardiac Department, Our Lady's Hospital for Sick Children, Crumlin, Dublin 12

Abstract
We report a 23-month old girl who presented with bilateral epiphora who underwent bilateral lacrimal probing and syringing, during which a cocaine adrenaline solution was used. Two hours after the procedure she developed acute pulmonary oedema secondary to myocardial ischaemia. The patient was treated with intravenous glyceryltrinitrate and milrinone infusions; cardiac enzymes and left ventricular function normalised over the subsequent 72 hours. Topical administration of cocaine and adrenaline solution may have dangerous systemic cardiac effects and should always be used judiciously.

Introduction
For over a century, cocaine has been used as a topical anaesthetic and vasoconstrictor in otorhinolaryngological procedures. It thereby reduces local bleeding and mucosal swelling making it a useful agent for procedures in confined mucosal spaces[1]. However, systemic absorption of cocaine does occur via the nasal mucosa, at rates which vary considerably between individuals[2]. Adverse reactions are rare but occasional reports of iatrogenic cocaine induced acute coronary syndrome have been documented in the adult literature[3,4]. Adrenaline is frequently used in conjunction with cocaine to reduce the absorption of cocaine.

Case Report
An otherwise healthy 23-month old girl presented to her local hospital with bilateral epiphora secondary to congenital nasolacrimal duct obstruction. Under general anaesthetic she

underwent bilateral lacrimal probing and syringing, during which cotton dental roll dampened with an 4% cocaine and 1 in 1000 adrenaline solution was placed in the nose under the inferior turbinate for approximately twenty minutes. This allowed good endoscopic visibility of the lacrimal probe in the nose. She also had a small volume of the cocaine adrenaline solution injected into the lacrimal sac to anaesthetise the lacrimal sac mucosa. Approximately two hours following the procedure she became agitated, tachycardic and developed acute pulmonary oedema requiring intensive care admission. She demonstrated acute myocardial ischaemia with subtle anterolateral ST segment changes on her electrocardiogram and a markedly elevated troponin T of 161 ng/L. Left ventricular (LV) ejection fraction was reduced at 35%. At 23 hours following development of symptoms, she was urgently transferred to a paediatric cardiology unit given the risk for development of fatal tachyarrhythmias. She was treated with intravenous glyceryltrinitrate and milrinone infusions, diuretics, aspirin and an ACE inhibitor. Her electrocardiogram at this time demonstrated a return to baseline of her ST segments. Her LV fractional shortening on echocardiogram measured 28% with markedly jerky relaxation. Cardiac enzymes and LV function normalised over the subsequent 72 hours. There were no arrhythmias detected. Following thorough local investigation into this adverse clinical incident at the regional hospital, no medication or procedural error was identified. Independent laboratory analysis of the cocaine solution was confirmed at 4%. This child appeared to suffer toxicity from a standard cocaine adrenaline solution that was used in a manner that is widely recognised.

Discussion

This case highlights a serious side effect of topical cocaine administration not previously reported in a child. The systemic absorption of cocaine in this child had a dramatic effect on coronary perfusion and myocardial integrity as evidenced by acute pulmonary oedema, elevated troponin T, abnormal electrocardiogram and reduced left ventricular function on echocardiogram. Although the child recovered fully, such an event may have resulted in a poor outcome, particularly with the risk of reperfusion arrhythmia[5].

The etiology of cocaine induced cardiac ischaemia is complex and likely multifactorial. Cocaine increases myocardial oxygen demand, but simultaneously decreases supply by inducing coronary arterial vasoconstriction from stimulation of alpha adrenergic receptors and promoting intra-coronary thrombus formation from enhanced platelet aggregation[6,7]. Epinephrine is often used with cocaine in the context of topical anaesthesia, as its vasoconstrictive qualities further promote haemostasis and it is believed to reduce systemic absorption of cocaine. However, overall results showing decreased absorption of cocaine are inconsistent [8]. There is a potential risk that epinephrine could act synergistically to strengthen its sympathomimetic effects[9,10]. A healthy 18-year old male who underwent nasal surgery with prior nasal packing of a cocaine/epinephrine solution, where no drug administration error was later identified, suffered myocardial ischaemia intra and post operatively[10]. To date, there have been no reported cases to our knowledge, of iatrogenic cocaine induced myocardial ischaemic in a child. Care should be taken with topical administration of cocaine due to its sometimes unpredictable absorption rate and potential for cardiac toxicity.

Correspondence: CJ McMahon
Cardiac Department, Our Lady's Hospital for Sick Children, Crumlin, Dublin 12
Email: cmcmahon992004@yahoo.com.

References

1. Schenck NL. Local anaesthesia in otolaryngology. A re-evaluation. Ann Otol Rhinol Laryngol 1975;84:65-72.
2. Fleming J, Blyck R, Barash P. Pharmacology and therapeutic applications of cocaine. Anesthesiology 1990;73:518-31.
3. Makaryus JN, Makaryus NA, Johnson M. Acute myocardial infarction following the use of intranasal anesthetic cocaine. South Med J 2006;38:759-61.
4. Ashchi M, Wiedemann HP, James KB. Cardiac complication from use of cocaine and phenylephrine in nasal septoplasty. Arch Otolaryngol Head Neck Surg 1995;121:681-684.
5. Jurkovicová O, Cagán S. Reperfusion arrhythmias. Bratisl Lek Lisky 1998;99:162-171. 7.
6. Benzaquen B S, Cohen V, Eisenburg MJ. Effects of cocaine on the coronary arteries. Am Heart J 2001;142:402-10.
7. Lange RA, Hillis LD. Cardiovascular complications of cocaine use. N Engl J Med 2001;345:351-358.
8. Latorre F, Klimek L. Does cocaine still have a role in nasal surgery? Drug Saf 1999;20:9-13.
9. Torres M, Rocha S, Rebelo A, Marques J, Nabais S, Azevedo P, Magalhães S, Costa J, Correia A. Toxicidade Cardiovascular da Cocaína de Natureza Iatrogénica. Caso Clínico. Rev Port Cardiol 2007;26:1395-1404.
10. Laffey JG, Neligan P, Ormonde G. Prolonged Perioperative Myocardial ischemia in a young male: due to topical intranasal cocaine? Journal of Clinical Anesthesia 1999;11:419-424.

Open-Access Ultrasound Referrals from General Practice

P Hughes, P Beddy, N Sheehy
Department of Radiology, St James's Hospital, Dublin 8

Abstract

Direct access referral for radiological investigations from General Practice (GP) provides an indispensable diagnostic tool and avoids the inherently long waiting time that referral through a hospital based specialty would entail. Improving access to hospital based radiology services is one of Health Information and Quality Authority's key recommendations in its report on patient referrals from general practice. This study aimed to review all GP referrals for ultrasound investigations to a tertiary referral teaching hospital over a seven month period with respect to their demographics, waiting times and diagnostic outcomes. 1,090 ultrasounds originating in general practice were carried out during the study period. Positive findings were recorded in 332 (30.46%) examinations. The median waiting time from receipt of referral to the diagnostic investigation was 56 days (range 16 - 91 years). 71 (6.5%) patients had follow-up imaging investigations while recommendation for hospital based specialty referral was made in 35 cases (3.2%). Significant findings included abdominal aortic aneurysms, metastatic disease and lymphoma. Direct access to ultrasound for general practitioners allows the referring physician to make an informed decision with regard to the need for specialist referral. We believe these findings help support the case for national direct access to diagnostic ultrasound for general practitioners.

Introduction

Ultrasound is a non-invasive, radiation free investigation with a wide variety of clinical applications. Direct access for General Practitioners (GPs) to hospital based radiology services, in the form of plain film radiography, is well established. Direct access to ultrasound however is not universally available in Ireland. The traditional patient care pathway in Ireland involves referral to a hospital specialist who may then request imaging if deemed

CPD available online at www.imj.ie and questions on page 95.

appropriate. A 2011 HIQA report recommended that the HSE should carry out a review of the benefits of a direct access referral system.[1] To our knowledge no such review has been carried out to date. There is significant data supporting the benefits of direct access referral for ultrasound, though little in the recent literature and none in Ireland.[2-9] It has previously been demonstrated that referrals from GPs have a comparable rate of positive findings when placed alongside referrals from hospital consultants.[2] It has also been shown to reduce the number of outpatient and emergency department referrals made by general practitioners.[2-4] Robinson et al. demonstrated that direct access to ultrasound is the preferred arrangement for the majority of general practitioners, rather than transferring services to primary care.[5] This study aimed to review all direct GP referrals for ultrasound investigations to a tertiary referral teaching hospital and to assess the waiting times and diagnostic outcomes.

Methods

All GP referrals are vetted by a consultant radiologist and triaged according to urgency, as per the HIQA patient referral pathway. Our department is staffed by one Consultant Radiologist, one Specialist Registrar and two to three Sonographers, including one Clinical Specialist. Ultrasounds are generally reported on the same day as they are performed and the results made available to the referring GP either by post or via Healthlink. Urgent or unexpected results are communicated directly to the referring physician by phone at the time of reporting. All patients who underwent diagnostic ultrasound between January 1st and July 31st 2012 were identified using the hospital Radiology Information System. Patients who had an ultrasound requested by a GP were included in the study, patients were excluded if the referral was from a Hospital Consultant. Breast and axillary ultrasound are carried out in the breast imaging department and were also excluded. The radiology reports from the included studies were reviewed by a Specialist Registrar in radiology. Patients were divided into two possible groups: those with positive findings and those with normal studies. A positive finding was classed as any finding which could explain the patient's symptoms or a significant incidental finding. Studies which were normal or those that demonstrated benign entities such as simple renal cysts or simple liver cysts were included in the normal category. The number of patients who had a recommendation for subsequent specialty referral or who underwent follow up imaging investigations was also noted.

Results

Over the 7 month period, there were a total of 7,624 ultrasound investigations carried out in our department. Of these, 1,090 referrals (14.3%) originated from general practice. A total of 327 different referring physicians were identified. The majority of these (304) referred less than 10 patients each. 21 GPs made between 10-20 referrals and 2 physicians sent in excess of 20 referrals in the 7 month period. The average age of patients was 43.7 years (range 16-91 years). The male to female ratio was 1:3.4. The median turnaround time was 56 days from the time of referral to the time of scan. Of the 1,090 studies, there were positive findings in 332 (30.5%) patients (Table 1). 71 patients (6.5%) had further imaging investigations either to further characterise a lesion seen on ultrasound or to ensure resolution or stability of a detected lesion. 35 patients (3.2%) had a recommendation for subsequent referral to a hospital based specialist based on the result of their ultrasound. Within the category of positive findings, there were 9 patients who required urgent specialist referral including; 2 large abdominal aortic aneurysms both of which underwent endovascular repair within 2 days; 2 patients with newly diagnosed metastatic disease to the liver; 1 suspicious thyroid mass later confirmed as papillary thyroid cancer; 1 patient with extensive lymphadenopathy later confirmed as Hodgkin's lymphoma; 1 patient with hydronephrosis secondary to an obstructing calculus; 1 patient with a neck abscess requiring surgical drainage. Renal ultrasound demonstrates the highest rate of negative findings with 121 of 131 (92.36%) studies classed as normal (table 1). Further review of the indications for these studies demonstrates that urinary tract infection was the most common reason for referral, accounting for 47 of 131 cases (44 of which were normal) while flank pain accounted for 32 cases (28 of which were normal).

Table 1 The number of "positive" and "normal" studies by subtype according to body area

Body Region	Normal	Positive
Abdomen (N=276)	188 (68.12%)	88 (31.88%)
Pelvis (N=247)	189 (76.52%)	58 (23.48%)
Renal (N=131)	121 (92.37%)	10 (7.63%)
Transvaginal (N=112)	84 (75%)	28 (25%)
Testes (N=87)	37 (42.53%)	50 (57.47%)
Neck/ Thyroid (N=77)	38 (49.35%)	39 (50.65%)
Liver (N=51)	30 (58.82%)	21 (41.18%)
Soft Tissue / MSK (N=47)	23 (48.94%)	24 (51.06%)
Gallbladder (N=38)	27 (71.05%)	11 (28.95%)
Aorta (N=15)	13 (86.66%)	2 (13.34%)
Salivary Glands (N=6)	6 (100%)	0
Groin (N=3)	2 (66.67%)	1 (33.33%)
Totals (N=1090)	758 (69.54%)	332 (30.46%)

Discussion

Direct access ultrasound for general practitioners has been consistently shown to yield a similar rate of positive diagnostic outcomes to referrals generated from the hospital outpatient department which demonstrates that general practitioners make good use of the resource when it is made available to them.[2,4-6] Referrals from general practice accounted for just 14.7% of the total number of ultrasounds performed over the study period, significantly lower than the number of referrals from the outpatient department and inpatients. There are well established referral guidelines available to GPs, such as the Royal College of Radiologists "iRefer", to guide GPs in the appropriateness of referral and to ensure the correct radiological investigation is performed to "obtain maximum information with the minimum of radiation, inform clinical management, reassure the patient and add confidence to the clinician's diagnosis. In the case of a normal result, the GP is able to provide reassurance to the patient and avoid unnecessary specialist referral."[10] Direct access to radiology results in an overall reduction in the number of referrals to hospital outpatient and emergency departments.[2] In the absence of a direct referral system, GPs have no choice but to refer patients that require imaging to hospital based specialists. 44 patients in our study required urgent specialist referral or had a recommendation for further specialist referral made. It can be extrapolated from this that up to 1,046 patients were able to benefit from a diagnostic study and avoid an unnecessary outpatient visit. By removing the need to go through a hospital specialty a considerable saving can be made in terms of waiting time. The time from referral to investigation has been identified by HIQA as a key performance indicator and the HSE's HealthStat states that the target metric for waiting times from GP referral to scan date is 70 days, our median waiting time is within this target.

While this study provides evidence to support a direct referral system, we acknowledge a number of limitations. There are other options for imaging in the community, such as private healthcare providers. This study only captures those patients referred from GPs to our hospital and may not reflect the absolute need in the catchment area. The number of patients in our study referred for follow up was relatively low, however this only includes those who were followed up in our institution and some patients may have been further investigated elsewhere. We do not account for those who may have been referred for further investigation but were lost to follow up. Finally, the division into either "normal' of "abnormal" is potentially too simplistic as the designation of incidental findings may be quite subjective. This study provides further evidence to support the provision of a nationwide direct access referral system for general practitioners. The Irish Faculty of Radiologists supports the provision of "walk-in access" to services for patients provided it is supported by an adequate number of specialised staff and is properly resourced.[1] At a time where outpatient departments are stretched to capacity and there is a politico-economic movement

towards re-emphasising the role of primary care physicians as the gatekeepers to the hospital system, we believe that providing an adequately resourced direct access ultrasound service is of benefit to hospitals, general practitioners and patients alike.

Correspondence: N Sheehy
Department of Radiology, St James's Hospital, Dublin 8
Email: nsheehy@stjames.ie

References

1. Health Information and Quality Authority. Report and recommendations on patient referrals from general practice to outpatient and radiology services, including the national standard for patient referral information. Dublin, 2011.
2. Charlesworth CH, Sampson MA. How do general practitioners compare to the outpatient department when requesting upper abdominal ultrasound investigations? Clin Radiol 1994; 49: 343-345.
3. Connor SEJ, Banerjee AK. General practice requests for upper abdominal ultrasound: their effect on clinical outcome. Br J Radiol, 1998; 73: 1021-1025.
4. Speets AM, Hoes AW, van der Graaf Y, Kalmijn S, de Wit N, Montauban van Swijndregt A, Gratama JW, Rutten M, Mali WP. Upper abdominal ultrasound in general practice: indications, diagnostic yield and consequences for patient management. Fam Prac 2006; 23: 507–511.
5. Robinson L, Potterton J, Owen P. Diagnostic ultrasound: a primary care-led service? Br J Gen Prac 1997; 47: 293-295.
6. Speets AM, Kalmijn S, Hoes AW, van der Graaf Y, Mali WP. Yield of abdominal ultrasound in patients with abdominal pain referred by general practitioners. Eur J Gen Prac 2006; 12: 135-137.
7. de Vries CJ, Wieringa-de Waard M, Bindels PJ, Ankum WM. Open access transvaginal sonography in women of reproductive age with abnormal vaginal bleeding: a descriptive study in general practice. Br J Gen Prac, 2011.
8. Mills P, Joseph AEA, Adam EJ. Total abdominal and pelvic ultrasound: incidental findings and a comparison between outpatient and general practice referrals in 1000 cases. Br J Radiol 1989; 62: 974–976.
9. Colquhoun IR, Saywell WR, Dewburry KC. An analysis of referrals for primary diagnostic abdominal ultrasound at a general X-ray department. Br J Radiol 1988; 61: 297–300.
10. Royal College of Radiologists. iRefer, Making the Best Use of Clinical Radiology. [Internet] 2012 November. Available from: http://www.irefer.org.uk/.

A Rare Case of Cryptogenic Stroke with an Incidental Finding of Patent Foramen Ovale

Sir

Patent foramen ovale (PFO) occurs in 25-30% of the general population. Stroke in the puerperium is a rare phenomenon, 34 per 100,000 women. A 32 year old lady, Para3+2 presented eight days postnatally with symptoms of a transient episode of left sided facial and limb parathesia and dysphasia. She had a CT brain which was normal, however a subsequent MRI brain showed a small right parietal lobe infarct. An echocardiogram was performed which showed a small PFO, with an ejection fraction of 60-65%. A bubble study was performed which was positive with valsalva. She was started on aspirin 300mg once daily for 2 weeks, and shall remain on life-long aspirin 75mg.

Introduction

Patent foramen ovale (PFO) occurs in 25-30% of the general population. Stroke in the puerperium is a rare phenomenon (34 per 100,000 women)[1]. Paradoxical embolism may be more frequent in pregnancy due to the hypercoagulable state. Cases of stroke[2,3] and myocardial infarction[4,5] in conjunction with a patent foramen ovale in pregnancy and the peurperium have been reported.

Case Report

A 32 year old lady, Para3+2 presented eight days postnatally with symptoms of a transient episode of left sided facial and limb parathesia and dysphasia. Her antenatal course was complicated by a new diagnosis of hepatitis C at her booking visit. She was induced at 39 weeks gestation due to oligohydramnios and had a vaginal delivery. She had a CT brain which was normal, however a subsequent MRI brain showed a small right parietal lobe infarct. Carotid Doppler and lower limb Doppler studies were normal. An echocardiogram was performed which showed a small PFO, with an ejection fraction of 60-65%. A bubble study was performed which was positive with valsalva. She was started on aspirin 300mg once daily for 2 weeks, and shall remain on life-long aspirin 75mg. She has been seen at 2 and 6 weeks postnatally and is asymptomatic.

Discussion

This case represents transient symptoms of a parietal infarct in the postpartum period. Detection of PFO can be augmented by releasing a sustained Valsalva manoeuver while performing a Bubble study[6]. The Valsalva manoeuvre occurs during the second stage of labour causing the same right-to-left shunt to occur, allowing a paradoxical embolus to travel to the brain. A study by Komar et al, comparing symptomatic to asyptomatic patients with PFOs, showed that those who are sypmptomatic have larger diameter PFO (3.9mm +/- 1.4mm), longer tunnel length (overlap of septum primum and secundum) and a greater frequency of atrial septal aneurysm (55% vs 15%)[7]. The 2012 ACCP guidelines advise antiplatelet therapy in patients with cryptogenic stroke and PFO. Anticoagulation is indicated only in those with other risk factors such as a hypercoagulable state, or in the case of recurrent ischaemic events despite treatment with aspirin. Fortunately for this lady she suffered no residual neurological deficit and her prognosis is excellent.

B Anglim[1], N Maher[1], O Cunningham[1], D Mulcahy[2], J Harbison[3], M O'Connell[1]
Departments of [1]Obstetrics & Gynaecology, [2]Cardiology, and [3]Stroke Medicine, Coombe Women & Infant's University Hospital, Dolphin's Barn, Dublin 8

References

1. James A, Bushnell C, Jamison M, Myers E. Incidence and risk factors for stroke in pregnancy and the puerperium. Obstet Gynecol. 2005 Sep;106:509-16.
2. Bodur H, Caliskan E, Anik Y, Cakiroglu Y, Corakci A. Cranial thromboembolism secondary to patent foramen ovale and deep venous thrombosis after cesarean section. Gynecol Obstet Invest. 2008;65:258-61.
3. Szydelko M, Kwolek A, Majka M. Stroke in young woman in the first day after delivery. Wiad Lek. 2006;59:280-4.
4. Ramineni R, Daniel GK. Association of a patent foramen ovale with myocardial infarction and pulmonary emboli in a peripartum woman. Am J Med Sci. 2010 Oct;340:326-8.
5. Agostoni P, Gasparini G, Destro G. Acute myocardial infarction probably caused by paradoxical embolus in a pregnant woman. Heart. 2004 Mar;90:e12.
6. Lynch J, Schuchard G, Gross C, Wann L. Prevalence to right-to-left atrial shunting in a healthy population. Detection by Valsalva maneuver contrast echocardiography. Am J Cardiol 1984;53:1478-80.
7. Komar M, Podolec P, Przewlocki T, Wilkolek P, Tomkiewicz-Pajak L, Motyl R. Transoesophageal echocardiography can help distinguish between patients with "symptomatic" and "asymptomatic" patent foramen ovale. Kardiologia Polska 2012; 70:1258-1263.

Children with Life-Limiting Conditions: Establishing Accurate Prevalence Figures

Sir

Children's palliative care is a new and evolving specialty. In order to ascertain accurate data on the number of children requiring services, a number of countries, including Ireland, have undertaken children's palliative care needs assessments. Regardless of the country of origin, the findings of these needs assessments are very similar. Irish child (0-17 years) population figures indicate that there are approximately 1.2 million children in Ireland[1]. Hampered by ambiguity surrounding definitions and the lack of a national database, currently there are no definitive data on the number of these children living with a life-limiting condition.

In the absence of a national database on children with life-limiting conditions, data from a needs assessment published in 2005[2] continues to be utilised. In this needs assessment calculations for the number of children living with a life-limiting condition in Ireland were extrapolated from UK data which at the time, reported a prevalence rate of 12:10,000 child population[3]. This was utilised although known to be an underestimate. Applying this ratio to Irish census data the researchers estimated 1,369 children were living with a life-limiting condition in Ireland. Cultural factors that may impact on the accuracy of these estimates for example, the legislation governing termination of pregnancy in Ireland were not considered despite the likelihood of impacting on the number of children born and surviving with complex care needs and conditions that may result in premature death[4]. A more recently published Irish report examined prevalence figures further and after considering international evidence a higher median prevalence figure of 14.5:10,000 per child population was used to plan for the development of respite services for children with life-limiting conditions[5].

Researchers in England, in order to gather more robust data on prevalence utilised the English Hospital Episode Statistics Dataset and International Classification of Disease Data[6]. Analysis suggests that the true prevalence of children living with a life-limiting condition is at least 32:10,000 child population and may be as high as 44:10,000. Historically Irish prevalence rates are based on the UK data therefore, application of the 32:10,000 figure to recent child population data[1] suggests that there are 3840 children in Ireland living with a life-limiting condition. It is clear from both national and international data that the original figure of 1369 children living with a life-limiting condition is an underestimate[2]. Findings from England[6] indicate an approximate three-fold increase on original estimates. This has significant implications for service provision and workforce planning. The national children's palliative care policy[7] is widely viewed as the blueprint for the future development of children's palliative care in Ireland, in light of these findings this document needs to be reviewed and the implications of this significantly increased prevalence of children with life-limiting conditions needs to be considered by service planners, care providers and policy makers alike.

J Ling[1], M O'Reilly[2], J Balfe[1], C Quinn[1], M Devins[3]
[1]LauraLynn Children's Hospice, Leopardstown Rd, Foxrock, Dublin 18
Departments of [2]Palliative Care and [3]Paediatrics, Our Lady's Children's Hospital, Crumlin, Dublin 12

Acknowledgements
Written on behalf of the HSE National Development Committee for Children's Palliative Care

References

1. CSO (Central Statistics Office) (2011) http://www.cso.ie/Quicktables/GetQuickTables.aspx?FileName=CNA15.asp&TableName=Population+by+Age+2011&StatisticalProduct=DB_CN Accessed 16th June 2014.
2. Department of Health and Children/Irish Hospice Foundation (2005) A Palliative Care Needs Assessment for Children. Stationery Office: Dublin.
3. Association for Children with Life-threatening or terminal Conditions and their families (ACT) and the Royal College of Paediatrics and Child Health (RCPCH) (2003) A guide to the development of children's palliative care services: Report of the Joint Working Party (2nd Edition), Bristol: ACT and London: RCPCH, UK.
4. Boyd PA, Rounding C, Chamberlain P, Wellesley D, Kurinczuk J. Survey of prenatal screening policies in Europe for structural malformations and chromosome anomalies, and their impact on detection and termination rates for neural tube defects and Down's syndrome. BJOG 2008;115:689-696.
5. LauraLynn/Irish Hospice Foundation (2013) Respite services for children with life-limiting conditions and their families in Ireland. A national needs assessment. LauraLynn/Irish Hospice Foundation: Dublin.
6. Fraser LK, Miller, M Hain, R, Normand, P., Aldridge, J., McKinney, P., Parslow, R. (2002) Rising National Prevalence of life-Limiting Conditions in Children in England. Pediatrics 2012;129:E923-E929.
7. Department of Health and Children (2011) Palliative Care for Children. A national policy. Dublin: Stationery Office.

Thyroid Disorders in Girls with Turner Syndrome and the Influence of the Underlying Karyotype

Sir

The risk of developing thyroid dysfunction is higher in Turner syndrome (TS) than the general population[1,2]. In previous studies, the influence of karyotype[3] and thyroid autoantibodies[4] on thyroid disorder in patients with TS has been investigated. We therefore set out to determine the prevalence of thyroid dysfunction in Irish girls with TS. The impact of underlying karyotype and thyroid autoantibodies has also been examined. The presence of thyroid dysfunction was assessed by measuring serum thyroid-stimulating hormone (TSH), thyroxin (T4) and anti-thyroid peroxidase antibodies (TPO-Ab) values. The association between TPO-Ab values and thyroid dysfunction (hypothyroidism and hyperthyroidism) was also assessed.

We studied 32 girls with TS; mean (SD) [range] age 16.7 (2.6) [12.4- 20.2] years. Of 32 girls, 14 (43.75 %) had structural X abnormalities, 12 (37.5%) experienced monosomy 45, X and 6 (18.75%) exhibited mosaicism monosomy X. In this group of girls with TS, thyroid abnormalities were reported in 5 of 32 girls (15.6%), of whom 4 of 5 (80%) had hypothyroidism and 1 of 5 (20%) experienced hyperthyroidism. Of 4 girls with hypothyroidism, 2 (50%) had monosomy X chromosome (45, X) and 2 (50%) exhibited isochromosome-X structural abnormalities [45,X/46,X,i(Xq)/47,X,i(Xq),i(Xq) and [46,X,i(X)/46,XX)]. Hyperthyroidism was found in 1 girl with X structural abnormalities (46,X,del(X)(p11.21p22.3). In this study, hypothyroidism occurred

in girls with monosomy X chromosome and isochromosome-X structural abnormalities, but not mosaicism monosomy X. In this group of patients with TS, the underlying karyotype does not appear to influence the risk of hypothyroidism (p value = 0.93), whether it would have reach significant level if the number of patients would have been higher is unclear. Further study with larger number of patients may be required to explore this issue. TPO-Ab values were higher than the reference ranges in 8 of 32 girls (25%), of whom 3 (37.5%) exhibited normal thyroid function, 4 (50%) had hypothyroidism and 1 (12.5%) had hyperthyroidism. TPO-Ab showed significant association with thyroid dysfunction (p value < 0.02).

In conclusion, the prevalence of hypothyroidism in girls with TS is higher than the general population and anti-thyroid peroxidase antibodies values, but not the underlying karyotype, appear to influence risk. With respect to the relatively high prevalence of thyroid dysfunction in Irish girls with TS, the potential risks and benefits of thyroid disorder screening should be discussed with young people with TS and / or their families. Our experience underlines the importance of monitoring for thyroid function in patients with TS.

M Nadeem, EF Roche
Paediatric Department, AMNCH, Tallaght, Dublin 24
Email: drnadeem.gad@gmail.com

References

1. Chiovato L, Larizza D, Bendinelli G, Tonacchera M, Marinó M, Mammoli C, Lorini R,Severi F, Pinchera A. Autoimmune hypothyroidism and hyperthyroidism in patientswith Turner's syndrome. Eur J Endocrinol 1996;134:568-75.
2. El-Mansoury M, Bryman I, Berntorp K, Hanson C, Wilhelmsen L, Landin-WilhelmsenK. Hypothyroidism is common in turner syndrome: results of a five-year follow-up.J Clin Endocrinol Metab. 2005;90:2131-5.
3. Elsheikh M, Wass JA, Conway GS. Autoimmune thyroid syndrome in women with Turner's syndrome—the association with karyotype. Clin Endocrinol (Oxf) 2001;55:223-6.
4. LivadasS, Xekouki P, Fouka F, Kanaka-Gantenbein C, Kaloumenou I, Mavrou A, Constantinidou N, Dacou-Voutetakis C. Prevalence of thyroid dysfunction in Turner's syndrome: a long-term follow-up study and brief literature review, Thyroid2005;15:1061-6.

Continuing Professional Development

To receive CPD credits, you must complete the question online at www.imj.ie.

A Randomised Controlled Trial using the Epidrum for Labour Epidurals

M Deighan, D O Briain, H Shakeban, D O'Flaherty, H Abdulla, A Al-Jourany, S Ash, S Ahmed, R McMorrow. Ir Med J. 2015; 108: 73-5.

Question 1
The number of patients enrolled in the study was

a) 260
b) 270
c) 280
d) 290
e) 300

Question 2
In the epidrum group the number of epidurals that had to be sited by a second anaesthetist was

a) 6
b) 7
c) 8
d) 9
e) 11

Question 3
The number of accidental dural punctures in the epidrum group was

a) 4
b) 5
c) 6
d) 7
e) 8

Question 4
The number of patients in epidrum group who suffered a post dural puncture headache was

a) 1
b) 2
c) 3
d) 4
e) 5

Question 5
The number of patients in the epidrum group who received a blood patch was

a) 1
b) 2
c) 3
d) 4
e) 5

Improving Surgical Site Infection Prevention Practices through a Multifaceted Educational Intervention

P Owens, S McHugh, M Clarke-Moloney, D Healy, F Fitzpatrick, P McCormick, E Kavanagh. Ir Med J. 2015; 108: 78-81.

Question 1
The number of patients included in the pre-intervention was

a) 44
b) 46
c) 48
d) 50
e) 52

Question 2
The number of patients included in the post-intervention was

a) 41
b) 43
c) 45
d) 47
e) 49

Question 3
Post intervention, prophylaxis within 60 minutes prior to incision increased to

a) 62%
b) 64%
c) 66%
d) 68%
e) 70%

Question 4
Appropriate postoperative prescribing improved to

a) 88%
b) 90%
c) 92%
d) 94%
e) 96%

Question 5
The number of males in the study was

a) 24
b) 26
c) 28
d) 30
e) 32

Open-Access Ultrasound Referrals from General Practice

P Hughes, P Beddy, N Sheehy. Ir Med J. 2015; 108: 90-2.

Question 1
The number of ultrasounds included in the study were

a) 1070
b) 1080
c) 1090
d) 1100
e) 1110

Question 2
The number of ultrasounds with positive findings were

a) 300
b) 302
c) 312
d) 322
e) 332

Question 3
The mean waiting time for the ultrasound investigation was

a) 50 days
b) 52 days
c) 54 days
d) 56 days
e) 58 days

Question 4
The number of patients who had follow up investigations were

a) 69
b) 71
c) 73
d) 75
e) 77

Question 5
The number of abdominal ultrasounds with positive findings was

a) 82
b) 84
c) 86
d) 88
e) 90

It pays to protect your income

Can you afford not to safeguard your largest financial asset and in doing so protect your lifestyle?

What is Income Protection?

Income protection will provide you with an alternative regular income if you suffer an illness or injury that prevents you from working.

Why should you consider this form of protection?

Since March 31st 2014 paid sick leave for public service employees including HSE employees has been reduced:

Old arrangement:	New arrangement:
Six months full pay	Three months full pay
Six months half pay	Three months half pay

The facts

There are numerous products on the market with similar features:

- Benefit cannot exceed 75% of pre-disability income
- Benefits cease on recovery, return to work, retirement or death
- It can pay out after 4, 8, 13, 26 or 52 weeks following illness or injury
- Applications are subject to underwriting
- Tax relief is available on your premiums at your marginal rate of tax

As IMO FS is not tied to a single life assurance company, we can search the market for the cheapest quotes on your behalf and advise you on the product most suitable to your specific circumstances.

You can also avail of a tailored income protection product offered exclusively to IMO members. It is specifically designed with the medical profession in mind and offers special features such as:

* **Cover while abroad** *(e.g. EU countries, USA, Canada, Australia, New Zealand, South Africa, Saudi Arabia). This is of particular interest to those planning to gain work experience abroad for a period of time.*
* **Includes a percentage of overtime when calculating maximum benefit**

IMO
FINANCIAL SERVICES

If you wish to receive further information or discuss this subject in more detail with one of our financial advisers, please email us on imofs@imo.ie or call on
01 6618299