# Is the NCHD Changeover Associated with Increased Risk of Intravenous Catheter Related Infections?

Sir,

Both central venous catheters (CVCs) and peripheral intravenous cannulas (PVCs) have changed the management of patient care in a hospital setting. However there is a significant risk of local and/or blood stream infection with both[1,2]. Indeed, every day the catheters remain in place increases the chances of developing a related blood stream infection[3]. Healthcare associated infections (HCAIs) lead to increased morbidity and mortality, increased length of hospital stay and costs[4]. HCAIs are an important indicator of quality of care. Our hypothesis was that the non consultant hospital doctor changeover at the beginning of July may be associated with some impact on these quality indicators. The primary aim of this study was to monitor the rates of CVC associated infections in a 649 bed teaching hospital for twenty days before and after the changeover. Secondary aims included monitoring of PVC related adverse events and blood culture contamination rates before and after the changeover.

Daily surveillance of all patients with CVCs in place was carried out on all long stay wards in the main hospital for the forty days of the study. All CVCs were inserted by senior medical staff in the radiology department. The same was performed for PVCs on a pre-selected medical and surgical ward for twenty four days. The blood culture data was collected retrospectively from the microbiology laboratory computer system. The total number of CVC line days was 549 before the changeover and 681 afterward. The number of central catheter associated bloodstream infections per 1000 line days before and after the changeover was 10.9 and 1.5 respectively ($p<0.05$, Fishers exact test). All of these infections were seen in haematology (5) and oncology (2) patients and were associated with Hickman lines (4), portacaths (2) and Peripherally Inserted Central Catheter lines (1). Adverse events, associated with peripheral cannulas, per 1000 line days on the medical ward, were 15.3 and 26.79 before and after the changeover respectively ($p=0.67$, Fishers exact test). The same figures for the surgical ward, were 8.9 and 19.9 ($p=0.43$, Fishers exact test). Blood culture contamination rates before and after the changeover were 3.55% and 5.13% respectively ($p=0.26$, Fishers exact test). It is difficult to compare this to international figures as there is little data for similar institutions in the literature.

Overall a trend exists towards increased levels of adverse events associated with PVCs and contamination of blood cultures. Whilst not reaching statistical significance, these suggestions support our hypothesis. However, the reduction in infections associated with CVCs contradicts our initial hypothesis. This may very well be a chance finding or may reflect greater adherence to recommended procedures following induction training and or may even be due to surveillance being carried out. The study was unfortunately very limited by its numbers as it was conducted at a single site however the issue may merit more comprehensive multi-site study in the future as there is growing recognition of the need for quality assurance systems in health care and major personnel changes represent a risk to quality for any service provider.

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## References
1. Richet H, Hubert B, Nitemberg G, Andremont A, Buu-Hoi A, Ourbak P, Galicier C, Veron M, Boisivon A, Bouvier AM, Ricome JC, Wolff MA, Pean Y, Berardi-Grassias L, Bourdain JL, Hautefort B, Laaban JP and Tillant D. Prospective multicenter study of vascular-catheter-related complications and risk factors for positive central-catheter cultures in intensive care unit patients. J. Clin. Microbiol. November 1990 vol. 28 no. 11 2520-2525.
2. O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Lipsett PA, Masur H, Mermel LA, Pearson ML, Raad II, Randolph AG, Rupp ME and Saint S. Guidelines for the Prevention of Intravascular Catheter-related Infections Clin Infect Dis. (2011) 52:e162-e193.
3. Simmons BP, Hooton TM, Wong ES and Allen JR Guidelines for Prevention of Intravascular Infections Infection Control Vol. 3, No. 1 (Jan. - Feb., 1982), 61-72.
4. Raad II and Hanna, HA. Intravascular catheter-related infections: new horizons and recent advances. Arch Intern Med 2002, 162, 871-8.

# In this Month's IMJ

**Cancer incidence and mortality due to alcohol: an analysis of 10-year data:** Laffoy et al have calculated that the increased incidence of cancer associated with alcohol ingestion. The susceptible cancers are oral, upper GI, lower GI, liver breast and pancreas. Between 2001–10 a total of 4585 male and 4594 female cancers were attributable to alcohol. They state that over half of the alcohol related cancers are preventable by adhering to the alcohol consumption guidelines.

**Table 1  Relative Risks for cancers causally related to alcohol consumption**

| Cancer Site | ICD 10 Code | Relative risk for selected consumption levels | | | | Data Source |
|---|---|---|---|---|---|---|
| **Males** | | Abstainer | 0.25-39.9g/d | 40-59.9 g/d | 60+ g/d | |
| **Females** | | Abstainer | 0.25-19.9g/d | 20-39.9 g/d | 40+ g/d | |
| Lip, Oral Cavity, Pharynx | C00-C14 | 1 | 1.45 | 1.85 | 5.39 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Oesophagus | C15 | 1 | 1.8 | 2.38 | 4.36 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Larynx | C32 | 1 | 1.83 | 3.9 | 4.93 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Liver | C22 | 1 | 1.45 | 3.03 | 3.6 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Breast (female) | C50 | 1 | 1.15 | 1.32 | 1.46 | Hamajima[7] Chen[16] Rehm[13] |
| Colon | C18 | 1 | 1.05 | 1.1 | 1.21 | Carrao[17] |
| Rectum | C19-21 | 1 | 1.09 | 1.19 | 1.42 | Carrao[17] |
| Pancreas | C25 | 1 | 1.03 | 1.1 | 1.3 | Tramacere[6] |

**Are Irish adult general practice consultation rates as low as official records suggest? A cross sectional study at six general practices:** Behan et al have analysed the frequency of GP visits among 20,706 adult patients across 6 practices. The yearly overall consultation rates was 5.17 visits per year–

**Table 2  Key study findings and how they compare with consultation rates estimated elsewhere**

| GP ATTENDANCE RATES (Adults) | 2013 Local Audit GMS | 2001 CSO GMS | 2007 CSO GMS | 2010 CSO GMS | Ave. 2007-2011 HSE Fee-per-item | 2008/9 UK QRESEARCH | 2010 Dept of GP NUI Galway |
|---|---|---|---|---|---|---|---|
| ALL PATIENTS | 5.17 | 5 | 2.8 | 3.2 | | 5.5 | |
| ALL UNDER 70 | 4.54 | | 2.6 | 2.9 | | 4.5 | |
| ALL OVER 70 | 8.56 | | 5.2 | 5.4 | | 10.8 | 8.74 |
| GMS | 7.72 | 8.9 | 5.3 | 5.2 | 8.7 | | |
| GMS Discretionary | 8.11 | | | | | | |
| GMS DVC | 5.06 | | | | | | |
| PRIVATE only | 3.35 | 3.46 | 2.2 | 2.1 | | | |
| GMS UNDER 70s | 7.01 | | 5.3 | 4.7 | | | |
| GMS OVER 70s | 9.69 | | 5.3 | 5.6 | | | |

GMS 7.7 and private 3.35. The authors calculate that a free GP service would increase would GP workload by 4.4 million consultations annually.

**Adverse event recording post hip fracture surgery:** Doody et al report on the adverse event rate among 39 patients after a hip fracture. They used a standardised form to record adverse events and classified the complications according to the degree of severity. Among the 32 female patients there were 24 complications and among the 7 male patients there were 4 with complications. Common problems included anaemia, urinary retention, pneumonia, delirium and constipation.

**Table 1  Frequency of adverse event recording comparing prospective data collection with HIPE data**

| Complication | Adverse Event Form | HIPE Record |
|---|---|---|
| Constipation | 10 | 2 |
| Anaemia | 8 | 1 |
| Urinary retention | 8 | 0 |
| Pneumonia | 5 | 2 |
| Delirium | 5 | 1 |
| Cardiac event | 3 | 3 |
| Airway/ventilation | 3 | 2 |
| Pressure sore | 2 | 0 |
| Peri-prosthetic fracture | 2 | 0 |
| Acute renal failure | 2 | 2 |
| Wound ooze | 2 | 0 |
| Dehydration | 1 | 0 |
| Abnormal LFTs | 1 | 0 |
| Sepsis | 1 | 0 |
| Surgical site infection | 1 | 0 |
| Chest infection | 1 | 0 |
| Total adverse events | 55 | 13 |

**A national house-staff audit of medical prophylaxis in medical patients for the prevention of venous thromboembolism (prevent-vte):** Adamali et al audited the administration of DVT prophylaxis before and after the placing of reminder stickers in the notes of patients deemed at risk of DVT. The intervention had no impact. Among the 'before' patients 29.7% received prophylaxis and in the 'after' patients 27.1% were prescribed prophylaxis. The reluctance to prescribe LMWH may be due to fears of causing a bleed in elderly frail patients. More teaching and training is needed.
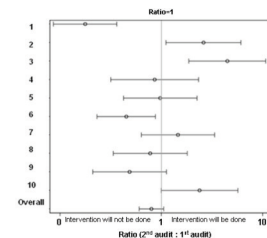


**The compliance to acute asthma management protocols in paediatric emergency department:** Yasin et al describe a cohort of 140 children attending their emergency department with acute asthma. The asthma episodes were classified as life-threatening in 6 cases, severe in 70 cases and mild-moderate in 64 cases. The authors found inconsistent documentation of clinical signs including respiratory rate, mental status and speech impairment. The necessity to adhere to asthma management guidelines is emphasised.

**Table 1  Frequency of recorded signs of respiratory distress (Retrograde categorisation)**

| Variable | Mild/Mod | Severe | Life threatening |
|---|---|---|---|
| **MENTAL STATUS** | | | |
| Not Recorded (NR) | 17 (26.6%) | 24 (34.3%) | 3 (50%) |
| Normal | 47 (73.4%) | 46 (65.7%) | 2 (33.3%) |
| Altered | | | 1 (16.7%) |
| **SPEECH** | | | |
| NR | 57 (89.1%) | 51 (72.9%) | 5 (83.3%) |
| Able | 7 (10.9%) | 16 (22.9%) | |
| Single | | 3 (4.3%) | 1 (16.7%) |
| Unable | | | |
| **RESPIRATORY EFFORT** | | | |
| NR | 25 (39.1%) | 8 (11.4%) | |
| None | 15 (23.4%) | 4 (5.7%) | |
| Some | 24 (37.5%) | 25 (35.7%) | |
| Marked | | 33 (47.1%) | 6 (100%) |
| Silent | | | |
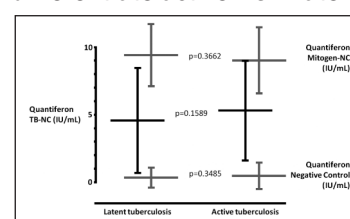
**The intensity of Quantiferon TB-gold response does not differentiate active from latent tuberculosis:** Khan et al report that the Quantiferon TB gold test does not distinguish between active and latent tuberculosis. The study consisted of 94 patients with latent TB and 35 patients with active TB.



**Routine obstetric ultrasound services:** Walsh et al report on a national survey on the availability of routine mid-trimester anomaly scanning. It is offered in 7/20 (35%) Units, selectively in 9/20 (45%) Units and not in the other 4 Units. In no Irish Unit are images of fetal anomaly scanning reviewed by a fetal medicine Obstetrician. The authors recommend the need for national guidelines on antenatal ultrasound provision.
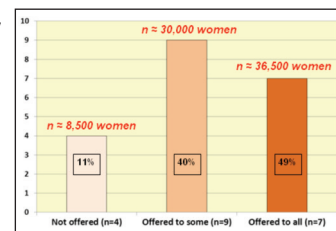


**The changing epidemiology of the bronchiolitis epidemic in Tallagh hospital:** O'Connor et al have examined the changing pattern of bronchiolitis. There has been a shift in the timing and incidence of bronchiolitis over the last 2 years. A total of 1202 bronchiolitis admissions were included. There was a 102% increase in cases in the first 6 months of 2011 and 2012.



**Safety comes first: are doctors attentive enough to their initial clinical assessment notes:** Daly et al assessed the quality of written medical clinical notes. A total of 154 active medical records were selected. A data collection sheet with variables reflecting relevant fields was designed. A number of deficiencies were identified including the patient's medications, allergy status and an objective record of the doctor's own identity. The authors recommend the introduction of a standard template.

**Table 2  Comparison of documentation rates for medical versus surgical patients**

| Parameter | Medical n=83 (%) | Surgical n=71 (%) | P-value | Total n (%) out of n=154[1] |
|---|---|---|---|---|
| Patient name | 81 (98) | 66 (93) | 0.2 | 147 (95.5) |
| MRN/DOB | 81 (98) | 66 (93) | 0.2 | 147 (95.5) |
| Date | 80 (96.4) | 70 (98.6) | 0.6 | 150 (97.4) |
| Time | 27 (32.5) | 29 (40.8) | 0.3 | 56 (36.4) |
| Dr. Name | 37 (44.6) | 40 (56.3) | 0.2 | 77 (50) |
| Referral source | 37 (44.6) | 17 (23.9) | 0.01 | 54 (35.1) |
| Admission Type | 8 (9.6) | 26 (36.6) | 0.0001 | 34 (22.1) |
| Presenting Complaint | 58 (69.9) | 58 (81.7) | 0.1 | 116 (75.3) |
| History of PC | 77 (92.8) | 65 (91.5) | 1.0000 | 142 (92.2) |
| Past Medical History | 74 (89.2) | 59 (83.1) | 0.3 | 133 (86.4) |
| Past Surgical History | 31 (37.4) | 45 (63.4) | 0.002 | 76 (49.4) |
| Medications (all 5 parameters)[2] | 144 (42.4) | 87 (31.6) | 0.007 | 231 (37.6) |
| Allergies | 57 (68.7) | 49 (69) | 1.0000 | 106 (68.8) |
| Social History (all 6 parameters)[3] | 208 (41.8) | 157 (36.9) | 0.1 | 365 (39.5) |
| Family History | 29 (34.9) | 17 (23.9) | 0.2 | 46 (29.9) |
| Review of Systems | 23 (27.7) | 18 (25.4) | 0.9 | 41 (26.6) |
| General exam/vitals (all 5 parameters)[4] | 238 (57.4) | 69 (19.4) | 0.0001 | 365 (47.4) |
| Cardiovascular exam | 74 (89.2) | 35 (49.2) | 0.0001 | 109 (70.8) |
| Respiratory exam | 79 (95.2) | 37 (52.1) | 0.0001 | 114 (74) |
| Gastro-intestinal exam | 73 (87.9) | 45 (63.4) | 0.0005 | 118 (76.6) |
| Neurological exam | 43 (51.8) | 2 (2.8) | 0.0001 | 45 (29.2) |
| Investigations | 62 (74.7) | 17 (23.9) | 0.0001 | 79 (51.3) |
| Impression | 59 (71.1) | 16 (22.5) | 0.0001 | 75 (48.7) |
| Plan (of care) | 78 (93.9) | 69 (97.2) | 0.5 | 147 (95.5) |
| Signature | 80 (96.4) | 68 (95.8) | 1.0000 | 148 (96.1) |
| Pager number | 56 (67.5) | 41 (57.7) | 0.2 | 97 (62.9) |
| Medical Council registration number[5] | 24 (28.9) | 23 (32.4) | 0.7 | 47 (30.5) |

# 49th Doolin Lecture: AE (Freddy) Wood: The Patient, the Surgeon and the Regulator: 7th Dec 2013

This year's Doolin lecture was delivered by Freddy Wood cardiothoracic surgeon and incoming President of The Medical Council. Wood described his career from entering medicine in 1965 and his subsequent journey through a long and illustrious career in surgery. His apprenticeship is daunting for those who follow in his footsteps. It consisted of 40,000 hours on call, 8,000 hours operating and 7,500 hours in clinical care and education. He highlights the current challenge of training competent surgeons within 6 years while conforming to the 48 hour EU directive. Training will need to become more intense with greater concentration of surgical services. The current model with 47 hospitals nationally will need to be addressed.

The long hours of duty did have some compensations. If one worked hard and got all the ward duties completed you may be invited to share night time supper with the nurses in their kitchen. This was a real treat for a young male doctor. Many St Vincents Hospital romances blossomed in this setting.

Wood's training across many hospitals and countries will be familiar to most consultants who qualified from that era. Junior posts in Ireland were ad hoc appointments and there was no training scheme. Once registrar grade level was attained the doctors packed their bags and dragged their wives and young children with them to work in hospitals outside Ireland. Like many others he was told that there wouldn't be any job for him in Ireland. However he persevered and initially worked in Belfast and subsequently went to Toronto. He vividly remembers Belfast in 1977. It was like a fortress and one simply went from home to work but the chest trauma experience was invaluable. Toronto was an enlightenment. In 1979 the Sick Childrens' Hospital was performing 800 cardiac operations annually and was at the forefront of pioneering surgical techniques.

Wood outlined the major developments that have taken place in Irish cardiothoracic surgery. The fundamental turning point was in 1969 when a group of cardiothoracic surgeons approached the Minister of Health and persuaded him to centralise open heart surgery. At the time 7 hospitals were doing heart surgery with variable results. After intense negotiations it was agreed in 1971 to establish a National Cardiac Surgery Unit at the Mater hospital under Maurice Nelligan. The benefits of this enlightened decision have been sustained over the last 43 years.

The specialty developed rapidly with the advent of the heart lung bypass machine which greatly facilitated the application of open heart surgery. The original device required 54 units of blood for priming and necessitated a large group donation from the soldiers' barracks. Subsequent models only needed 2 units. Transposition of the great vessels (TGA) and coarctation of the aorta were two of the major challenges facing paediatric cardiac surgery. Atrial redirection of TGA was introduced in Dublin in 1979 by Maurice Nelligan. Wood returned to Dublin around 1984. By 1985 there were 850 cardiac operations annually in the Mater and 220 operations in Crumlin. Subsequently the more effective but technically challenging switch operation for TGA's was introduced.

The next major advance was the development of heart transplant surgery in Ireland. After the concept was floated in 1984 there was an 18 month intense period of fund raising and medical/nurse training at Harefield Hospital. On 10th September 1985 a donor became available in Wexford General Hospital. Wood and Roisin MacSullivan, Anaesthetist flew down and collected the heart donation and brought it back to the Mater. The recipient was Eddie Kelly who survived the procedure. The successful transplant was reported in the Irish Times the following day. Subsequently between 1985 and 1994 there were 100 heart transplants the 30 day survival being 85% and the 5 year survival being 75%. The average life expectancy of a heart transplant recipient is 14 years. The publicity surrounding the transplant programme had unintended consequences in that Wood and Nelligan were instructed by the Medical Council to maintain a low profile. The source and reason for the complaint was never made known to them.

The Department of Health Cardiovascular Strategy in 1999 had a major impact. It provided an impetus for the development of cardiac and cardiovascular services. Crumlin became an increasingly busy centre for paediatric cardiac surgery and is the fourth largest centre in the UK and Ireland. In 1992 the National Homograft Valve Bank was established. The valves can be preserved for 5 years. When placed in a recipient they can last for 15-20 years, have reduced risk of infection and avoid the need for anticoagulation. In 2005 the artificial heart programme was introduced. Also around this time ECMO was established for cardiac cases in adults and children. The first lung transplant was undertaken in 2005 and to date 80 patients have received transplants.

He raised the issue of medical regulation and emphasised the significance of the 2007 new medical practitioners' act. He gives two descriptions of a good doctor. The first is one who cures sometimes, relieves often and cares always. The second is a physician who is able, affable and available. There is a dichotomy in that although 90% of the public trust doctors, Ireland has a high malpractice rate second only to Florida.

Finally, in 2012 the exit rate for Irish doctors per age group was: 25-29 years ( 6.4%), 30-34 years (6.3%), 35-39 years ( 6.1%), 40-59 years (2.1%), 60-64 years (6.4%). Retention of medical staff has now become a major challenge. The other is the equipoise between management and the medical profession. The command control model remains in existence.

JFA Murphy
Editor

# Towards Realistic and Flexible Advance Care Planning

The suffering of the many Irish people who bought houses at the height of the economic boom with variable mortgages is a topical and telling demonstration of the difficulties of planning for the future. What seemed like a good idea in 2006 has become a millstone around many necks, putting huge strains on marriages and family life, and is deservedly a topic of national debate. Signing into a binding written commitment for their financial future has been a bitter experience for this large group of people: how much more painful might it be if they had signed into unhappy binding agreements about their future healthcare? The illusion that the future healthcare can be tightly defined is typified by the case for advance directives, an idea for which enthusiasm has unhappily out-stripped an increasingly critical biomedical literature[1]. This ranges from their description by the majority of ICU staff in one US study as 'useless'[2] to clear problems which arise when advance directives are patently in conflict with the patient's best interests[3].

A number of criticisms can be levelled at most forms of proposed advance care directives currently available in Ireland – the most prominent of which is Think Ahead www.thinkahead.ie , in part funded by Atlantic Philanthropies - as well as the recommendations of the Irish Law Reform Commission[4]. They are generally negative in nature, focussing on non-treatment rather than treatment, and offer an impoverished pallette of responses to the demands of late-life complexity. A further major concern is the extent to which they may consciously or unconsciously reflect widespread ageism and prejudice against disability, a trend magnified by underprovision of gerontological nursing skills in many settings[5]. This was illustrated in an RTE documentary in 2009 which prefaced a discussion on end-of-life care with a video of a man with Parkinson's apparently aspirating on regurgitated feed from a gastrotomy tube. To any trained clinicians watching, the problem was a care issue in that he was being fed while recumbent – which hugely increases the risk of aspiration - and not necessarily that of the ethics of life support and disability, a point completely missed by the panel on the programme.

Combatting negativity about life with dementia and disability remains challenging, despite ground-breaking conceptual[6], ethical[7] and empirical study on preserved personhood and quality of life in dementia[8]. Research on personal growth in disability[9], as well as the remarkable testimony of the Irish film-maker Simon Fitzmaurice on his struggle to ensure that he would be ventilated with his motor neuron disease[10], should instil caution on those who might consider eschewing life-support in advance planning for a possibile future disabling illness. This is especially relevant given the emotive video on the Think Ahead website whereby a relatively young fireman expresses a wish not to be on life support if there is 'no way back'.

Older people themselves understand that late life is also a time marked by complexity, increased inter-individual variability and unpredictability, and defer advance care planning to a time when the reality of illness and disability are salient, as displayed by a study from the first Irish longitudinal study on ageing[11]. In the USA, it is a striking that many avoid engaging with advance directives in settings where the law mandates that they should be offered the opportunity to make one[12]. For those that do make an advance directive, frequent changes are common[13], and it is clear that patients do not desire a stark dichotomy between life-sustaining treatment and hospice care[14]. In addition, the heterogeneity of possible outcomes means that the methodology of assisted decision-making is less helpful[15], unlike more specific decisions such as the use of respite care[16].

So given that some form of advance care planning is clearly desirable at certain stages of health care, what form of mechanisms might we put in place, building on the encouraging finding that Irish doctors consult appropriately with patients and their families when altering treatment intensity at the end of life[17]? Such care should be planned at at a point where the patient has some experience and knowledge of the likely conditions. The plan should be developed with a healthcare professional who has in-depth knowledge of the relevant conditions. It should be possible to request positive, pro-active care as well as treatment refusal. For example, given that the most likely scenario for impaired decision-making capacity in clinical practice arises from the two key illnesses of later life, dementia and stroke, specifying that those looking after the patient would have specific training in gerontology and dementia care would be reasonable[18].

In this way, so that the patient's wishes can be interpreted in a sensitive fashion for as long as possible and flexible advance care preferences constructed that can adapt to changing circumstances and new therapeutic and palliative advances. Rather than binding my healthcare providers into an out-dated view of a fast-changing medical landscape, the plan should be phrased in terms of advanced care preferences with a strong moral force rather than a legally binding directive[19]. This approach is supported by studies which show that in general patients trust their doctors to do the right thing[20].

The impending Irish legislation on mental capacity promotes the concept of co-decision-maker. This is a more useful concept than that of health-care proxy, a subtle but important emphasis on assisted decision-making, extending autonomy. Even in late dementia, a patient may make preferences clear by pulling out a tube or line, or by insisting in drinking despite a swallow disorder which means that liquids may spill into the lungs: what is most important is that the care staff know how to interpret and support these decisions. Bertrand Russell wrote that the demand for certainty is one which is natural to man, but is nevertheless an intellectual vice. There is an urgent need for Irish clinicians to inject clinical reality and relevant research into the national debate on advance care planning so as to develop new models which avoid early foreclosure on options for a full palette of care at the end of life.

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**References**
1. Perkins HS. Controlling death: the false promise of advance directives. Annals of internal medicine 2007; 147: 51-7.
2. Gutierrez KM. Advance directives in an intensive care unit: experiences and recommendations of critical care nurses and physicians. Critical care nursing quarterly 2012; 35: 396-409.
3. Smith AK, Lo B, Sudore R. When previously expressed wishes conflict with best interests. JAMA internal medicine 2013; 173: 1241-5.
4. Law Reform Commission. Report on Bioethics: Advance Care Directives. Dublin: Law Reform Commission, 2009.
5. Canavan M, O'Neill D. Palliative care for older people in nursing homes. Irish medical journal 2010; 103: 165-6.
6. Kitwood TM. Dementia reconsidered : the person comes first. Buckingham England ; Philadelphia: Open University Press; 1997.
7. Post SG. The moral challenge of Alzheimer disease. Baltimore, Md.: Johns Hopkins University Press; 1995.
8. Banerjee S, Smith SC, Lamping DL, et al. Quality of life in dementia: more than just cognition. An analysis of associations with quality of life in dementia. Journal of neurology, neurosurgery, and psychiatry 2006; 77: 146-8.
9. Pollard C, Kennedy P. A longitudinal analysis of emotional impact, coping strategies and post-traumatic psychological growth following spinal cord injury: a 10-year review. British journal of health psychology 2007; 12: 347-62.

10. Fitzmaurice S. They asked me why I would want to live. Irish Times. 2011.
11. Garavan R, McGee HM, Winder R, O'Neill D. When and how older people discuss preferences for long-term care options. Journal of the American Geriatrics Society 2009; 57: 750-1.
12. Van Leuven KA. Advanced care planning in health service users. Journal of clinical nursing 2012; 21: 3126-33.
13. Fried TR, O'Leary J, Van Ness P, Fraenkel L. Inconsistency over time in the preferences of older persons with advanced illness for life-sustaining treatment. Journal of the American Geriatrics Society 2007; 55: 1007-14.
14. Casarett D, Van Ness PH, O'Leary JR, Fried TR. Are patient preferences for life-sustaining treatment really a barrier to hospice enrollment for older adults with serious illness? Journal of the American Geriatrics Society 2006; 54: 472-8.
15. O'Connor AM. Ottawa decision support framework to address decisional conflict, 2006.
16. Stirling C, Leggett S, Lloyd B, et al. Decision aids for respite service choices by carers of people with dementia: development and pilot RCT. BMC medical informatics and decision making 2012; 12: 21.
17. Robinson D, O'Neill D. Communication and documentation of Do-Not-Associate orders in an Irish teaching hospital. Medico-Legal Journal of Ireland 2005; 11: 60 - 2.
18. O'Neill D. Present, rather than, advance directives. Lancet 2001; 358: 1921-2.
19. O'Neill D. Advance Care Planning. In: O'Neill D, ed. Ageing and Caring: a guide for later life. Dublin: Orpen Press; 2013: 349-56.
20. Fournier V, Berthiau D, Kempf E, d'Haussy J. [Are advance directives useful for doctors and what for?]. Presse medicale 2013; 42: e159-69.

# Cancer Incidence and Mortality due to Alcohol: An Analysis of 10-Year Data

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**Abstract**
Alcohol consumption is causally related to cancer of the upper aero-digestive tract, liver, colon, rectum, female breast and pancreas. The dose response relationship varies for each site. We calculated Ireland's cancer incidence and mortality attributable to alcohol over a 10-year period. Between 2001 and 2010, 4,585 (4.7%) male and 4,593 (4.2%) female invasive cancer diagnoses were attributable to alcohol. The greatest risk was for the upper aero-digestive tract where 2,961 (52.9%) of these cancers in males and 866 (35.2%) in females were attributable to alcohol. Between 2001 and 2010, 2,823 (6.7%) of male cancer deaths and 1,700 (4.6%) of female cancer deaths were attributable to alcohol. Every year approximately 900 new cancers and 500 cancer deaths are attributable to alcohol. Alcohol is a major cause of cancer after smoking, obesity and physical inactivity. Public awareness of risk must improve. Over half of alcohol related cancers are preventable by adhering to Department of Health alcohol consumption guidelines.

## Introduction

Alcohol consumption causes 3.8% of global mortality. Europe and America have the highest death rates, 6.5% and 5.6% respectively[1]. The main causes of alcohol related death in European men are cirrhosis (26%), unintentional injury (23%) and cancer (17%). In European women, the main causes of alcohol related death are cirrhosis (37%) and cancer (31%)[2]. In Ireland the proportion of alcohol related deaths from cancer is higher than the European average, 20.7% for men and 38.8% for women[3]. Cancer incidence due to alcohol was quantified for eight European counties (but not Ireland) as part of the EPIC study[4]. This found 10% of male and 3% of female cancer incidence is attributable to current or former alcohol consumption.

There is a proven link between alcohol consumption and cancer of the upper aero-digestive tract (lip, oral cavity, pharynx, larynx, oesophagus), liver, colon, rectum and female breast, with a small statistically significant increased risk for pancreatic cancer with high intake[5,6]. There is no threshold below which there is no increased cancer risk. The strength of the relationship varies for different sites. The relationship between alcohol consumption and cancer of the upper aero-digestive tract is greatest, with more than a doubling in risk from an average consumption of 50g of pure alcohol per day[2]. For female breast cancer each additional 10g of pure alcohol per day is associated with a 7% increase in relative risk[7]. For colorectal cancer, consumption of 50g per day increases the risk by 10-20%[2]. The molecular mechanisms for alcohol-associated carcinogenesis focus on acetaldehyde, the first and most toxic ethanol metabolite, as a cancer-causing agent. Ethanol may also stimulate carcinogenesis by inhibiting DNA methylation and by interacting with retinoid metabolism. Alcohol-related carcinogenesis may interact with other factors such as smoking, diet and co-morbidities, and depends on genetic susceptibility[8,9].

The volume of alcohol consumed in Ireland increased dramatically over the past 50 years. In 1963 average consumption of pure alcohol was 6.2 litres per adult per year. In 2002 consumption reached a peak at 14.2 litres (compared with a European average of 9.1 litres and a global average of 6.1 litres at that time). In 2010 Ireland's consumption reduced to 11.9 litres[10]. While this is now more in line with the European average, it remains a concern especially as one in five in Ireland is an abstainer[11]. The objective of this study is to calculate the proportion of cancer incidence and cancer mortality in Ireland that was due to alcohol consumption over the ten year period, 2001 to 2010.

## Methods

The alcohol attributable fraction (AAF) is used to estimate the proportion of a condition that is causally related to alcohol. The cancer AAF is a function of population age-specific prevalence (P) of alcohol consumption and relative risk (RR) estimates of acquiring a specific alcohol-related cancer, using the formula in Figure 1. AAFs can be applied to national population data on incidence and mortality to determine the number of new cancers and cancer deaths, for a defined time-period, that are causally related to alcohol consumption. Previous research calculated AAFs for all alcohol-related mortality in Ireland[3]. These researchers used alcohol consumption data from the Survey of Lifestyles, Attitudes and Nutrition (SLAN) in 2007[12] and adjusted it upwards to account for the underestimation by self-reporting. We used their adjusted prevalence data in this study and their consumption categories i.e. abstainer (the reference category),

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low risk, risky and high risk. Consumption is recorded in grams per day.

A literature review of meta-analyses/systematic reviews identified RRs of specific cancers that are causally related to alcohol. These RRs were applied to the SLAN categorical variables of alcohol consumption in Ireland, Table 1. We obtained national cancer incidence and mortality data, for cancers known to have a causal relationship with alcohol consumption, for the 10 year period 2001-2010. Cancer incidence data were obtained from the National Cancer Registry of Ireland. Cancer mortality data were obtained from the Central Statistics Office. The derived AAFs for each cancer by 5-year age group, for males and females, were collated with cancer incidence and mortality data to determine the number of alcohol attributable cancers in each age group. The total number of new cancer cases and deaths between 2001 and 2010 attributable to alcohol was then calculated, as were the overall proportions attributable to alcohol.

$$AAF_j = \frac{\sum_{i=1}^{k} p_{ij}(RR_i - 1)}{\sum_{i=0}^{k} p_{ij}(RR_i - 1) + 1}$$

**Figure 1**

Formula for calculating cancer specific Alcohol Attributable Fractions (AAF) for each age group (j)

$i$ = alcohol consumption category (note reference category $i = 0$ equates to abstinence)
$p_{ij}$ = prevalence of exposure to alcohol level i in age group j (13 age groups)
$RR_i$ = the relative risk of the specific cancer associated with consumption level i

**Table 1  Relative Risks for cancers causally related to alcohol consumption**

| Cancer Site | ICD 10 Code | Relative risk for selected consumption levels | | | | Data Source |
|---|---|---|---|---|---|---|
| **Males** | | Abstainer | 0.25-39.9g/d | 40-59.9 g/d | 60+ g/d | |
| **Females** | | Abstainer | 0.25-19.9g/d | 20-39.9 g/d | 40+ g/d | |
| Lip, Oral Cavity, Pharynx | C00-C14 | 1 | 1.45 | 1.85 | 5.39 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Oesophagus | C15 | 1 | 1.8 | 2.38 | 4.36 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Larynx | C32 | 1 | 1.83 | 3.9 | 4.93 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Liver | C22 | 1 | 1.45 | 3.03 | 3.6 | Rehm[13] Gutjahr[14] Ridolfo[15] |
| Breast (female) | C50 | 1 | 1.15 | 1.32 | 1.46 | Hamajima[7] Chen[16] Rehm[13] |
| Colon | C18 | 1 | 1.05 | 1.1 | 1.21 | Carrao[17] |
| Rectum | C19-21 | 1 | 1.09 | 1.19 | 1.42 | Carrao[17] |
| Pancreas | C25 | 1 | 1.03 | 1.1 | 1.3 | Tramacere[6] |

### Results
Table 2 shows total 10-year cancer incidence in sites known to be impacted by alcohol and the number (%) calculated as being attributable to alcohol. Table 3 provides the results for cancer mortality attributable to alcohol.

*Incidence*
Between 2001 and 2010, there were 21,371 invasive cancers diagnosed in men in sites where alcohol is known to play a causative role; 4,585 were attributed to alcohol i.e. 21.5% of all cancers in those sites and 4.7% of all invasive male cancers, Table 2. Of the 4,585 alcohol-attributable cancers diagnosed in men, 64.5% were in the upper aero-digestive tract (lip, oral cavity, pharynx, larynx, oesophagus). Alcohol was considered responsible for 52.9% of male upper aero-digestive tract cancers, in contrast with 6% of colon cancers, 11.4% of rectal cancers and 7% of pancreatic. Alcohol played a causative role in 44.5% of male liver cancers. Between 2001 and 2010, 39,555 invasive cancers were diagnosed in women in sites where alcohol is known to play a

**Table 2  Ten year total cancer incidence and alcohol attributable cancer incidence in specific sites, 2001-2010 (NCRI)**

| Cancer site | 10 year cancer incidence Number | 10 year cancer incidence attributable to alcohol Number (%) |
|---|---|---|
| **Males** | | |
| Lip, Oral Cavity, Pharynx | 2135 | 1121 (52.5) |
| Oesophagus | 2273 | 1158 (50.9) |
| Larynx | 1191 | 682 (57.3) |
| Colon | 7478 | 452 (6.0) |
| Rectum | 5143 | 587 (11.4) |
| Liver | 993 | 442 (44.5) |
| Pancreas | 2158 | 143 (6.6) |
| Total | 21371 | 4585 |
| **Females** | | |
| Lip, Oral Cavity, Pharynx | 977 | 335 (34.3) |
| Oesophagus | 1278 | 439 (34.4) |
| Larynx | 205 | 92 (44.9) |
| Colon | 6486 | 235 (3.6) |
| Rectum | 2952 | 208 (7.0) |
| Liver | 532 | 163 (30.6) |
| Pancreas | 2130 | 63 (3.0) |
| Breast | 24995 | 3058 (12.2) |
| Total | 39555 | 4593 |

**Table 3  Ten year total cancer mortality and alcohol attributable cancer mortality in specific sites, 2001-2010 (CSO)**

| Cancer site | 10 year cancer mortality Number | 10 year cancer mortality attributable to alcohol Number (%) |
|---|---|---|
| **Males** | | |
| Lip, Oral Cavity, Pharynx | 902 | 455 (50.5) |
| Oesophagus | 2084 | 1048 (50.3) |
| Larynx | 527 | 294 (55.8) |
| Colon | 3156 | 184 (5.8) |
| Rectum | 2243 | 243 (10.8) |
| Liver | 1067 | 462 (43.3) |
| Pancreas | 2102 | 137 (6.5) |
| Total | 12081 | 2823 |
| **Females** | | |
| Lip, Oral Cavity, Pharynx | 372 | 110 (29.6) |
| Oesophagus | 1178 | 389 (33.0) |
| Larynx | 90 | 36 (40.0) |
| Colon | 2643 | 86 (3.3) |
| Rectum | 1342 | 83 (6.2) |
| Liver | 836 | 241 (28.8) |
| Pancreas | 2094 | 60 (2.9) |
| Breast | 6601 | 695 (10.5) |
| Total | 15156 | 1700 |

causative role; 4,593 were considered attributable to alcohol i.e. 11.6% of all the cancers in these specific sites and 4.2% of all female invasive cancers, Table 2. Among females, upper aero-digestive tract cancers were also most impacted, with 866 (35.2%) of the 2,460 cancers of the upper aero-digestive tract attributable to alcohol. Only 3.6% of colon, 7% of rectal and 3% of pancreatic cancers were attributed to alcohol. However, 12.2% of breast cancers, 305 cases annually, were attributed to alcohol. This accounted for two-thirds of all cancer diagnoses attributable to alcohol in females.

*Mortality*
Between 2001 and 2010, 6.7% of all male cancer deaths and 4.6% of all female cancer deaths were attributable to alcohol. There were 12,081 male cancer deaths in sites known to be impacted by alcohol and of these 2,823 (23.4%) were attributed to alcohol. Like cancer incidence, most alcohol-related cancer deaths in men were in the upper aero-digestive tract (63.6%). Among females there were 15,156 cancer deaths in sites known to be impacted by alcohol and 1,700 (11.2%) were attributed to alcohol. Breast cancer deaths contributed to 40.9% of alcohol related cancer deaths.

### Discussion
Alcohol is a group 1 carcinogen. It is one of the most important causes of cancer after tobacco smoking, obesity and physical inactivity. Yet, the public is not generally aware of the risk of cancer from alcohol. Though the overall risk of cancer from alcohol is low, this study shows that, every year in Ireland approximately 5% of newly diagnosed cancers and cancer deaths are attributed to alcohol i.e. a yearly average of 917 new cases and 452 deaths between 2001 and 2010. This is similar to international findings, with regional differences reflecting variations in alcohol consumption[4,18].

The cancer risk from alcohol varies for different parts of the body. The greatest risk is to the upper aero-digestive tract where it explains over 50% of these cancers in men and over one-third in women in Ireland. The risk of cancer in the upper aero-digestive tract is strongly related to the amount of alcohol consumed[19]. Furthermore, alcohol consumption together with tobacco smoking can explain 75% of these cancers, as alcohol and tobacco act synergistically. Therefore the majority of cancers of the upper

aero-digestive tract could be avoided by not smoking and moderating alcohol use[20,21]. Just 12.2% of breast cancers were attributable to alcohol but most (67%) of all the female cancers attributable to alcohol were breast cancers. This is simply because breast cancer is a common disease. Other research world-wide concurs that 60% of female cancers attributable to alcohol occur in the breast[18]. While the impact on breast cancer is modest in percentage terms, is important at a population level. It is important that women who are at higher risk of breast cancer have information on the additional risk from alcohol. In relation to liver cancer, the EPIC study found that the average proportion of liver cancer incidence due to alcohol, in eight European countries, was 33% for men and 18% for women[4]. The corresponding figure for Ireland was higher at 44.5% for men and 30.6% for women. It is also notable that between 2001 and 2010 recorded liver cancer mortality was higher than liver cancer incidence and the variation was greater in women. One possible hypothesis is that some deaths from 'metastatic liver cancer' may be recorded on death certificates as 'liver cancer'. This warrants further study.

Department of Health alcohol consumption guidelines are 17 units per week for males and 11 units per week for females. The EPIC study showed that 50% of alcohol-related cancer incidence was due to drinking over recommended limits[4]. However there is no threshold of consumption below which there is no risk. Even small volumes of alcohol consumption, within the recommended consumption limits, have been shown to contribute to breast cancer[13].

There are some limitations in the derivation and application of attributable risk estimates. Firstly, the AAF is dependent on the accuracy of population alcohol consumption data and on the RRs used in the calculations. We used adjusted consumption data to overcome the issue of underestimation by self reporting. Using adjusted data is in itself limiting as it assumes a symmetrical distribution across consumption categories. Relative risk estimates in the epidemiological literature vary between different meta-analyses but are broadly similar. Confidence limits associated with these RRs need to be borne in mind but as with other calculations of AAFs[15], we have not developed methodologies to calculate confidence intervals for each AAF. Therefore there is some uncertainty surrounding the estimate presented. Secondly, the interpretation of attributable risk should be approached with caution, particularly in relation to a multifactorial disease such as cancer. Removal of exposure does not reduce risk to zero in the individual or the population, given the existence of other significant risk factors. However, it can be used to estimate the potential reduction in an individual's risk of a particular cancer, or indeed the burden of disease that could be prevented in the population. Finally there is a long lag-time between consumption of alcohol and eventual onset of or death from cancer. As such, the burden of cancer from 2001-2010 more accurately reflects patterns of alcohol consumption in the 1980s and 1990s.

A public and health professional information campaign is needed to highlight the risk of alcohol on cancer. This should reinforce that drinking within Department of Health guidelines could prevent half of alcohol-related cancers. It should highlight the huge risk of upper aero-digestive cancer from alcohol and the synergistic impact of smoking. Women need to know about the risk of breast cancer from even low levels of consumption so that they can make an informed choice about their alcohol consumption.

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**References**
1.  Rehm J, Mathers C, Popova S, Thavorncharoensap M, Teerawattananon Y, Patra J, Alcohol and Global Health 1; Global Burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. Lancet 2009; 373; 2223-2233.
2.  Alcohol in the European Union: consumption, harm and policy approaches. WHO; 2012.
3.  Martin J, Barry J, Goggin D, Morgan K, Ward M, O'Suilleabhain T. Alcohol attributable mortality in Ireland. Alcohol and Alcoholism 2010; 45:379-386.
4.  Schütze M, Boeing H, Pischon T, Rehm J, Kehoe T, Gmel G, Olsen A, Tjønneland A, Dahm C, Overvad K, Clavel-Chapelon F, Boutron-Ruault M, Trichopoulou A, Benetou V, Zylis D, Kaaks R, Rohrmann S, Palli D, Berrino F, Tumino R, Vineis P, Rodríguez L, Agudo A, Sánchez M, Dorronsoro M, Chirlaque M, Barricarte A, Peeters P, van Gils C, Khaw K, Wareham N, Allen N, Key T, Boffetta P, Slimani N, Jenab M, Romaguera D, Wark P, Riboli E, Bergmann M Alcohol attributable burden of incidence of cancer in eight European countries based on results from prospective cohort study. Br Med J 2011; 342: d1584.
5.  IARC Monographs. Personal habits and indoor combustions; Volume 100 E. A review of human carcinogens. IARC Monographs on the evaluation of carcinogenic risks to humans. IARC. WH0, Lyon, France 2012. http://monographs.iarc.fr/ENG/Monographs/vol100E/100E-06-Table2.13.pdf. Accessed July 2013. http://monographs.iarc.fr/ENG/Monographs/vol100E/100E-06-Tables2.14.pdf. Accessed July 2013. http://monographs.iarc.fr/ENG/Monographs/vol100E/100E-06-Table 2.25.pdf. Accessed July 2013.
6.  Tramacere I, Scotti L, Jenab M, Bagnardi V, Bellocco R, Rota M, Corrao G, Bravi F, Boffetta P, La Vecchia C. Alcohol drinking and pancreatic cancer risk: a meta-analysis of the dose-risk relation. Int J Cancer 2010; 126: 1474-1486.
7.  Hamajima N, et al. Alcohol, tobacco and breast cancer—collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without breast cancer. Br J Cancer. 2002; Nov 18; 87: 1234-45.
8.  Seitz H, Stickel F. Molecular mechanisms of alcohol-medicated carcinogenesis. Nature Reviews Cancer 2007; 599-612.
9.  Seitz H, Pelucchi C, Bagnardi V, La Vecchia C. Epidemiology and pathophysiology of alcohol and breast cancer: Update 2012. Alcohol and Alcoholism, 2012; 1-9.
10. Global Health Observatory Data Repository. World Health Organisation. http://apps.who.int/gho/data/node.main.A1025?lang=en&showonly=GISAH. Accessed July 2013.
11. Steering group report on a National Substance Misuse Strategy. February 2012. Department of Health. Dublin. www.dohc.ie Accessed July 2013.
12. Department of Health and Children; SLAN 2007; Survey of Lifestyle. Attitudes and Nutrition in Ireland; Main Report; 2008. www.dohc.ie Accessed July 2013.
13. Rehm J, Room R, Monteiro M, Gmel G, Graham K, Rehn N, Sempos CT, Frick U, Jernigan D: Alcohol use. In Comparative quantification of health risk: Global and regional burden of disease attributable to selected major risk factors. Volume 1. Edited by Ezzati MLA, Rodgers A, Morray CJ. Geneva: The WHO; 2004:959-1108. Accessed July 2013.
14. Gutjahr E, Gmel G, Rehm J: Relation between average alcohol consumption and disease: an overview. European Addiction Research 2001, 7:117-127.
15. Ridolfo B, Stevenson C: The quantification of drug caused mortality and morbidity in Australia, 1998. Canberra (AS): Australian Institute of Health and Welfare; 2001.
16. Chen WY, Rosner B, Hankinson SE, Colditz GA, Willet WC. Moderate alcohol consumption during adult life, drinking patterns, and breast cancer risk. JAMA. 2011 Nov 2;306:1884-90.
17. Carrao G., Bagnardi V, Zambon A, La Vecchia C. A meta-analysis of alcohol consumption and the risk of 15 diseases. Prev Med 2004; 38: 613-9.

18. Boyle P, Levin B. Interaction between tobacco and alcohol frequency and the risk of head and neck cancer. Adapted from Boyle 2008. World Cancer report, 2008. World Health Organisation Lyon 2008.

19. Altieri A Bosetti C. Gallus S. Wine, beer and spirits and the risk of oral and pharyngeal caner: a case control study from Italy and Switzerland. Oral Oncol. 2004; 40;904-9.

20. Doll R. Forman D. La Vecchia C. Woutersen R. Alcoholic beverages and cancers of the digestive tract and larynx. In: Macdonald, I., ed. Health Issues Related to Alcohol Consumption. 2nd ed. Oxford: ILSI Europe-Blackwell Science Ltd, 1999. pp. 351–393.

21. Bofetta P, Hashibe M, LaVechia, Zatonski W, Rehm J. The burden of cancer attributable to alcohol drinking. Int. J. Cancer 2006; 119: 884-887.

# Are Irish Adult General Practice Consultation Rates as Low as Official Records Suggest? A Cross Sectional Study at Six General Practices

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**Abstract**
Accurate data on primary care activity is key to health services planning and reconfiguration. Official data estimate general practice adult consultation rates to be 3.2 visits annually, based on patient self reports. We aim to estimate the consultation rate using practice based data and compare this to official estimates. We interrogated six general practices' information systems and estimated consultation rates based on practice, telephone, domiciliary and out of hours consultations by patients aged 18 years or older. The study population (20,706 patients) was representative of the national population in terms of age and GMS status. The mean consultation rate was 5.17, though this was higher among GMS-eligible patients and among older age groups. Estimates of consultation rates derived from practice based data are likely to be higher than that derived from other approaches. Using multiple sources of data will enhance accuracy of workload estimates and this will benefit service planning.

## Introduction
General practice and primary care are key to the reconfiguration of health services in Ireland. Accurate data on workload, morbidity and health service utilisation is necessary. Though official data estimated Irish general practice consultation rates to be 3.2 visits annually in 2010 (2.8 visits in 2007), this estimate is based on patient self reports alone and does not consider data contained in general practice based information systems. There is an increasing recognition that such health information systems have key role in this respect. This paper aims to estimate the consultation rate at a sample of Irish general practices using general practice information systems.

The method of funding Irish general practice is unique by international comparisons. Forty-three per cent of the population access free GP care through Ireland's General Medical Services (GMS) scheme[1]. Irish GPs, with a few exceptions, are paid a 'capitation fee' according to the patient's age and sex to provide 24 hour care for these patients[2]. **'Full'** GMS eligibility is determined predominantly on the basis of low income with patients aged 70 and older being allowed a much higher income threshold. About 6% GMS cards are 'GP Visit Cards' (GPVCs) which allow patients free access to their GP without the benefit of free medications and access to the other community services. The GPVC is granted on the basis of the medical card income threshold plus 50% after certain living expenses are taken into account. In addition, a small proportion of the population are granted discretionary medical cards on the basis of experiencing 'undue hardship. Therefore 57% of the population pay for general practice care though may be entitled to recoup a portion, depending on the extent of private health insurance. All GMS patients are registered with a GP. There is no national patient identifier and also no mandatory registration for private patients. The average adult standard consultation fee was €51 in 2010[3].

Official Irish adult patient GP Consultation rates are derived from the 2007 and 2010 National Quarterly Household Survey (NQHS)[4,5]. These estimates are based on recollection of consultations by patients over the previous 12 months which is at odds with the methodology used by 'European Health Interview Survey' which asked interviewees to report their doctor visits during the previous four weeks[6]. The 2007 and 2010 CSO survey methodology produces much lower attendance rates than several other estimates of consultation rate, including: CSO 2001 data which was based on recollection of consultations over the previous two weeks[7]; 'Fee-per-item' contract GP attendance rates based on administrative records and published annually by Ireland's 'Primary Care Reimbursement Service'[2,8-11]; and 'QRESEARCH' audit of 4.3 million patients involving 21.7 million clinical consultations in the UK[12]. In addition, these recent reports estimating GP consultation rate imply that consultation rates among GMS-eligible patients are similar for both younger and older patients which is again at odds with national and international evidence[12-14]. Therefore this paper aims to determine if General Practice consultation rates among Irish adults are as low suggested by this recent official data. A secondary objective was to explore if age and GMS status affect consultation rates.

## Methods
We estimated annual adult consultation rates at six general practices, purposefully selected based on interest in the topic under study and to be reflective of General Practice in Ireland[15]. Participating practices had a full complement of nursing and administrative staff and were located in all four of Ireland's Health Service Executive (HSE) regions. Characteristics of participating practices (i.e. location, staffing, local area deprivation and practice demographics) are described in Table 1. The study period was the 12 months from 23/10/12 to 22/10/13. We adopted the same definition of consultation as that used by the 'QRESEARCH' audit of clinical consultations in the UK[12] and the CSO NQHS, i.e. 'direct contact between a clinician and patient either in the surgery, in the patients' house or on the telephone'. Telephone

contacts involving discussion of results, request for notes or a prescription were not considered as consultations. Clinic contacts at all six participating practices registered for inclusion as a consultation when a patient appointment coincided with a consultation note in the same patient's record on the same day. Estimates of out of hours contacts and telephone consultations were based on records maintained at one practice and this figure was extrapolated to all six practices.

Calculation of the number of GMS patients was taken from each practice's GMS list on the 01/04/2013. We estimated the number of 'private' patients in each practice from the number of unique private patient attendances during the 12 month study period and dividing by 0.7 (derived from 2010 CSO NQHS data which estimated that 70% of non-GMS patients attended their GP in the previous 12 months). Data at each practice was collected by a GP Principal at that practice, anonymised and only anonymised, aggregate data was reviewed / analysed by the principal investigator (WB).

**Table 1 Characteristics of participating practices**

| Practice | GP | GP Registrar | Nurse | Admini-strator | Catch-ment Area | % GMS | % Over 70 | Affluence of population |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 1.25 | 3 | Town | 40 | 8.4 | Mix with bias towards average affluence |
| 2 | 4 | 1 | 4 | 4.5 | Mixed town/rural | 43 | 9.4 | Mix with bias towards average affluence |
| 3 | 2 | 0 | 0.5 | 2 | Inner city | 53 | 10.2 | Predominantly deprived population |
| 4 | 2.5 | 0 | 0.75 | 1.25 | Rural | 59 | 14.2 | Mix marginally below average affluence/disadvantaged |
| 5 | 4 | 1 | 1.5 | 3 | Mixed town/rural | 40 | 7.1 | Mix with bias towards average affluence |
| 6 | 2.25 | 0 | 1 | 2.25 | City suburb | 32 | 15.1 | Mix with bias towards above average affluence |
| **Total** | **16.75** | **3** | **9** | **16** | | **42** | **10.1** | |
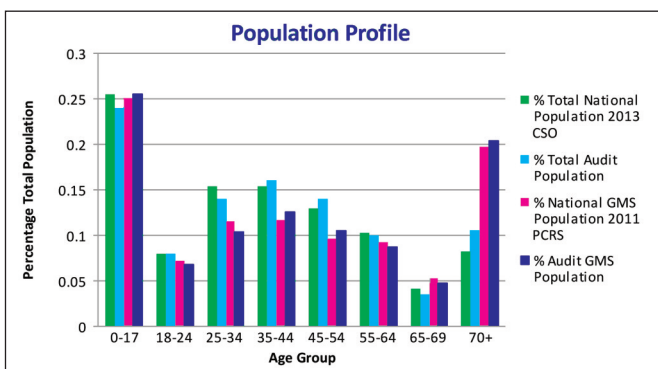


**Figure 1** Study population compared to national population, GMS-eligible population

### Results
At participating practices, there was a total combined patient population of 27,080 in the six practices of whom 20,706 were aged 18 years or older. Whole time equivalent staff was estimated as 16.75 GPs, three GP registrars, nine practice nurses and 16 administrative staff. Characteristics of the study population were comparable to both Ireland's national population and the national population of GMS-eligible patients (see Figure 1).

11,428 (42 % of total population) were GMS-eligible, which is comparable to the national reports[1]. We estimated the total population of 'private patients to be 15,652. Of the GMS eligible population, 19.6% was aged over 69 which is similar to national population[8]. 10.1% of the total population (including children) were aged over 69 years which is a slightly higher percentage of over 69 year olds than the national population proportion of 8.2% according to the 2013 CSO projections. 23.5% of our population

**Table 2 Key study findings and how they compare with consultation rates estimated elsewhere**

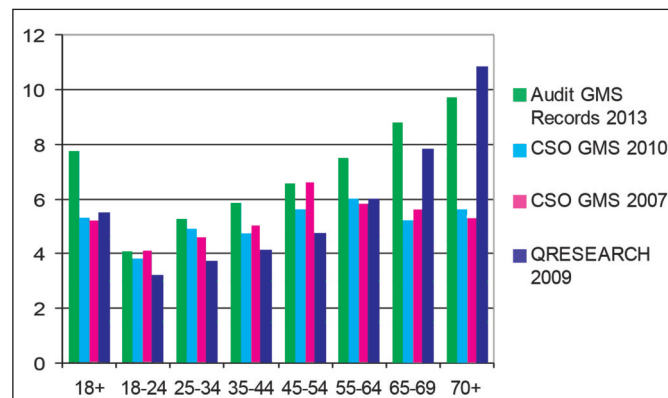| GP ATTENDANCE RATES (Adults) | 2013 Local Audit GMS | 2001 CSO GMS | 2007 CSO GMS | 2010 CSO GMS | Ave. 2007-2011 HSE Fee-per-item | 2008/9 UK QRESEARCH | 2010 Dept of GP NUI Galway |
|---|---|---|---|---|---|---|---|
| ALL PATIENTS | 5.17 | 5 | 2.8 | 3.2 | | 5.5 | |
| ALL UNDER 70 | 4.54 | | 2.6 | 2.9 | | 4.5 | |
| ALL OVER 70 | 8.56 | | 5.2 | 5.4 | | 10.8 | 8.74 |
| GMS | 7.72 | 8.9 | 5.3 | 5.2 | 8.7 | | |
| GMS Discretionary | 8.11 | | | | | | |
| GMS DVC | 5.06 | | | | | | |
| PRIVATE only | 3.35 | 3.46 | 2.2 | 2.1 | | | |
| GMS UNDER 70s | 7.01 | | 5.3 | 4.7 | | | |
| GMS OVER 70s | 9.69 | | 5.3 | 5.6 | | | |



**Figure 2** Consultation rate by age group and comparison with other literature

were under the age of 18 years old compared to 25.5% of the national population[20]. The consultation rate among all adult patients was 5.17; 7.72 among GMS-eligible patients and 3.35 among 'private' patients. GMS patients under the age of 70 attended 7.01 times per annum and 70s and those older attended 9.69 times per annum.

Almost all patients who had GPVCs or 'Discretionary' GMS cards were aged under 70. Consultation rate among patients with 'Discretionary' GMS cards was 8.11; this was higher than the consultation rate among all GMS patients aged under 70 (7.01) and patients with GPVCs (5.06). Compared to the 2007 and 2010 CSO surveys, the consultation rates we observed were higher among all age groups and medical card status. Older patients exhibit an increasing attendance rate, which would not be obvious in the CSO data (see Table 2).

### Discussion
This cross sectional study of 20,706 adult patients at six general practices estimates a mean annual consultation rate of 5.17 in Irish general practice, with higher rates observed among GMS-eligible and older patients. Our findings suggest consultation rates in Irish general practice are higher than that estimated using other approaches, especially the 2007 and 2010 CSO data[4,5]. Other approaches that involve asking patients to report health service utilisation over a shorter period and that report data from clinical records would appear to provide higher, possibly more accurate, estimates of consultation rates[7,12-14]. In particular, our findings and especially that consultation rates are higher in older age groups, are consistent with those of Hippisley Cox[12]. Our data also mirrors a recent review of 427 patients (aged >55) attending General Practice over a 12-month period which reported a mean of 8.0 discrete clinical encounters, predominantly for respiratory conditions[13]. The most marked variance between our findings and the 2007 and 2010 CSO data involves older, GMS eligible patients – the groups with higher consultation rates. While the reasons for this are complex, relying on patients to report the number of visits over a longer time period is likely to under-estimate activity. That there was little variance between our study and the 2001 CSO data, in which patients were asked to report their medical contacts over the previous two weeks, would support this hypothesis.

The introduction of free primary care, by expansion and

reconfiguration of the GMS system and the introduction of universal health insurance is a stated policy objective in Ireland[16]. Our findings suggest this policy will have considerable workload implications. Previous research in Ireland indicated that when older patients become eligible for free primary care / GMS services, they are exposed to more screening and general practice activity even after controlling for a variety of individual and household socio-economic and health status characteristics[17]. Furthermore, Nolan recently estimated 1.5-1.8 additional GP visits per person would result from the introduction of universal primary care an estimate that is consistent with our findings[18].

Extrapolating our findings to a national population of 4.59 million (2013 CSO), suggests approximately 24 million consultations occur in general practice annually (15.4 million GMS consultations and 8.8 million private consultations). Were private patients to attend at the same rate as GPVC patients, then one might anticipate an increase in general practice workload of 4.4 million consultations per year, which is well in excess of the figures currently used in planning of Universal Primary Care[19]. The planned introduction of a national chronic disease management program would further inflate this figure.

While our study population is large and reflective of the national population in terms of urban/rural location and deprivation, we acknowledge a number of potential sources of bias. These include, that only six practices were involved and a marginally higher proportion of patients aged over 69 years compared to the national population. In addition, it is unlikely that all surgery consultations were included as more than one patient may have been seen during a single consultation and urgent consultations may not have been documented. We extrapolated the telephone and out of hours consultation rate (calculated directly from practice management software or returns from the deputising service) from one practice to all six practices. It should be noted that the calculated 'out of hours' consultation rate for this practice was 0.2 per GMS patient; lower than what one would expect from national data of 804,670 out of hours GMS payments in 2011 for a total population of 1,819,720 GMS patients.

It is generally accepted that general practice and primary care are key to the reconfiguration of health services in Ireland in order to provide a more responsive, cost effective health service. Accurate data on workload, morbidity and health service utilisation is necessary to reliably inform these changes. Current official data, which is produced by survey and does not consider data contained in general practice based information systems, appears to greatly under-reflect workload in general practice, both current and future. Significant changes in national health policy should only be made if the data supporting the transformation is both reliable and convincing. Utilising current official data to plan future work-load will lead to very unpredictable results.

### Acknowledgements

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### References
1. 43.3% Population possess medical cards. Dáil Éireann Debate. Discretionary Medical Cards: Motion [Private Members] (Continued)Tuesday, 8 October 2013 http://oireachtasdebates.oireachtas.ie/debates%20authoring/debateswebpack.nsf/takes/dail2013100800047?opendocument (Accessed 03 November 2013.).
2. Statistical Analysis of Claims and Payments http://www.hse.ie/eng/staff/PCRS/PCRS_Publications/pcrsclaimsandpayments2011.pdf (Accessed 22 October 2013.). Dublin: Health Service Executive. Primary Care Reimbursement Service. 2011.
3. Doctors and Dentists Survey http://corporate.nca.ie/eng/Research_Zone/price-surveys/NCA-Doctors-Dentists-Report-may2010.doc (Accessed 11 November 2013). Dublin: National Consumer Agency, 2010.
4. Health Status and Health Service Utilisation, Quarterly National Household Survey http://cso.ie/en/releasesandpublications/health/archive/ (Accessed 22 October 2013.). Dublin: Central Statistics Office2007.
5. Health Status and Health Service Utilisation, Quarterly National Household Survey http://cso.ie/en/releasesandpublications/health/ (Accessed 22 October 2013.). Dublin: Central Statistics Office, 2010.
6. European health interview survey (EHIS). Reference Metadata in Euro SDMX Metadata Structure (ESMS). http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/hlth_ehis_esms.htm (Accessed 22 October 2013.): Eurostat, the statistical office of the European Union.2008.
7. Health, Quarterly National Household Survey. http://cso.ie/en/media/csoie/releasespublications/documents/labourmarket/2001/qnhs_healthqtr32001.pdf (Accessed 22 October 2013.). Dublin: Central Statistics Office2001.
8. Statistical Analysis of Claims and Payments 2010. http://www.hse.ie/eng/Staff/PCRS/PCRS_Publications/20108_Report.pdf (Accessed 22 October 2013.). Dublin: Health Service Executive. Primary Care Reimbursement Service. .
9. Statistical Analysis of Claims and Payments 2009. http://www.hse.ie/eng/Staff/PCRS/PCRS_Publications/2009_Report.pdf (Accessed 22 October 2013.). Dublin: Health Service Executive. Primary Care Reimbursement Service. .
10. Statistical Analysis of Claims and Payments 2008. http://www.hse.ie/eng/Staff/PCRS/PCRS_Publications/2008_Report.pdf (Accessed 22 October 2013.). Dublin: Health Service Executive. Primary Care Reimbursement Service. .
11. Statistical Analysis of Claims and Payments 2007. http://www.hse.ie/eng/Staff/PCRS/PCRS_Publications/2007_Report.pdf (Accessed 22 October 2013.). Dublin: Health Service Executive. Primary Care Reimbursement Service. .
12. Hippisley-Cox J, Vinogradova Y. QResearch and The Health and Social Care Information Centre. Final Report to the NHS Information Centre and Department of Health. Trends in Consultation Rates in General Practice 1995/1996 to 2008/2009: Analysis of the QResearch database http://www.hscic.gov.uk/searchcatalogue?productid=729&topics=1%2fPrimary+care+services%2fGeneral+practice&sort=Most+recent&size=100&page=1#top (Accessed 22 October 2013.). 2009.
13. Power C, O'Connor R, Dunne S, Finucane P, Cullen W, Dunne C. An evidence-based assessment of primary care needs in an economically deprived urban community. Ir J Med Sci. 2013 Sep;182:457-61.
14. Glynn LG, Valderas JM, Healy P, Burke E, Newell J, Gillespie P, et al. The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. Family practice. 2011 Oct;28:516-23.
15. O'Dowd T, O'Kelly M, O'Kelly F. Structure of General Practice in Ireland: 1982-2005. Dublin: ICGP / TCD2005.
16. Programme for Government. Dublin: Oireachtas2011.
17. Fitzpatrick F, Harrington P, Mahony D. The "silver-haired" general medical services patient. Clinical activity of the non-means tested over-70's during their first six months. Ir Med J. 2004 Apr;97:111-4.
18. Nolan A. Evaluating the impact of eligibility for free care on the use of general practitioner (GP) services: a difference-in-difference matching approach. Social Science and Medicine. 2008;67 (1164-1172 ).
19. Brick A, Nolan A, O'Reilly J, Smith S. Resource Allocation, Financing and Sustainability in Health Care. Evidence for the Expert Group on Resource Allocation and Financing in the Health Sector http://www.esri.ie/UserFiles/publications/BKMNEXT167V2.pdf (Accessed 22 October 2013.). Dublin-: Economic and Social Research Institute2010.
20. CSO statistical release, 29 August 2013, Population and Migration Estimates. Apr-13. Table 5 Estimated Population classified by Sex and Age Group, 2008 - 2013.

# Adverse Event Recording Post Hip Fracture Surgery

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

**Abstract**
Accurate recording of adverse events post hip fracture surgery is vital for planning and allocating resources. The purpose of this study was to compare adverse events recorded prospectively at point of care with adverse recorded by the Hospital In-Patient Enquiry (HIPE) System. The study examined a two month period from August to September 2011 at University Hospital Limerick. Out of a sample size of 39, there were 7 males (17.9%) and 32 females (82.1%) with an age range of between 53 and 98 years. The mean age was 80.5 years. 55 adverse events were recorded, in contrast to the HIPE record of 13 (23.6%) adverse events. The most common complications included constipation 10 (18.2%), anaemia 8 (14.5%), urinary retention 8 (14.5%), pneumonia 5 (9.1%) and delirium 5 (9.1%). Of the female cohort, 24 (68.8%) suffered an adverse event, while only 4 (57%) males suffered an adverse event.

## Introduction
The number of hip fractures occurring each year is increasing primarily due to the ageing demographics of the population[1]. In Ireland it is predicted that between 2008 and 2026 the number of hip fractures occurring will increase by 100%[2]. This will inevitably lead to a larger burden on health service providers[3,4]. Hip fractures are a major cause of morbidity and mortality in the elderly population[5,6]. One third of patients may be unable to regain their ability to live independently after a hip fracture[7]. Given the ages and other co-morbidities of these patients, they are at a significant risk of developing general complications common to any major surgery[8]. It is vital that these adverse events are accurately recorded so adequate resources can be allocated for the management of hip fractures. There are large inconsistencies in the rates of adverse events post hip surgery as recorded by different entities. The reasons for this include differences in adverse event definition[9-11], the data not being accurately recorded and reporting bias[12-15]. Much of the information we have on patient complication rates is dependent on administration abstraction method. This means that the validity of adverse event recording is dependent on accurate interpretation of clinical records by non-medical staff.

The purpose of this study is to assess whether the current administration abstraction method is giving an accurate representation of the number of adverse events occurring in this patient cohort and therefore reflecting the complexity of these patients.

## Methods
This study was carried out at University Hospital Limerick. This hospital provides orthopaedic services for a population catchment area of over 360,000 people and serves the counties of Limerick, Clare and Tipperary. There are approximately 300 hip fracture presentations per annum at University Hospital Limerick. All patients admitted with a hip fracture over a two month period from August to September 2011 were included in this study, giving rise to a sample size of 39 patients. Patients were chosen by means of consecutive sampling in order to reduce bias. All adverse events that occurred in these patients were recorded daily on a standardised form by a clinical nurse specialist. It is these adverse events that were compared with adverse events recorded in the Hospital In-Patient Enquiry (HIPE) database for the same patient group. The HIPE database is a national database which was set up and run on a pilot basis in 1969[16]. It is a computer based system which collects demographic, clinical and administration data on discharges and deaths from national hospitals. In Ireland all acute public hospitals participate in HIPE with reporting on greater than 1.3 million records each year[16]. The objectives of HIPE are for the "timely and accurate collection of national hospital activity data"[16]. As HIPE is the only national source we have on morbidity data it is imperative that this information is accurately recorded. Currently the validity of the information stored is dependent on the personnel extracting relevant data from the patients chart in addition to the correct information having been recorded in the chart.

A standardised form was used to record adverse events. An adverse event was defined as "any event (not the underlying disease process or injury) that requires additional monitoring/investigation or treatment during the patient's acute hospital stay"[17]. This form was adapted from Spine AdVerse Events Severity system, SAVES[18]. The adverse event was graded from 1-6 depending on the severity. Grade 1: Adverse event does not require treatment and has no adverse effect; Grade 2: Adverse event requires non-invasive treatment but has no long term effect; Grade 3: Requires invasive or complex treatment, for example, surgery/ICU admission for monitoring, likely to have a temporary effect on outcome ($<$ 6 months); Grade 4: Requires invasive or complex treatment, likely to have a prolonged adverse effect on outcome ($>$ 6 months); Grade 5: Significant event. Serious life or limb threatening event; Grade 6: Adverse event resulting in death. Additional information recorded included type of surgery, date of surgery, date of complication and type of complication.

**Table 1 Frequency of adverse event recording comparing prospective data collection with HIPE data**

| Complication | Adverse Event Form | HIPE Record |
|---|---|---|
| Constipation | 10 | 2 |
| Anaemia | 8 | 1 |
| Urinary retention | 8 | 0 |
| Pneumonia | 5 | 2 |
| Delirium | 5 | 1 |
| Cardiac event | 3 | 3 |
| Airway/ventilation | 3 | 2 |
| Pressure sore | 2 | 0 |
| Peri-prosthetic fracture | 2 | 0 |
| Acute renal failure | 2 | 2 |
| Wound ooze | 2 | 0 |
| Dehydration | 1 | 0 |
| Abnormal LFTs | 1 | 0 |
| Sepsis | 1 | 0 |
| Surgical site infection | 1 | 0 |
| Chest infection | 1 | 0 |
| Total adverse events | 55 | 13 |

## Results
In total, there were 39 patients enrolled in the study. There were 7 males (17.9%) and 32 females (82.1%) with an age range of between 53 and 98 years. The mean age of the sample was 80.5 years. The most common operation that took place was a cemented hemiarthroplasty which accounted for 46.2% of all operations. This was followed by dynamic hip screw insertion 28.2%, hemiarthroplasty 12.8%, proximal femoral nail insertion 10.3% and a revision proximal nail insertion accounting for 2.5% of operations carried out. Please refer to Figure 1, which also illustrates the variations in the occurrence of complications for each surgery type.

28 (71.8%) of the 39 patients were recorded by the prospective data collection as having an adverse event with a total number of 55 occurring (Table 1). Of the female cohort, 24 (68.8%) suffered an adverse event, while only 4 (57%) males suffered an adverse event. The most common complications included constipation (18.2%), anaemia (14.5%), urinary retention (14.5%), pneumonia (9.1%) and delirium (9.1%). More serious/life threatening adverse
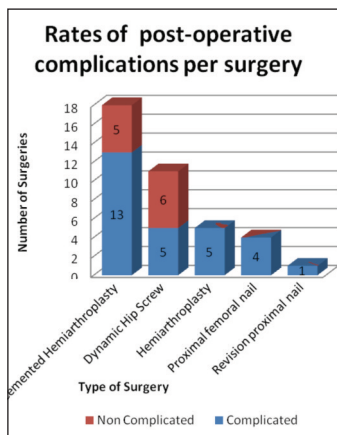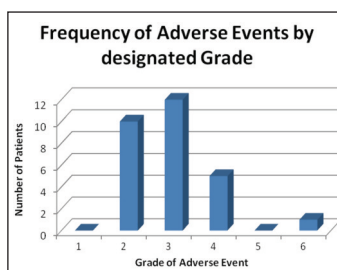
**Figure 1**



**Figure 2**

events recorded in the study included cardiac events (5.5%), respiratory complications that needed intubation/oxygenation (5.5%), acute kidney failure (3.6%), and sepsis (1.8%). The grades of adverse events that occurred ranged from 2 to 6. 10 patients suffered a grade 2 adverse event, 12 patients suffered a grade 3 adverse event, 5 patients suffered a grade 4 adverse event and 1 patient had a grade 6 adverse event resulting in that patient's death (Figure 2). This demonstrates whilst the majority of patients suffered non-life threatening events, for 6 (15.3%) patients the complication they suffered led to a prolonged (>6 months) adverse effect on their health and in one case the death of a patient.

In contrast, the HIPE data shows that only 13 (23.6%) adverse events were recorded (Table 1). There were 42 (76.4%) adverse events which were not recorded in the HIPE data for this patient cohort. In addition, two patients who were recorded using the prospective data collection sheet were not recorded by HIPE. There was no grading system or similar system used by HIPE to convey the complexity of adverse events that were recorded and the potential long-term consequences for the patient.

**Discussion**
As the demographics of our population is changing and the incidence of hip fractures is projected to increase, it is important that the post-operative complications are accurately documented. This study looked at prospectively collected data in order to gain a more accurate account of all medical complications. The mean patient age was 80.5 years and given the other co-morbidities of the cohort and the nature of the surgery, these factors likely lead to an increased risk of developing post-operative adverse events and complications. We recorded a high level of post-operative adverse events with 71.8% of patients recorded as suffering an adverse event. The majority of these where non-life threatening events but life threatening adverse events such as cardiac events, respiratory complications, acute kidney failure and sepsis accounted for over 16% of total adverse events recorded. Only 25.6% of patients suffered one adverse event with the majority suffering greater than one. These figures are much higher than those reported in the literature, which depends primarily on obtaining data by means of retrospective chart abstraction. Lawrence et al[19] looked at medical complications and outcomes after hip fracture repair. They analysed 8,930 and concluded that post-operative complications affect prognosis in addition to 30 day and 1 year mortality rates.

In particular, they found that patients with greater than one post-operative complication had a particularly poor prognosis. This study, which had a large patient cohort, had very different adverse event rates from our study. Overall, they found that 19% of patients had an adverse event with only 0.7% of patients having 2 adverse events and 0.3% of patients having 3 or more adverse events. This significant difference in complication rates between studies may be due to errors in reporting or inaccurate recording of adverse events. Given the fact that post-operative

complications have major implications on the patient's outcome, it is imperative that accurate recording takes place. In the study by Lawrence et al[19], they recognised that their study's primary limitation is its retrospective chart audit design. They recognise that this may have led to them having underestimating the incidence of some adverse events.

Many studies to date have depended on retrospective chart abstraction to obtain their data on adverse event reporting. The problem is that there are inconsistencies in the extent of reporting of adverse events between centres. This makes it difficult to make an accurate comparison between centres[20,21]. Krizek (2000) believes that it is inadequate to retrospectively collect data from the medical record[9]. He believes that we should collect the data at the point of care, which will be much more accurate. Runciman et al[22] compared adverse event reporting in the Quality in Australia Health Care Study (QAHCS) and the Utah-Colorado Study (UTCOS) accounting for methodological differences between the two studies. Despite this, a threefold difference in the levels of reporting of adverse events between the two centres was noted. What Runciman concluded was that whilst there were similarities between reporting rates for more serious adverse events than for the remaining categories of adverse events, there were 6-7 times more adverse events reported by QAHCS than UTCOS. This Runciman believes is partly due to under reporting of adverse events by UTCOS.

In our study collecting data prospectively we aimed to give a more accurate representation of adverse events occurring in this cohort of patients. Major differences between levels of adverse event recording were evident between our data and HIPE data which was obtained retrospectively using a chart abstraction method. Using a grading system for the adverse events also gives a more in-depth analysis of the likely additional cost and informs us whether the adverse event had a short or prolonged effect on the patient's outcome. Reasons for under-reporting include differences in adverse event definition, reporting bias and the data not being recorded accurately. In addition, data on adverse events is currently being retrospectively recorded and is dependent on the non-medically trained administrator being able to interpret the information that is recorded in patient charts.

The system we used in this study will hopefully eliminate much of this error and as the data is being collected prospectively leads to much more accurate recording of adverse events. Using a standardised adverse event form, as we did in this study, has already been proven to reduce variability in what personnel record for spinal surgeries[17]. This study was a pilot study and a limitation is that we had a small patient cohort of 39. The aim is to introduce this system of recording to a much larger patient cohort across all general and orthopaedic trauma. If this system of prospective adverse event recording is introduced nationally it could lead to more accurate recording of adverse events. In addition, as the form is standardised it would allow comparison between centres and reduce reliance on the chart abstraction method. This would result in better planning of services and resource allocation without creating additional cost.

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**References**
1. Mortazavi SMJ, R. Greenky M, Bican O, Kane P. Total Hip Arthroplasty After Prior Surgical Treatment of Hip Fracture. The Journal of Arthroplasty. 2012 Jan 1;27:31–6.
2. Dodds MK, Codd MB, Looney A, Mulhall KJ. Incidence of hip fracture in the Republic of Ireland and future projections: a population-based study. Osteoporosis International. 2009 Apr 1;20:2105–10.
3. Melton L. Hip Fractures- A Worldwide Problem Today and Tomorrow. Bone. 1993 Jan 1:14:S1-S8.

4. Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone. 1996 Jan;18:57S–63S.
5. Haentjens P, Magaziner J, Colon-Emeric CS, Vanderschueren D. Meta-analysis: excess mortality after hip fracture among older women and men. Annals of Internal Medicine. 2010 Mar 16;152:380.
6. Karagas MR, Lu-Yao GL, Barrett JA, Beach ML, Baron JA. Heterogeneity of hip fracture: age, race, sex, and geographic patterns of femoral neck and trochanteric fractures among the US elderly. Am. J. Epidemiol. 1996 Apr 1;143:677–82.
7. Morrison RS, Chassin MR, Siu AL. The Medical Consultant's Role in Caring for Patients with Hip Fracture. Annals of Internal Medicine. 1998 Jun 15;128:1010.
8. Prior GA. (ii) Complications of hip fractures. Current Orthopaedics. 2000 Jan 1;14:86–92.
9. Krizek TJ. Surgical error: Ethical issues of adverse events. Archives of Surgery. 2000 Nov 1;135:1359.
10. Chang A, Schyve PM, Croteau RJ, O'Leary DS, Loeb JM. The JCAHO patient safety event taxonomy: a standardized terminology and classification schema for near misses and adverse events. Int J Qual Health Care. 2005 Apr;17:95–105.
11. Elder NC, Dovey SM. Classification of medical errors and preventable adverse events in primary care: A synthesis of the literature. Journal of Family Practice. 2002 Nov;51:927–32.
12. Berlinger N, Wu AW. Subtracting insult from injury: addressing cultural expectations in the disclosure of medical error. J Med Ethics. 2005 Feb 1;31:106–8.
13. Pierluissi E, Fischer MA, Campbell AR, Landefeld CS. Discussion of medical errors in morbidity and mortality conferences. JAMA-Journal of the American Medical Association. 2003 Dec 3;290:2838–42.
14. Ricci M. Pitfalls of adverse event reporting in paediatric cardiac intensive care. Archives of Disease in Childhood. 2004 Sep 1;89:856–9.
15. Wu AW. Medical error: the second victim – The doctor who makes the mistake needs help too. British Medical Journal. 2000 Mar 18;320:726–7.
16. The Economic and Social Research Institue (2012),Hospital In-Patient Enquiry Scheme[online], available : http://www.esri.ie/health_information/hipe/ [accesssed 18 Nov 2012].
17. Rampersaud YR, Neary MA, White K. Spine Adverse Events Severity System Content Validation and Interobserver Reliability Assessment. Spine. 2010 Apr 1;35:790–5.
18. Rampersaud YR, Moro ERP, Neary MA, White K, Lewis SJ, Massicotte EM, et al. Intraoperative adverse events and related postoperative complications in spine surgery: implications for enhancing patient safety founded on evidence-based protocols. Spine. 2006 Jun 1;31:1503–10.
19. Lawrence VA, Hilsenbeck SG, Noveck H, Poses RM. Medical complications and outcomes after hip fracture repair. Archives of Internal Medicine. 2002 Oct 14;162:2053–7.
20. Kreder HJ, Berry GK, McMurtry IA, Halman SI. Arthroplasty in the octogenarian: quantifying the risks. The Journal of arthroplasty. 2005 Apr 1;20:289.
21. Pagnano MW, McLamb LA, Trousdale RT. Primary and revision total hip arthroplasty for patients 90 years of age and older. Mayo Clinic proceedings. Mayo Clinic. 2003 Mar 1;78:285.
22. Runciman WB. A comparison of iatrogenic injury studies in Australia and the USA II: reviewer behaviour and quality of care. International Journal for Quality in Health Care. 2000 Oct 1;12:379–88.

# A National House-staff Audit of Medical Prophylaxis in Medical Patients for the PREVENTion of Venous ThromboEmbolism (PREVENT-VTE)

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## Abstract

We established a national audit to assess the thromboprophylaxis rate for venous thromoembolism (VTE) in at risk medical patients in acute hospitals in the Republic of Ireland and to determine whether the use of stickers to alert physicians regarding thromboprophylaxis would double the rate prophylaxis in a follow-up audit. 651 acute medical admission patients in the first audit and 524 in the second re-audit were recruited. The mean age was 66.5yrs with similar numbers of male and female patients and 265 (22.6%) patients were active smokers. The first and second audits identified 549 (84%) and 487 (93%) of patients at-risk for VTE respectively. Of the at-risk patients, 163 (29.7%) and 132 (27.1%) received LMWH in the first and second audit respectively. Mechanical thromboprophylaxis was instigated in 75 (13.6%) patients in the first and 86 (17.7%) patients in the second audit. The placement of stickers in patient charts didn't produce a significant increase in the number of at risk patients treated in the second audit. There is unacceptably low adherence to the ACCP guidelines in Ireland and more complex intervention than chart reminders are required to improve compliance.

## Introduction

Acute VTE occurs in medical inpatients, contributing significantly to morbidity and mortality[1-4]. In the UK, it's estimated that up to 25,000 hospital death per year are due to pulmonary embolism (PE)[5]. Of the cases of fatal PE, 75% occur in hospitalized medical patients who weren't receiving prophylaxis[5]. The frequency of confirmed DVT is 10-20% in hospitalized patients and can be significantly reduced through prophylaxis[6]. Cochrane[7] and NICE[8] have reviewed the importance of VTE-prophylaxis. LMWH treatment reduced the incidence of DVT by 60%, and symptomatic PE by 39% compared to placebo (RR 0.61, 95%CI 0.25,1.5)[7,8]. Hospital policies regarding thromboprophylaxis vary from mandatory intervention to physicians' discretion. Some audits suggest that physicians have begun to recognize VTE as a serious

health problem and use prophylaxis for high-risk patients[8]. Nevertheless, VTE prophylaxis remains underutilized in many centres[9].

The objectives of this audit were to determine (1) the background rate of patients at-risk in representative hospitals throughout Ireland (2) the rate of VTE prophylaxis in those patients (3) if we would double the rate of VTE prophylaxis in at-risk medical patients by repeating the audit following the introduction of a specific physician reminder program using stickers in the charts of new medical admissions.

## Methods
Acute medical patients, after written consent was obtained, were enrolled. Data were obtained from medical records. The same non-consultant hospital doctor (NCHD) completed both audits. Each audit had to be completed within five days of the first patient enrolment. The ACCP guidelines for thromboprophylaxis and the Cohen model for completion of VTE risk assessment[7] were provided. Exclusion criteria included following patients: psychiatric, pediatric, palliative, maternity/obstetrics, neonatal, burn, ear nose and throat, dermatological, ophthalmologic, alcohol/drug treatment, rehabilitation patients and those admitted by the surgical teams. Patients admitted for treatment of DVT or PE (begun <24 hours of admission) or admitted for diagnostic testing only were excluded.

The two audits were separated by 3 months. During the five days of each audit a pre-printed sticker was placed in the chart informing the team that the patient was participating in an audit, and recorded if VTE assessment was completed. A second pre-printed sticker was inserted in the local prescription card with a direction on therapeutic intervention. A third sticker was used to remind relevant medical personnel that the patient participated in the study and that follow-up and treatment may be warranted. Following the first audit, specific stickers were placed in the charts of all new admissions over a three-month period, raising awareness and increasing the rate of medical prophylaxis. It was assumed for the power calculations that approximately 39% of patients included in the study would be at risk of VTE[6]. It was recommended that at least fifty patients be recruited in both audit periods in each centre, allowing detection of a doubling of the intervention rate (medical prophylaxis) from a 10% to 20% with power of 90%.

The rates of risk assessment and VTE intervention were summarized for each centre and overall across all hospitals for each study period. For the rate of risk assessment, the planned analysis was a proportional odds model to estimate the odds ratio of risk assessment being done versus recommended/not done for the second audit relative to the first. An overall estimate of the rate of risk assessment performed was also derived using a mixed model analysis treating the centers as random effects. The change in the rate of intervention from the first to the second audit was analyzed using a logistic regression model fitted with terms for centre and audit period to see if centers differed for the change in intervention rate. The data show the odds ratio of final intervention rate to initial intervention rate, with 95% confidence intervals. This indicates whether the change seen was similar across all participating centers, or whether there were some centers performing differently to the others. All statistical analyses were carried out using SAS Version 9.2 for Windows.

## Results
*Study Population*
11 acute hospitals participated, recruiting 651 patients during the first audit and 524 in the second; one centre did not perform the second audit and as a result was excluded from analyses. The number of patients recruited by each centre ranged from 38 to 98 in the first audit and from 22 to 100 in the second. Six patients were excluded from all analyses; three did not give informed consent and three didn't meet the study inclusion criteria. In the
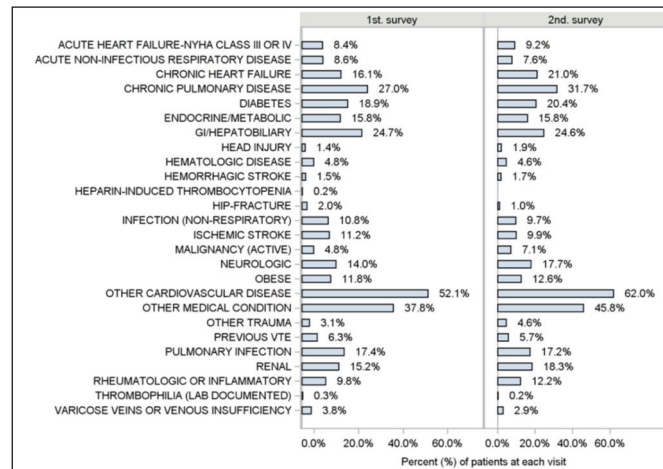


**Figure 1**   Prevalence of risk factors in all centres in both surveys

first audit period, the mean age of patients was 65.6 (±18.1)yrs. In the second audit the mean age was 67.5 (±16.3)yrs. In both audits, there were equal numbers of males and female patients. The age and sex distribution of the patients studied in the two audits were similar across all centers. In the first and second audits 21.8% and 23.5% of patients respectively were actively smoking. Smoking status was also similar for the two audits. The prevalence of all chronic diseases documented was similar within centers between the two audits (Figure 1).

*Risk Assessment in Patients At Risk of VTE*
In the first and second audits 84% and 93% of patients were considered at risk of VTE respectively. The rate of risk assessment being completed and documented in the medical record for those patients considered at risk of VTE was 53.7% and 47.0% in the first and second audits, respectively (Table 1). With the exception of 2 sites, the results for each centre are all consistent with the overall estimate. The overall estimate of the probability of risk assessment being done at the first visit was 0.53 and 0.50 at the second visit, giving an odds ratio for the difference between visits of 0.90 (95% C.I. 0.69 to 1.10) (Table 2).

**Table 1   Risk assessment rates of patients at risk and not at risk from VTE in the first and second audits**

| Patients Not At Risk | | | | At Risk Patients | | | |
|---|---|---|---|---|---|---|---|
| 1st Audit (N=102) | | 2nd Audit (N=37) | | 1st Audit (N=549) | | 2nd Audit (N=487) | |
| n | (%) | n | (%) | n | (%) | n | (%) |
| 53 | (52.0%) | 11 | (29.7%) | 295 | (53.7%) | 229 | (47.0%) |

*VTE intervention*
The patients who were at risk of VTE were significantly more likely to have VTE intervention than those who were not (p<0.0001); the odds of having intervention for the at-risk patients being around three times higher than those not at risk. There was a statistically significant interaction between centre and the audits (p<0.0001) in terms of the rate of intervention. The rates of intervention increased in the second survey for three of the hospitals. The rates for three of the hospitals declined. The rates in the other centers were similar for the two audits. Fitting the centers as random in order to derive an overall estimate for the at-risk patients of the rate of intervention during the second audit relative to the first yielded no statistically significant difference (p=0.11). The odds ratio for the odds of intervention at the second visit relative to the first was 0.80 (95% C.I. 0.60 to 1.05) (Figure 2). The number of

**Table 2   Odds ratios for rate of risk assessment being done in the second survey relative to the first**

| | Done vs Not Done | |
|---|---|---|
| Centre* | Odds ratio | 95% C.I. |
| 1 | 10.74 | 4.50 to 25.66 |
| 2 | 1.79 | 0.84 to 3.84 |
| 3 | 0.25 | 0.12 to 0.54 |
| 4 | 1.27 | 0.60 to 2.69 |
| 5 | 0.32 | 0.18 to 0.57 |
| 6 | 0.08 | 0.03 to 0.19 |
| 7 | 1.98 | 0.81 to 4.85 |
| 8 | 4.47 | 2.00 to 10.01 |
| 9 | 0.90 | 0.43 to 1.91 |
| 10 | 0.78 | 0.43 to 1.41 |
| Overall | 0.90 | 0.69 to 1.10 |
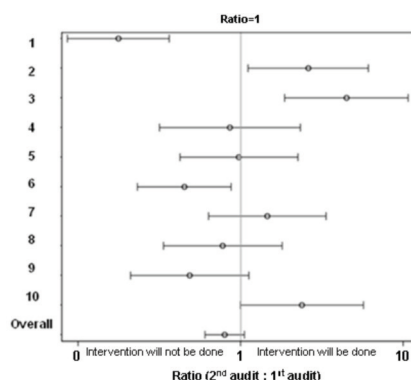
**Figure 2**

Odds ratio of VTE intervention being done at the second survey relative to the first in each centre. Overall odds ratio is also shown.

at-risk patients receiving LMWH was 27.9% for first audit and 27.1% for the second. The number of at-risk patients receiving mechanical prophylaxis increased from 13.6% in the first audit to 17.7% in the second audit.

## Discussion

This national study showed that the use of VTE-prophylaxis was sub-optimal in Ireland. While at-risk patients were more likely to have a VTE intervention, only 27% of this at-risk group was actually commenced on LMWH. The uptake in the participating hospitals of ACCP recommendations was sub-optimal. Attachment of stickers to drug charts was not sufficient to ensure commencement of VTE-prophylaxis. The overall number of patients considered at risk of developing VTE (close to 90%) was higher than anticipated. The study was planned to detect a doubling of the intervention rate, based on an initial intervention rate of between 10% and 40%. In this study the lowest rate of intervention during the first survey period was 34% only in one centre whereas in remaining centers the rates were >50%. It is well recognized that acutely ill patients have an increased risk of developing VTE[10]. The ENDORSE Global study has reported a range of 21.1% to 71.2%[11]. In our study 84% and 94% of our patients were in the at risk category. This could be accountable by an older population with multiple co-morbidities presenting in our hospitals giving these patients a higher risk profile.

The inconsistent use of prophylactic measures for VTE in hospital patients seen in our study has been widely reported. A UK survey suggested that 71% of patients assessed to be at medium or high risk of developing deep vein thrombosis did not receive any form of mechanical or pharmacological VTE prophylaxis[3]. The French experience showed that of the 50% of at risk patients, 38.6% did not receive thromobo-prophylaxis[12]. Globally, the findings of the International ENDORSE study indicated that up to 50% of all hospitalized patients at-risk for VTE were not receiving appropriate prophylaxis[13]. Furthermore, medical patients at-risk for VTE were less likely than surgical patients to receive appropriate prophylaxis. A larger study spanning 32 countries showed 70% of the hospitalized medical patients, < 50 years of age did not receive VTE prophylaxis[11]. Between audits there was no increase in the use of VTE-prophylaxis despite the increased prevalence risk factors including cardiovascular disease and chronic pulmonary disease. Interestingly many patients not at risk received thromboprophylaxis treatments (data not shown). Implementation of VTE-prophylaxis may be confounded by several factors including confusion regarding the assessment of VTE-risk, lack of awareness of VTE-risk and complexity associated with the patients.

Other authors have shown improvement in VTE prophylaxis rates using similar sticker-based approaches[14,15]. In contrast to our study, these studies used a single site hospital; or survey encompassed 11 hospital sites throughout Ireland. The New-Zealand based survey utilised pharmacist to identify patients who were suitable for thromboprophylaxis, prompting physicians to consider LMWH and recommending doses after performing risk assessments[14]. Three trials have guided the use of VTE-

prophylaxis in hospitalized patients: MEDENOX[16], PREVENT[17] and ARTEMIS[18]. The population cohort of these trials may have been biased in selecting patients who were at high risk and who had a low bleeding risk. Our doctors in contrast may be dealing with elderly frail patients with high risk of falls and bleeding. Hence there may some reluctance in prescribing the LMWH.

The recommendations' from the ACCP for thromboprophylaxis apply to patients with congestive cardiac failure or severe respiratory disease confined to bed and have one or more additional venous thromboembolism risk factors and those admitted to ICU[6]. Other risk stratification systems including those described NICE[19] and other authors[20-24] are available however none of these have been validated in clinical trials. The implementation of a standardized national protocol in Ireland for risk assessment and prophylaxis prevention of VTE is lacking even though it remains an ACCP Grade 1A recommendation. In the UK, financial incentives for organizations have been introduced for Quality and Innovative Payment Framework (CQUINN). A proportion of CQUINN payments to acute providers are conditional on risk assessing at least 90% of patients admitted to hospital[25]. VTE-prophylaxis champions, be it nursing, pharmacists or physicians may be required at on each ward to improve rates. Urgent national support and prioritization of VTE-prevention led by clinicians and multidisciplinary teams are essential to ensure that the protocols are in place.

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## References

1. Lindblad B, Sternby NH, and Bergqvist D. Incidence of venous thromboembolism verified by necroscopy over 30 years. BMJ 1991; 302:709-711.
2. Sandler DA, Martin JF. Autopsy proven pulmonary embolism in hospital patients: are we detecting enough deep vein thrombosis? J R Soc Med 1989; 82:203-205.
3. Rashid ST, Thursz MR, Razvi NA, Voller R, Orchard T, Rashid ST, Shlebak AA. Venous thromboprophylaxis in UK medical inpatients. J R Soc Med 2005;11:507−12.
4. Cohen AT, Edmondson RA, Phillips MJ, Ward VP, and Kakkar VV. The changing pattern of venous thromboembolic disease. Haemostasis 1996; 26: 65-71.
5. House of Commons Health Committee. The prevention of venous thromboembolism in hospitalised patients. 2005. London, Department of Health.
6. Geerts WH, Bergqvist D, Pineo GF, Heit JA, Samama CM, Lassen MR, Colwell CW; American College of Chest Physicians. Prevention of venous thromboembolism: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines (8th Edition). Chest 2008;133:381S-453S.
7. Alikhan R, Cohen AT. Heparin for the prevention of venous thromboembolism in general medical patients. Cochrane Database Syst Rev 2009 Issue 3.
8. Amin AN, Stemkowski S, Lin J, Yang G. Preventing venous thromboembolism in US hospitals: Are surgical patients receiving appropriate prophylaxis? Thromb Haemost 2008; 99:796-797.
9. Yu H.T, Dylan ML, Lin J, Dubois RW. Hospitals' compliance with prophylaxis guidelines for venous thromboembolism. Am J Health Syst Pharm 2007; 64: 69-76.
10. Cohen AT, Alikhan R, Arcelus JI, Bergmann JF, Haas S, Merli GJ, Spyropoulos AC, Tapson VF, Turpie AG. Assessment of venous

thromboembolism risk and the benefits of thromboprophylaxis in medical patients. Thromb Haemost 2005; 94:750-759.

11. Anderson FA Jr, Goldhaber SZ, Tapson VF, Bergmann JF, Kakkar AK, Deslandes B, Huang W, Cohen AT. ENDORSE Investigators. Venous thromboembolism risk and prophylaxis in hospitalised medically ill patients. The ENDORSE Global Survey. Thromb Haemost 2010;103:736-48.

12. Bergmann JF, Lloret-Linares C, Rami A, Cohen AT, Garay RP, Kakkar AK, Goldhaber SZ, Deslandes B, Tapson VF, Anderson FA; pour les investigateurs de l'étude Endorse France. Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): results obtained in France]. Presse Med 2011;40:e528-37.

13. Cohen AT, Tapson VF, Bergmann JF, Goldhaber SZ, Kakkar AK, Deslandes B, Huang W, Zayaruzny M, Emery L, Anderson FA Jr; ENDORSE Investigators. Venous thromboembolism risk and prophylaxis in the acute hospital care setting (ENDORSE study): a multinational cross-sectional study. Lancet 2008;371:387-94.

14. Gladding P, Larsen F, Durrant H, Black P. Education together with a preprinted sticker improves the prescribing of prophylactic enoxaparin. NZMJ 2007;120:U2461..

15. Sharif-Kashani B, Raeissi S, Bikdeli B, Shahabi P, Behzadnia N, Saliminejad L, Samiei-Nejad M, Nasiri F, Khayyami M, Forootan B, Pozhan S, Masjedi MR. Sticker reminders improve thromboprophylaxis appropriateness in hospitalized patients. Thromb Res 2010;126:211-6.

16. Samama Samama MM, Cohen AT, Darmon JY, Desjardins L, Eldor A, Janbon C, Leizorovicz A, Nguyen H, Olsson CG, Turpie AG, Weisslinger N. A comparison of enoxaparin with placebo for the prevention of venous thromboembolism in acutely ill medical patients. Prophylaxis in Medical Patients with Enoxaparin Study Group. N Engl J Med 1999;341:793–800.

17. Leizorovicz A, Cohen AT, Turpie AG, Olsson CG, Vaitkus PT, Goldhaber SZ; PREVENT Medical Thromboprophylaxis Study Group. Randomized, placebo-controlled trial of dalteparin for the prevention of venous thromboembolism in acutely ill medical patients. Circulation 2004;110:874–9.

18. Cohen AT, Davidson BL, Gallus AS, Lassen MR, Prins MH, Tomkowski W, Turpie AG, Egberts JF, Lensing AW; ARTEMIS Investigators. Efficacy and safety of fondaparinux for the prevention of venous thromboembolism in older acute medical patients: randomised placebo controlled trial. BMJ 2006;332:325–9.

19. Venous thromboembolism: reducing the risk of venous thromboembolism in patients admitted to hospital. National Clinical Guideline Centre Jan 2010. http://guidance.nice.org.uk/CG92.

20. Kucher N, Koo S, Quiroz R, Cooper JM, Paterno MD, Soukonnikov B, Goldhaber SZ. Electronic alerts to prevent venous thromboembolism among hospitalized patients. N Engl J Med 2005;352:969-977.

21. Lecumberri R, Marqués M, Díaz-Navarlaz MT, Panizo E, Toledo J, García-Mouriz A, Páramo JA. Maintained effectiveness of an electronic alert system to prevent venous thromboembolism among hospitalized patients. Thromb Haemost 2008;100:699–704.

22. Barbar S, Noventa F, Rossetto V, Ferrari A, Brandolin B, Perlati M, De Bon E, Tormene D, Pagnan A, Prandoni P. A risk assessment model for the identification of hospitalized medical patients at risk for venous thromboembolism: the Padua Prediction Score. J Thromb Haemost 2010;8:2450–2457.

23. Rocha AT, Paiva EF, Lichtenstein A, Milani J, Cavalheiro-Filho C, Maffei FH. Risk-assessment algorithm and recommendations for venous thromboembolism prophylaxis in medical patients. Vasc Health Risk Manag 2007;3:533–553.

24. Bullock-Palmer R. P., Weiss S., Hyman C. Innovative approaches to increase deep vein thrombosis prophylaxis rate resulting in a decrease in hospital- acquired deep vein thrombosis at a tertiary-care teaching hospital. J Hosp Med 2008;3:148-155.

25. Venous Thromboembolism Prevention. A Guide for Delivering the CQUIN Goal http://www.thrombosischarity.org.uk/cms/images/ stories/File/Guides/Guide%20for%20Delivering%20CQUIN% 20-%20Small%20PDF.pdf.

# The Compliance to Acute Asthma Management Protocols in Paediatric Emergency Department

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**Abstract**
Asthma guidelines should be followed closely to ensure improvement and consistency of outcome. In order to measure compliance with local acute asthma protocols, we reviewed notes of children presenting to our ED with acute asthma. We noted clinical assessment of severity of asthma exacerbation, compared management of cases with local protocols, noted time to first nebulisation, discharge advice and follow up plans. Retrospectively, 6 patients had life-threatening, 70 had severe and 64 had mild-to-moderate exacerbation. We observed inconsistent documentation of clinical signs including, respiratory effort 6 (100%), 62 (89%), 39 (61%), mental status 3 (50%), 46 (65%), 47 (73%) and speech 1 (16.7%), 19 (27%), 7 (11%) in life threatening, severe and mild-to-moderate groups respectively. Bronchodilator therapy was delayed in life-threatening 3 (50%) and severe cases 63 (90%). While discharge advice was documented in 54% patients, no written asthma action plans were given. This study demonstrated necessity of protocol-adherence in areas of clinical assessment, management and follow up.

## Introduction

Asthma is a common chronic inflammatory disease of the airways characterized by variable recurring symptoms, reversible airflow obstruction, and bronchospasm[1]. Ireland has the 4th highest prevalence of asthma worldwide[1]. There are approximately 5,000 asthma-related hospital admissions per year, of which 44% are young patients aged less than 15 years[1]. Annual Emergency Department visits are four times this figure[1]. Being a common condition, there should be a unified approach and education of medical care providers towards the management of this condition. Inadequate therapy with the selection of inappropriate medicines is among the failings in asthma management[3]. Various national and international guidelines have been developed about asthma

management[2,25]. Local protocols have been adopted in different institutions which draw on these broader guidelines. In the paediatric age group clinical signs provide essential information about the severity. In a prospective cohort study, assessment based upon clinical features alone has been shown to be equal to PEFR evaluation in discriminating severe cases requiring hospital admission[5]. Furthermore once the severity is assessed, prompt initiation of bronchodilator therapy is the mainstay of treatment[6]. Also following the achievement of control of exacerbation, appropriate follow up and written action plan are beneficial to prevent future acute attacks[25].

Guideline concordance is crucial to translate the guidelines into

improved asthma service[4]. Unfortunately, provider adherence to these guidelines remains an issue. Most of the studies to investigate guideline adherence are based on self reported data obtained by interviews or questionnaires[7-11]. Most of the clinicians are aware of these guidelines but there are potential barriers described in these studies[3,12,13]. We wished to investigate how adherent clinicians were in complying with local asthma management protocols in Paediatric Emergency Department (ED) of Tallaght Hospital. Our study was based on data from medical notes documented by emergency department clinicians. The objective was to measure the compliance with local acute asthma management protocols in Paediatric ED setting of a tertiary referral centre.

## Methods
Patients presenting with signs and symptoms of acute asthma during a three month period from January through March 2011 were selected and their medical records were retrospectively audited in the ED. Documentation of clinical findings, such as, respiratory effort, speech ability, mental status, oxygen saturation, heart rate and respiratory rate were noted to assess the severity of asthma exacerbation. Patients were retrospectively assigned to the following three categories: mild-to-moderate, severe, and life threatening by the investigators according to the documented signs. These categories were defined in the local hospital protocol. Mild to moderate category was defined as; Normal mental status, able to talk, some accessory muscle use and oxygen-saturation (SaO2) ≥92%. Severe exacerbation was defined as; Normal mental status, single word speech, marked accessory muscle,SaO2 between 90-92%, heart rate of>130/min (<5years) and>120/min (>5years), respiratory rate of>40/min (<5years) and>30/min (>5years). Life threatening episode was defined as; altered mental status, inability to talk, silent chest and SaO2 less than 90%.

According to the protocol, patients were designated and treated on the basis of the most severe feature. In the study, acute treatment of each category was compared to the local acute asthma management protocol. According to the protocol, addition of Ipratropium to Salbutamol as first line nebulisation was reserved for severe and life threatening cases only. Any deviation from the protocol was considered as non-adherence. We also examined the quality of our interventions by detailing the time between triage and commencement of first nebulisation; post-acute management outcome; discharge advice and the follow up plan.

## Results
During the audit period, 140 patients attended our ED with acute asthma exacerbation. Age of the children ranged between 1 to19 years with the median age of 5 years ± 3.5years. Out of 140 cases, 112 patients (80%) were known to be asthmatic.

*Clinical Features and Severity*
Based on above documented clinical signs, the retrospective severity of asthma exacerbation was: mild-to-moderate exacerbation in 64 (45.7%), severe exacerbation in 70 (50%), and life threatening exacerbation in 6 (4.3%) cases. During their assessment of severity, vital signs were uniformly recorded in all children by nursing staff. Respiratory

**Table 1  Frequency of recorded signs of respiratory distress (Retrograde categorisation)**

| Variable | Mild/Mod | Severe | Life threatening |
|---|---|---|---|
| **MENTAL STATUS** | | | |
| Not Recorded (NR) | 17 (26.6%) | 24 (34.3%) | 3 (50%) |
| Normal | 47 (73.4%) | 46 (65.7%) | 2 (33.3%) |
| Altered | | | 1 (16.7%) |
| **SPEECH** | | | |
| NR | 57 (89.1%) | 51 (72.9%) | 5 (83.3%) |
| Able | 7 (10.9%) | 16 (22.9%) | |
| Single | | 3 (4.3%) | 1 (16.7%) |
| Unable | | | |
| **RESPIRATORY EFFORT** | | | |
| NR | 25 (39.1%) | 8 (11.4%) | |
| None | 15 (23.4%) | 4 (5.7%) | |
| Some | 24 (37.5%) | 25 (35.7%) | |
| Marked | | 33 (47.1%) | 6 (100%) |
| Silent | | | |

**Table 2  Correlation of actual treatment with retrograde categorisation of severity (Retrograde categorisation)**

| | Mild/mod | Severe | Life threatening |
|---|---|---|---|
| **Treated as:** | | | |
| Mild/mod | 28 (43.7%) | | |
| Severe | 36 (56.2%) | 70 (100%) | |
| Life threatening | | | 6 (100%) |

effort was documented in all patients with a life threatening exacerbation. In the severe group, it was not recorded in 11% of patients. Also, 5% of patients who were considered as severe exacerbations had no respiratory distress according to clinical assessment (Table 1 and 2).

**Table 3  Time to first nebulisation categorised by asthma severity (Time between triage and first bronchodilator therapy)**

| Variable | Mild/mod | Severe | Life threatening |
|---|---|---|---|
| TIME 1st NEB | | | |
| Immediate | 0 | 2 (2.9%) | 3 (50%) |
| <10 minutes | 1 (1.6%) | 5 (7.1%) | |
| 10-60 minutes | 14 (21.9%) | 38 (54.3%) | 3 (50%) |
| 60-120 minutes | 9 (14.1%) | 17 (24.3%) | |
| >120 minutes | 19 (29.7%) | 6 (8.6%) | |
| None | 21 (32.8%) | 2 (2.9%) | |

In life threatening exacerbations, mental status and speech were not documented in 50% and 83.3% of cases respectively. In patients presenting with severe symptoms, these parameters were lacking in 34.3% and 72.9% of the cases respectively. Despite the relatively poor recording of clinical signs, there was 100% correlation between our retrospective categorisation of cases and their treatment in the severe and life threatening groups. In the mild-moderate group, over 50% were treated as severe despite only having signs consistent with a milder asthma exacerbation. Fifty percent of life threatening cases received first nebulisation immediately after the triage while the average time interval in this group was about 15 minutes. Ten percent of severe cases had first bronchodilator within 10 minutes of triage and nearly two thirds were managed within 60 minutes while average time interval in this group was 54 minutes.

All of the life threatening cases were admitted / transferred to another hospital. Ninety percent of mild to moderate and 40% of severe cases were discharged after acute management. Only one patient re-attended the emergency department within one week of last presentation. Fifty four percent of the discharged patients had discharge advice documented such as GP review, asthma nurse review and respiratory consultant outpatient referral. No asthma action plans given to patients.

## Discussion
Our study demonstrated varying degree of adherence to local asthma protocol by clinicians. In ED, initial triage assessment plays an essential role in raising concern about the severity of any condition. In this study, vital signs were uniformly recorded in all children at triage. The importance of use of accessory muscle as an indicator of respiratory distress is established for decades. A prospective study by Kerem et al showed that of all clinical findings the degree of accessory muscle use correlated most closely with lung function. Similarly, the degree of accessory muscle use correlated most closely with Oxygen-saturation followed by dyspnoea and respiratory rate[14]. In our study, we noted variable recording of respiratory signs. While there was good correlation between severity assessment and treatment in the more extreme cases, we saw over treatment in the milder cases which suggests that the assessment was deficient. It was also concerning that some patients were felt to have no respiratory distress despite being retrospectively being labelled as severe cases.

Furthermore, mental status and speech are important non respiratory features of severity of exacerbation and any deterioration in these should alert clinicians to prepare for potential respiratory failure. Consequently we would stress the significance of each clinical feature as asthma is a multidimensional clinical entity and no single parameter can reliably reflect the full picture of exacerbation. Therefore the best

practice is to combine all related information in each case and come to an appropriate level of severity which will then dictate our treatment. Studies and meta analysis show an important role for Ipratropium in severe cases of acute asthma than milder cases[15-17]. Addition of Ipratropium to acute management was shown to significantly reduce the hospitalization rates in severe cases while in milder to moderate cases its effect was same as Salbutamol or Albuterol alone group[8,15-17]. In regards to treatment, an important observation was the delay in initiation of bronchodilators in life threatening and severe cases. Prompt bronchodilator therapy is the mainstay of acute asthma treatment while delay can have disastrous outcome of the disease[6,19]. In an attempt to expedite the treatment, studies have been done to show comparable result of spacer device versus nebulizer in instituting prompt therapy and relief[20,21]. It is important to mention here, the approach of our study, where we retrospectively categorized the patients according to their most severe features in the notes. Life threatening cases should not necessarily be considered as patients 'in extremis' but certainly had the potential to deteriorate quickly and should have been treated as life threatening cases in real time also, as per our local protocol. At the same time, the value of our audit was to recognize any areas where deficiencies might occur. Again there is a possibility that the delay might have occurred secondary to poor recognition of signs of severity.

All life threatening and most severe cases were admitted for extended management and monitoring. Re-attendance of only one patient among severe cases after being discharged reflected good outcome of treated children in ED. Another appreciable observation was documented discharge advice/follow up in more than half of the discharged patients such as GP review, asthma nurse review and respiratory consultant out-patient referral. Although we acknowledge that not all asthmatics require a respiratory consultant review after every exacerbation, care should be taken in cases where certain risk factors warrant appropriate follow up as guided by guidelines. BTS guidelines recommend follow-up of all patients after acute exacerbation by primary physicians or asthma nurse within two working days and medical OPD within a month[25]. There was no asthma action plans given to patients. The significance of written action plan is clearly established by various studies in prevention of further acute attacks, recognition and prompt treatment in case of exacerbation and reduction in hospital visits to ED[8,11,2 2-24]. Being a busy department, unavailability of written action plan in ED is a possible reason for clinicians for not been able to provide adequate discharge advice to patients.

The study emphasizes the importance of guideline concordance for clinicians. It highlights areas where additional work is required. These include documentation of clinical findings to correctly categorize the severity of acute attack, selection of right arm of algorithm for appropriate treatment, prompt initiation of bronchodilator, in life threatening (immediately) and severe cases (within 10 minutes) after triage. We recommend continuing the follow-up plan when required. This study has educated the staff on the importance of recording clinical signs and appropriate treatment. We have also introduced the written action plan for discharge. This will standardise our care and facilitate regular audits for this common condition.

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## References

1. http://asthmasociety.ie/images/uploads/file/Asthma-in-Ireland-4-5-12.pdf.
2. NHLBI Guideline 2007, pp. 11–12.
3. Kelly I, Fitzpatrick P. Sub-optimal asthma control in teenagers in the midland region of Ireland. Ir J Med Sc. 2011 Dec;180:851-4.
4. Vandeleur M, Chróinín MN. Implementation of spacer therapy for acute asthma in children. Ir Med J. 2009 Sep;102:264-6.
5. Gorelick MH, Stevens MW, Schultz TR, Scribano PV. Performance of a novel clinical score, the Pediatric Asthma Severity Score (PASS), in the evaluation of acute asthma. Acad Emerg Med.2004Jan;11:10-8.
6. Wathen CG, Crompton GK, Carrington D, Hollingworth J.. Treatment for acute asthma in the ambulance. Br J Gen Pract.1990Sep;40:388.
7. Scribano PV, Lerer T, Kennedy D, Cloutier MM. Provider adherence to a clinical practice guideline for acute asthma in a pediatric emergency department. Acad Emerg Med.2001 Dec;8:1147-52.
8. Finkelstein JA, Lozano P, Shulruff R, Inui TS, Soumerai SB, Ng M, Weiss KB. Self-reported physician practices for children with asthma: are national guidelines followed? Pediatrics. 2000 Oct;106:886-96.
9. Wisnivesky JP, Lorenzo J, Lyn-Cook R, Newman T, Aponte A, Kiefer E, Halm EA. Barriers to adherence to asthma management guidelines among inner-city primary care providers. Ann Allergy Asthma Immunol.2008Sep;101:264-70.
10. Rastogi D, Shetty A, Neugebauer R, Harijith A. National Heart, Lung, and Blood Institute guidelines and asthma management practices among inner-city pediatric primary care providers. Chest.2006Mar;129:619-23.
11. http://www.nhlbi.nih.gov/guidelines/asthma/11_sec5_exacerb.pdf.
12. Cabana MD, Rand CS, Becher OJ, Rubin HR. Reasons for pediatrician non adherence to asthma guidelines. Arch Pediatr Adolesc Med. 2001 Sep;155:1057-62.
13. Scarfone RJ, Zorc JJ, CapraroGA. Patient self-management of acute asthma: adherence to national guidelines a decade later. Pediatrics.2001Dec;108:1332-8.
14. Kerem E, Canny G, Tibshirani R, Reisman J, Bentur L, Schuh S, Levison H. Clinical-physiologic correlations in acute asthma of childhood. Pediatrics. 1991 Apr;87:481-6.
15. Rodrigo GJ, Castro-Rodriguez JA. Anticholinergics in the treatment of children and adults with acute asthma: a systematic review with meta-analysis.Thorax.2005 Sep;60:740-6.
16. Schuh S, Johnson DW, Callahan S, Canny G, Levison H. Efficacy of frequent nebulized ipratropium bromide added to frequent high-dose albuterol therapy in severe childhood asthma. J Pediatr.1995 Apr;126:639-45.
17. Qureshi F, Pestian J, Davis P, Zaritsky A. Effect of nebulized ipratropiumonthe hospitalization rates of children with asthma. N Engl J Med.1998Oct 8;339:1030-5.
18. Rodrigo GJ, Rodrigo C. The role of anticholinergics in acute asthma treatment: an evidence-based evaluation. Chest. 2002 Jun;121:1977-87.
19. Siwik JP, Nowak RM, Zoratti EM. The evaluation and management of acute, severe asthma. Med Clin North Am. 2002 Sep;86:1049-71.
20. Schuh S, Johnson DW, Stephens D, Callahan S, Winders P, Canny GJ. Comparison of albuterol delivered by a metered dose inhaler with spacer versus a nebulizer in children with mild acute asthma. J Pediatr. 1999 Jul;135:22-7.
21. Leversha AM, Campanella SG, Aickin RP, Asher MI. Costs and effectiveness of spacer versus nebulizer in young children with moderate and severe acute asthma. J Pediatr. 2000 Apr;136:497-502.
22. Espinoza-Palma T, Zamorano A, Arancibia F, Bustos MF, Silva MJ, Cardenas C, De La Barra P, Puente V, Cerda J, Castro-Rodriguez JA, Prado F. Effectiveness of asthma education with and without a self-management plan in hospitalized children. J Asthma.2009 Nov;46:906-10.
23. Zemek RL, Bhogal SK, Ducharme FM. Systematic review of randomized controlled trials examining written action plans in children: what is the plan? Arch Pediatr Adolesc Med. 2008Feb;162:157-63.
24. Bhogal S, Zemek R, Ducharme FM. Written action plans for asthma in children. Cochrane Database Syst Rev. 2006 Jul 19;3:CD005306.
25. http://www.brit-thoracic.org.uk/Portals/0/Guidelines/AsthmaGuidelines/sign101%20revised%20June%2009.pdf.

# The Intensity of QuantiFERON TB-Gold Response does not Differentiate Active from Latent Tuberculosis

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**Abstract**
We analyzed positive QuantiFERON (QFT) assays, performed between July 2009 and April 2011 in the Mercy University Hospital, Cork, Ireland, which included, 94 patients with latent tuberculosis (LTBI) and 35 patients with active tuberculosis. There was no difference in the intensity of response between patients with LTBI and active tuberculosis (p=0.1589). In patients with LTBI, there were no correlations between age (p=0.353), sex (p=0.476), smoking (p=0.323), contact (p=0.612), Mantoux response (p=0.055), Irish nationality (p=0.768), previous BCG vaccination (p=0.504), WCC (p=0.187), lymphocyte count (p=0.786), neutrophil count (p=0.157) and the intensity of QFT response. Similarly in patients with active TB, there were no correlations between these variables and QFT response. The intensity of QFT response does not help to differentiate active from LTBI. The intensity of QFT response is not influenced by age, sex, smoking, remoteness of contact history, Mantoux response, nationality, CXR abnormalities, BCG vaccination and peripheral lymphocyte count.

## Introduction

In 2010, there were an estimated 8.8 million incident cases of active TB globally and 1.45 million deaths.[1] It has been estimated that up to one third of the world's population has latent TB infection (LTBI).[2] However, this figure is estimated from data obtained from tuberculin skin testing (TST). Using TST to diagnose LTBI may cause false-positive results in individuals who have been vaccinated with bacille Calmette et Guérin (BCG) or exposed to environmental mycobacteria. Furthermore, false-negative results occur in immunosuppressed individuals, suggesting that the estimated global prevalence of LTBI may be inaccurate. The QuantiFERON-TB Gold test (QFT) is based on a whole-blood ELISA developed in the late 1980s and is approved for in vitro diagnosis of tuberculosis infection by the U.S. Food and Drug Administration. Guidelines from the U.S. Centers for Disease Control and Prevention (CDC) in the use of interferon-gamma release assays (IGRAs), to diagnose Mycobacterium tuberculosis infection have been published and identified where IGRAs can be used to help diagnose both LTBI and active TB.[3] The specificity of the QFT assay is higher than the TST, as it is not affected by previous BCG vaccination.[4] In addition, this test is less influenced by anergy than TST.[5] IGRAs could therefore improve existing information about the global prevalence of LTBI.

The QFT assay is of value in distinguishing true positive TST reactions in patients with LTBI from false positive reactions in those who have been vaccinated with BCG, but is also useful in the diagnosis of active TB, particularly in those without culture confirmation. There are some limitations to the QFT assay. A negative QFT test does not exclude TB disease in immunosuppressed patients.[6] The sensitivity of QFT partly depends on peripheral lymphocyte counts. Therefore in the presence of lymphopenia, the ELISPOT assay is superior to QFT for detecting tuberculosis infection.[7] Accessibility and time constraints may cause difficulty in completing QFT. Blood samples must be processed within 8-16 hours. Also, limited data existing on use in children younger than 5 years of age, persons recently exposed to TB, and those who will be tested repeatedly.

It is not clear whether the intensity of QFT response can help to distinguish LTBI from active TB. Several studies have reported varying results in this respect. Metcalfe showed that higher quantitative IFN-y results were associated with active tuberculosis in a cohort of patients from San Francisco and Kobashi demonstrated significantly higher QFT response in patients with active TB in Japan.[8,9] In contrast, other studies have suggested that IGRAs cannot distinguish TB infection from disease in children and that concentrations of IFN-y did not differ in children with LTBI and TB either before or at the end of treatment.[10]

We sought to determine whether the intensity of response in patients with a positive QFT assay was predictive of active over latent tuberculosis, and whether other factors determined the intensity of response in adults with latent tuberculosis.

## Methods

A retrospective analysis of 129 immunocompetent patients from Mercy University Hospital, Cork, Ireland with a positive QFT between July 2009 and April 2011 was conducted. The study population consisted of 35 patients with active tuberculosis and 94 patients with LTBI. LTBI was defined as per CDC guidelines with no symptoms or physical signs suggestive of TB disease, normal radiological findings with positive TST or QFT and negative smear and culture of respiratory specimens. The majority of the patients that were included in the study had been referred to the TB outpatient clinic in the Mercy University Hospital from occupational health departments following occupational screening for LTBI and from public health clinics after screening people who were in close contact with patients with infectious pulmonary TB.

Data recorded (Table 1) included age, gender, history of TB infection or antituberculous treatment, other respiratory and non-respiratory diseases, medication use (including immunosuppressive drugs), smoking and alcohol consumption, nationality and duration of residence in Ireland if foreign born, previous TST results (in millimeters), contact history with patients with infectious tuberculosis and BCG vaccination. Laboratory and radiologic data, including white cell count (total and differential count), sputum or bronchial washing TB smear and culture results, chest radiograph, and thoracic CT results were collected. Sequential testing with Mantoux, followed by QFT in patients with positive Mantoux tests was performed. QFT assays were taken on the day of reading of the Mantoux test, that is, within three days of Mantoux insertion.

One hundred and eleven patients had positive Mantoux tests (31 in group 1 and 80 in group 2). For the TST test, 0.1 mL of tuberculin (Nippon BCG Manufacturing; Tokyo, Japan [equivalent to 2 tuberculin units of purified protein derivative]) was injected intradermally into the volar aspect of the forearm, and the transverse diameter of induration was measured 48 h later. Results were interpreted by hospital staff based on CDC guidelines for tuberculin testing. Each patient in both groups had a heparinized venous blood sample collected for the purpose of performing QFT test. The QuantiFERON-TB Gold test was performed according to the manufacturer's instructions (Cellestis, Carnegie, Australia), and the test results were reported according to the guidelines of the CDC.[3] Detection of IFN-y by ELISA was used to identify in vitro responses to ESAT-6 and CFP-10 that are associated with M. tuberculosis infection. Aliquots of heparinized

whole blood were incubated with the test antigens for 16-24 hours. Blood was incubated with the test antigens <12 hours after collection. Test kits included two mixtures of synthetic peptides representing ESAT-6 and CFP-10 as test antigens, phytohemaglutinin and saline. After incubation, the concentration of IFN-y in the plasma was determined by ELISA using reagents included in the test kit. The amount of IFN-y released was determined by subtracting the amount in the negative control from the amount in the ESAT-6, CFP-10, or mitogen stimulated plasma sample.

The quantitative values from the TB antigen (TB) containing tubes are compared to negative (NC) and positive ("mitogen tube") controls, which determine the validity of the test. The results can be indeterminate if the NC has inappropriately high levels of IFN-y. Similarly, a "low mitogen" indeterminate result can occur due to an inappropriately low IFN-y response to mitogen in the positive control. This may indicate the mishandled specimens or immunosuppression. The test is interpreted as positive with IFN- y responses ≥ 0.35 IU/L higher than NC i.e TB-NC ≥ 0.35 IU/L is positive and TB-NC < 0.35 IU/L is negative test, in the absence of inappropriate nil or mitogen responses.

Information from the collected demographic data, clinical history, laboratory, microbiological and radiological findings, TST results, and whole blood IFN-y assay results were entered into a database and then were transferred to a statistical software package (Graphpad InStat, San Diego, Ca) for analysis. Unpaired t-tests were used to determine differences between parametric data and the Mann-Whitney test was used to determine differences between non-parametric data. The Pearson x2 test was used to compare parametric correlation and Spearman's rank correlation coefficient for non-parametric correlation between groups. A p-value<0.05 was considered statistically significant.

| Table 1 | Demographic details. Data are presented as mean ± SD unless otherwise indicated |
|---|---|
| **Demographic details** | |
| Age (years) | 44.8 ± 18.35 |
| Sex (M/F) | 90/58 |
| Smoking status (yes/ex/no) | 53/37/58 |
| TST response (mm) | 17.43 ± 5.05 |
| WCC (x109/L) | 7.45 ± 2.0 |
| Neutrophil count (x109/L) | 4.61 ± 1.61 |
| Lymphocyte count (x109/L) | 1.94 ± 0.71 |

## Results
35 patients with active TB and 94 with LTBI were analyzed. Of the 35 active TB patients, 12 had extrapulmonary TB and 23 had pulmonary TB. In the latter, 7 patients were sputum culture positive for Mycobacterium tuberculosis (MTB) and the remainder had bronchial washing cultures that were positive for MTB. Of the 12 patients with extrapulmonary TB, 7 had TB lymphadenitis, 3 had tuberculous abscesses (1 epididymal, 1 inguinal and 1 pectoral tuberculous abscess), 1 had TB meningitis and 1 had TB parotitis.

| Table 2 | Comparison of variables between active and LTBI group. Data are presented as mean ± SD unless otherwise indicated | | |
|---|---|---|---|
| | **Active (n=35)** | **Latent (n=94)** | **p value** |
| Age | 39.5 ± 17.62 | 45.2 ± 18.31 | 0.1102 |
| Male sex | 23 (66%) | 55 (59%) | 0.4605 |
| Smoking | 22 (63%) | 50 (53%) | 0.3291 |
| Months since contact | 64.2 ± 119.3 (n=16) | 76.9 ± 158.6 (n=52) | 0.4665 |
| Mantoux (mm) | 16.4 ± 6.02 (n=31) | 16.0 ± 6.50 (n=80) | 0.5201 |
| Irish born | 11 (31%) | 19 (20%) | 0.1829 |
| How long in Ireland (months) | 75.6 ± 64.22 (n=11) | 95.4 ± 103.7 (n=15) | 0.7744 |
| BCG vaccinated | 25 (71%) | 77 (82%) | 0.1961 |
| WCC (x109/L) | 7.7 ± 2.20 | 7.5 ± 1.93 | 0.6466 |
| Lymphocytes (x109/L) | 1.8 ± 0.63 | 2.0 ± 0.72 | 0.1882 |
| Neutrophils (x109/L) | 4.9 ± 1.80 | 4.6 ± 1.54 | 0.3025 |
| Quantiferon Negative Control (IU/mL) | 0.47 ± 0.985 | 0.35 ± 0.735 | 0.3485 |
| Quantiferon TB-NC (IU/Ml) | 5.30 ± 3.693 | 4.58 ± 3.880 | 0.1589 |
| Quantiferon Mitogen-NC (IU/Ml) | 9.03 ± 2.440 | 9.40 ± 2.319 | 0.3662 |

There was no significant difference in intensity of quantiFERON TB-Gold response between patients with LTBI and those with active TB (p=0.1589) (Figure 1, Table 2).

In patients with latent tuberculosis, there were no correlations between age (p=0.353), sex (p=0.476), smoking status

(p=0.323), contact history (p=0.612), Mantoux response (p=0.055), Irish nationality (p=0.768), previous BCG vaccination (p=0.504), WCC (p=0.187), peripheral lymphocyte count (p=0.786), neutrophil count (p=0.157) and the intensity of QFT response (Table 3). Similarly in the group with active TB group, there were no correlations between these variables and the intensity of QFT response.
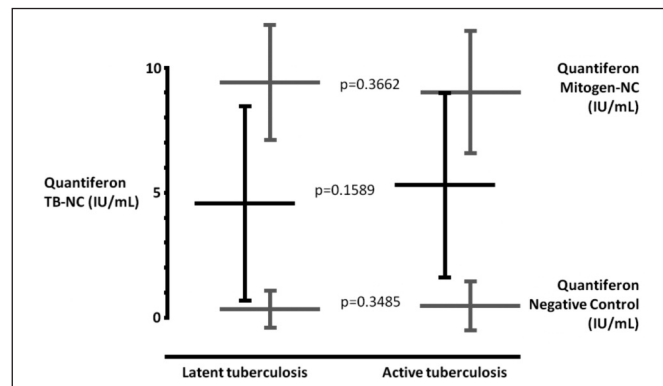


**Figure 1** The intensity of Quantiferon response in latent versus active tuberculosis

Figure 1 demonstrates that there was a difference between the intensity of response in Quantiferon assay between LTBI and active tuberculosis but that this difference was not statistically significant. Vertical bars represent standard deviation.

| Table 3 | Correlation between intensity of Quantiferon response (Quantiferon TB-NC (IU/mL)) and other variables | | | | | |
|---|---|---|---|---|---|---|
| | **Active (n=35)** | | **Latent (n=94)** | | **All TB (n=129)** | |
| | r-value | p-value | r-value | p-value | r-value | p-value |
| Age | 0.058 | 0.7388 | -0.097 | 0.3537 | 0.071 | 0.4270 |
| Male sex | -0.078 | 0.6582 | 0.074 | 0.4760 | 0.052 | 0.5572 |
| Smoking | 0.064 | 0.7132 | -0.103 | 0.3235 | -0.049 | 0.5842 |
| Months since contact | 0.089 | 0.7439 | -0.072 | 0.6126 | -0.029 | 0.8126 |
| Mantoux (mm) | -0.146 | 0.4348 | 0.215 | 0.0556 | 0.145 | 0.1289 |
| Irish born | -0.104 | 0.5537 | -0.031 | 0.7686 | -0.066 | 0.4589 |
| How long in Ireland (months) | 0.156 | 0.6538 | 0.336 | 0.2207 | 0.242 | 0.2335 |
| BCG vaccinated | 0.062 | 0.7208 | 0.070 | 0.5040 | 0.052 | 0.5569 |
| WCC (x109/L) | 0.020 | 0.9083 | -0.147 | 0.1872 | -0.081 | 0.3846 |
| Lymphocytes (x109/L) | 0.223 | 0.1984 | 0.031 | 0.7860 | 0.061 | 0.5158 |
| Neutrophils (x109/L) | -0.096 | 0.5852 | -0.158 | 0.1574 | -0.125 | 0.1782 |
| Quantiferon Neg Control (IU/mL) | 0.074 | 0.6740 | 0.034 | 0.7482 | 0.064 | 0.4729 |
| Quantiferon Mitogen-NC (IU/mL) | 0.259 | 0.1392 | 0.193 | 0.0620 | 0.200 | 0.0238 |

## Discussion
These data suggest that the intensity of QFT response cannot distinguish latent from active TB. IGRAs have revolutionized the management of patients with tuberculosis. Their primary advantage is to differentiate false positive TST reactions in patients who have been vaccinated with BCG (or indeed exposed to environmental mycobacteria) from true positive TST reactions in patients infected with Mycobacterium tuberculosis. In individuals that have not been vaccinated with BCG, there is a highly significant agreement between QFT and TST results and the assay is not influenced by previous BCG vaccination.[11] QFT is more reliable than the TST for identifying those who progress from LTBI to active TB. Diel reported progression to active TB in 14.6% of close contacts of active TB cases, compared to 2.3% of cases that were TST positive.[12] Aichelburg reported 8.3% of patients who were QFT-positive progressed to active tuberculosis over 19 months among outpatient HIV-positive adults.[13] Kik and colleagues showed lower rates of progression, 2.8% and 3.3%, among QFT and T-SPOT.TB-positive immigrant TB contacts.[14]

IGRAs can also be used to help the diagnosis of active TB. The sensitivity and specificity of the QFT in patients with active TB has been reported at 70.1%-89% and 91.6%-98.1%.[15,16] In a study from Italy, QFT was positive in 73.8% of pulmonary and 79.2% of extra-pulmonary cases and indeterminate in 9.5% and 6.2% respectively. Of note, 16.1% had false negative QFT results, occurring more frequently in foreign-born patients (p=0.006).[17]

Published studies to date have shown conflicting results as to whether IGRAs can help to differentiate LTBI from active TB.[8-11] In a study from Singapore, the authors found no differences in QFT response between persons with LTBI and active TB but significant differences in quantitative T-cell responses as measured by the T-SPOT.TB assay. They concluded however that T-cell responses may indicate mycobacteria burden and disease activity, but cannot be used to definitively discriminate active from latent TB.[18] A metaanalysis on the predictive value of QFT and TST for progression from LTBI to active disease state concluded that QFT has a higher positive and negative predictive value for progression to active TB compared with those of the TST.[19]

In our group of adults with latent and active tuberculosis, the intensity of QFT response was not influenced by age, sex, smoking, remoteness of contact history, Mantoux response, nationality, CXR abnormalities, BCG vaccination and WCC, peripheral lymphocyte and neutrophil count. In a study from Hamburg that examined contacts of patients with tuberculosis, QFT, but not TST, results were associated with exposure time (p<0.0001).[12] Other studies have shown that in persons with old healed TB on chest imaging, TST positivity waned in persons > 60 years but that QFT positivity was unaffected by age.[20] Another study from the US showed that among foreign-born individuals with a positive TST, increasing age, male sex, origin from a country with a high prevalence of tuberculosis (TB), shorter time since arrival in the United States, and increasing TST size were all independently associated with a positive QFT but not the intensity of QFT response.[21]

Recent studies have suggested that other biomarkers, including IL-15 and MCP-1 may help to distinguish LTBI from active TB.[22] Furthermore, biomarkers such as IP-10 may represent novel biomarkers for infection with MTB.[23] Although larger studies might demonstrate a statistically significant QFT response between latent and active TB, we conclude that in routine clinical practice, the intensity of QFT response cannot distinguish latent from active TB.

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**References**
1. WHO: Global tuberculosis control 2011. http://www.who.int/tb/publications/global_report/.
2. Dye C, Scheele S, Dolin P, Pathania V, Raviglione MC: Consensus statement. Global burden of tuberculosis: estimated incidence, prevalence and mortality by country. WHO Global Surveillance and Monitoring Project. JAMA1999:287:677-86.
3. Mazurek GH, Jereb J, Vernon A, LoBue P, Goldberg S, Castro K. Updated guidelines for using Interferon Gamma Release Assays to detect Mycobacterium tuberculosis infection – United States, 2010. MMWR Recomm Rep.2010;59:1-25.
4. Diel R, Loddenkemper R, Meywald-Walter K, Gottschalk R, Nienhaus A. Comparative Performance of Tuberculin Skin Test, QuantiFERON-TB-Gold In Tube Assay, and T-Spot. TB Test in Contact Investigations for Tuberculosis. Chest 2009;135:1010-8.
5. Richeldi L, Losi M, D'Amico R, Luppi M, Ferrari A, Mussini C, Codeluppi M, Cocchi S, Prati F, Paci V, Meacci M, Meccugni B, Rumpianesi F, Roversi P, Cerri S, Luppi F, Ferrara G, Latorre I, Gerunda GE, Torelli G, Esposito R, Fabbri LM. Performance of Tests for Latent Tuberculosis in Different Groups of Immunocompromised Patients. Chest 2009;136:198-204.
6. Hornum M, Mortensen KL, Kamper AL, Andersen AB. Limitations of the QuantiFERON-TB Gold test in detecting Mycobacterium tuberculosis infection in immunocompromised patients. Eur J Intern Med 2008;19:137-9.
7. Sato S, Nagai H. The clinical application of quantiferon TB-2G: its usefulness and limitations. Kekkaku 2011;86:101-12.
8. Metcalfe JZ, Cattamanchi A, Vittinghoff E, Ho C, Grinsdale J, Hopewell PC, Kawamura LM, Nahid P. Evaluation of Quantitative IFN-gamma response for risk stratification of active tuberculosis suspects. Am J Respir Crit Care Med 2010;181:87-93.
9. Kobashi Y, Shimizu H, Ohue Y, Mouri K, Obase Y, Miyashita N, Oka M. Comparison of T-cell interferon-gamma release assays for Mycobacterium tuberculosis-specific antigens in patients with active and latent tuberculosis. Lung. 2010;188:283-7.
10. Nenadic N, Kirin BK, Letoja IZ, Plavec D, Topic RZ, Dodig S. Serial interferon gamma release assay in children with latent tuberculosis infection and children with tuberculosis. Pediatr Pulmonol 2012;47:401-8.
11. Brock I, Weldingh K, Lillebaek T, Follmann F, Andersen P. Comparison of tuberculin skin test and new specific blood test in tuberculosis contacts. Am J Respir Crit Care Med 2004;170:65–9.
12. Diel R, Loddenkemper R, Niemann S, Meywald-Walter K, Nienhaus A. Negative and Positive Predictive Value of a Whole-Blood interferon-γ Release Assay for Developing Active Tuberculosis. Am J Respir Crit Care Med 2011 Jan 1;183:88-95.
13. Aichelburg MC, Rieger A, Breitenecker F, Pfistershammer K, Tittes J, Eltz S, Aichelburg AC, Stingl G, Makristathis A, Kohrgruber N. Detection and prediction of active tuberculosis disease by a whole-blood interferon-γ release assay in HIV-1–infected individuals. Clin Infect Dis 2009;48:954–62.
14. Kik SV, Franken WP, Mensen M, Cobelens FG, Kamphorst M, Arend SM, Erkens C, Gebhard A, Borgdorff MW, Verver S. Predictive value for progression to tuberculosis by IGRA and TST in immigrant contacts. Eur Respir J 2010;35:1346–53.
15. Mori T, Sakatani M, Yamagishi F, Takashima T, Kawabe Y, Nagao K, Shigeto E, Harada N, Mitarai S, Okada M, Suzuki K, Inoue Y, Tsuyuguchi K, Sasaki Y, Mazurek GH, Tsuyuguchi I. Specific detection of tuberculosis infection: an interferon-γ based assay using new antigens. Am J Respir Crit Care Med 2004;170:59–64.
16. Lee JY, Choi HJ, Park IN, Hong SB, Oh YM, Lim CM, Lee SD, Koh Y, Kim WS, Kim DS, Kim WD, Shim TS. Comparison of two commercial interferon gamma assays for diagnosing Mycobacterium tuberculosis infection. Eur Respir J 2006;28:24–30.
17. Losi M, Peracchi M, Dal Monte P, Meacci M, Fallico L, Lombardi G, Fabio A, Meccugni B, Manganelli R, Pellegrino M, Apice M, Palù G, Sambri V, Rumpianesi F, Fabbri LM, Richeldi L. Role of Quantiferon-TB Gold test in the diagnosis of active tuberculosis. Am J Respir Crit Care Med 2010;181:A1778.
18. Chee CB, Barkham TM, Khinmar KW, Gan SH, Wang YT. Quantitative T-cell interferon-gamma responses to Mycobacterium tuberculosis-specific antigens in active and latent tuberculosis. Eur J Clin Microbiol Infect Dis 2009 Jun;28:667-70.
19. Diel R, Loddenkemper R, Nienhaus A. Predictive value of interferon-γ release assays and tuberculin skin testing for progression from latent TB infection to disease state: a meta-analysis. Chest 2012;142:63-75.
20. Jeong YJ, Yoon S, Koo HK, Lim HJ, Lee JS, Lee SM, Yang SC, Yoo CG, Kim YW, Han SK, Yim JJ. Positive tuberculin skin test or interferon-gamma release assay in patients with radiographic lesion suggesting old healed tuberculosis. J Korean Med Sci 2012;27:761-6.
21. Mahan CS, Johnson DF, Curley C, van der Kuyp F. Concordance of a positive tuberculin skin test and an interferon gamma release assay in bacille Calmette-Guérin vaccinated persons. Int J Tuberc Lung Dis 2011;15:174-8.
22. Frahm M, Goswami ND, Owzar K, Hecker E, Mosher A, Cadogan E, Nahid P, Ferrari G, Stout JE. Discriminating between latent and active tuberculosis with multiple biomarker responses. Tuberculosis (Edinb)2011;91:250-6.
23. Ruhwald M, Dominguez J, Latorre I, Losi M, Richeldi L, Pasticci MB, Mazzolla R, Goletti D, Butera O, Bruchfeld J, Gaines H, Gerogianni I, Tuuminen T, Ferrara G, Eugen-Olsen J, Ravn P; TBNET. A multicentre evaluation of the accuracy and performance of IP-10 for the diagnosis of infection with M. tuberculosis. Tuberculosis (Edinb) 2011;91:260-7.

# Routine Obstetric Ultrasound Services

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**Abstract**
Antenatal ultrasonography is widely used in pregnancy to assess fetal growth, wellbeing and anatomy. Although ultrasound screening is now an integral part of routine antenatal care, recommendations for the delivery of obstetric ultrasound vary from country to country. A recent survey of English maternity units reported that 100% of women are offered routine mid-trimester fetal anomaly scanning, in line with expert recommendations. Currently in Ireland, no national guidance exists to inform practitioners on the minimum standards for obstetric ultrasound practice. In 2012, we conducted a structured telephone survey of all 20 maternity units in Ireland (n=74,377 births). Routine mid-trimester anomaly scanning was offered universally to all women in 7/20 (35%) units, offered selectively to some women in 9/20 (45%) units and not offered to any women in 4/20 (20%) of units. The time allotted for a complete fetal anatomical survey was 10-15 minutes in 4/16 (25%) units, 20 minutes in 7/16 (44%) units and 25-30 minutes in 5/16 (31%) units. Written guidelines on the appropriate management of "soft markers" for fetal aneuploidy were routinely used in 11/16 (69%) of units. In no Irish unit currently, are images from fetal anomaly scanning routinely reviewed by an Obstetrician with an interest in fetal medicine. 19/20 (95%) of respondents believed that a minimum of 2 scans should be offered in routine uncomplicated pregnancies. Improvements in the availability of obstetric ultrasound to pregnant women in Ireland will require increased staffing numbers at both the ultrasonographer and fetal specialist levels. There is a clear need for national guidelines on the provision of routine obstetric ultrasound in Ireland.

## Introduction

Antenatal ultrasonography is widely used in pregnancy to assess fetal growth, wellbeing and anatomy. Depending on the clinical scenario and the skills of the ultrasonographer, ultrasound is used for both screening and diagnostic purposes. Although ultrasound screening is now an integral part of routine antenatal care, recommendations for the delivery of obstetric ultrasound vary from country to country. In the UK, for example, the Royal College of Obstetricians and Gynaecologists (RCOG) recommend a 2-stage ultrasound screening programme for uncomplicated pregnancies, with an initial scan performed at booking and another at around 20 weeks gestation.[1] This is in contrast to the original 1984 RCOG Working Party report, which suggested a single ultrasound scan between 16 and 18 weeks.[2]

A 2008 guideline from the National Institute for Health and Clinical Excellence (NICE) endorses the 2-scan approach, suggesting that "pregnant women should be offered an early ultrasound scan between 10 weeks 0 days and 13 weeks 6 days to determine gestational age and to detect multiple pregnancies" and that "ultrasound screening for fetal anomalies should be routinely offered, normally between 18 weeks 0 days and 20 weeks 6 days".[3] Indeed, in the UK, the Department of Health have outlined an agreed policy for ultrasound screening of fetal anomalies – the NHS Fetal Anomaly Screening Programme (FASP) – which aims to offer all pregnancy women in England a minimum of two ultrasound scans.[4,5] In the United States, the American College of Obstetricians and Gynecologists (ACOG) recommends that "ideally, all women should be offered aneuploidy screening before 20 weeks gestation, regardless of maternal age".[6] However, the ACOG guidance also notes that "the optimal timing for a single ultrasound examination in the absence of specific indications for a first trimester examination is at 18–20 weeks of gestation".[6] A recently published practice guideline from the International Society for Ultrasound in Obstetrics and Gynaecology (ISUOG) noted that "most countries offer at least one mid-trimester scan as part of standard prenatal care".[7]

Currently in Ireland, no national guidance exists to inform practitioners on the minimum standards for obstetric ultrasound practice. This has led to huge variation in the delivery of antenatal ultrasound screening across Ireland. A 2007 study by our Unit found that fetal anomaly scanning was only offered routinely in 19% of Irish obstetric centres.[8] In contrast, a national survey of obstetric units in the UK reported the following year found that 100% of units routinely offered a 2nd trimester fetal anomaly scan.[9] In recent months, the quality and delivery of Irish ultrasound services in pregnancy has come under scrutiny.[10] In view of this,

we conducted an updated survey of all Irish obstetric centres, to ascertain the current availability of routine obstetric ultrasound services to pregnant women in Ireland.

## Methods

A telephone survey of Irish obstetric units was undertaken in January 2012. Respondents were asked to provide verbal answers to standard questions relating to routine obstetric ultrasound during the year 2011 under several domains: first-trimester dating scan, nuchal translucency scan, fetal anomaly scan and additional information (staffing, fetal gender, recommendations). In all cases a senior clinician, either a consultant obstetrician or the lead ultrasonographer in a unit, was surveyed, to ensure that respondents had a thorough understanding of the service offered by their unit. Respondents were assured that results would be anonymised and that practice within individual units would not be made publicly available. Denominator data on total births and deliveries per maternity unit in Ireland in 2011 were obtained from the National Perinatal Reporting System (NPRS) within the Economic and Social Research Institute (ESRI) and from the annual report of the Cork-based National Perinatal Epidemiology Centre (NPEC).
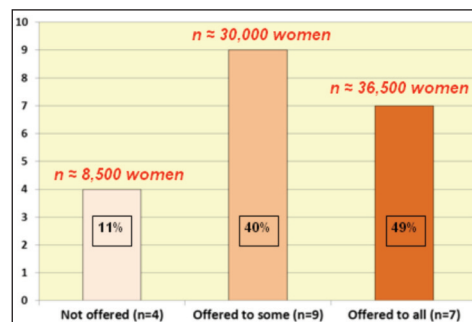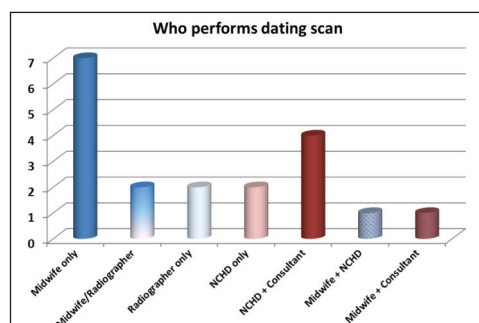


**Figure 1**

Availability of routine fetal anomaly scanning in Irish obstetric units in 2011.

## Results

The ESRI reported 74,377 notified births in Irish maternity units in 2011, which represents the highest birth rate per capita in the EU.[11] Of the 20 Irish maternity units, NPEC classifies 6 as small units (<2,000 births per annum), 10 as medium-sized units (2,000-5,999 births per annum) and 4 as large units (≥6,000 births per annum).[12] In total, 100% of Irish obstetric units were successfully contacted by telephone in January 2012 and completed the current survey. With regard to routine mid-trimester fetal anomaly scanning, this was offered universally to all women in 7 (35%) units, offered selectively to some women in 9 (45%) units and not offered to any women in 4 (20%) of units. Figure 1

demonstrates practices for routine mid-trimester scanning stratified by size of maternity unit. Within those units offering fetal anomaly scanning to some or all patients (n=16), the most common gestation for fetal anomaly scan was 20-22 weeks; indeed, the routine anomaly scan was offered at 18-24 weeks in all except one unit (where it is offered in the 3rd trimester).



**Figure 2**

Qualifications of the practitioners performing routine fetal anomaly scans

The time allotted for a complete fetal anatomical survey was 10-15 minutes in 4 (25%) units, 20 minutes in 7 (44%) units and 25-30 minutes in 5 (31%) units. Within units offering fetal anomaly scanning, information on the scan provided routinely to pregnant women ranged from verbal information only (n=5, 31%) to written information only (n=2, 13%) to both written and verbal information (n=9, 56%). Eighty percent of units used a formal written/computerised checklist to complete the fetal anatomical survey. Written guidelines on the appropriate management of "soft markers" for fetal aneuploidy were routinely used in 11/16 (69%) of units. Overall, 9/16 (56%) of Irish obstetric ultrasound units routinely keep a record (either hard-copy or computerised image) of images from the fetal anomaly ultrasound. On patient request, 80% (16/20) of Irish obstetric units reported they will routinely reveal fetal gender and the remaining 20% do not. Within units prepared to reveal gender, the diagnosis is made at ≥16 weeks, ≥18 weeks and ≥20 weeks in 12%, 44% and 44% respectively.
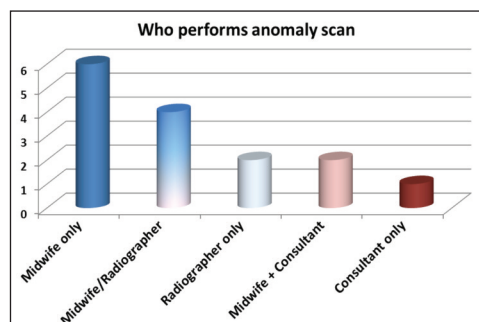


**Figure 3**

Qualifications of the practitioners performing routine fetal anomaly scans

Respondents were also surveyed on the staff who routinely perform fetal anomaly scanning in their unit. Within units offering fetal anomaly scanning, these are performed exclusively by midwife ultrasonographers or radiographers in 81% (n=13) of units, exclusively by consultant obstetricians in 13% (n=2) and by a combination of consultants and midwives in the remaining unit (6%; Figure 2). Fetal anomaly scanning was not routinely undertaken by non-consultant hospital doctors in any unit. In no Irish unit currently, are images from fetal anomaly scanning routinely reviewed by an Obstetrician with an interest in fetal medicine. Although the principal aim of this survey was to establish current practices in Irish routine fetal anomaly scanning, we also questioned respondents on early pregnancy ultrasonography within their units. A routine first trimester scan ( 14 weeks) is offered to all patients in 13/20 (65%) of units and offered to some patients by 6/20 (30%) of units, generally for a previous obstetric history of clinical indication (pain, bleeding) in the current pregnancy. One unit does not provide 1st trimester dating scans for any women. In 10/19 (53%) units, dating ultrasounds are performed exclusively by midwife ultrasonographers and radiographers. In 2011, 14/20 (70%) of

Irish obstetric units were not offering nuchal translucency (NT) scanning as part of a screening package for fetal aneuploidy.

Finally, respondents were asked how many ultrasound scans they believed should be offered to routinely to a woman in an uncomplicated pregnancy. All but one (95%) of those surveyed believed that a minimum of 2 scans should be offered routinely and more than half of clinicians surveyed (55%) felt that women with uncomplicated pregnancies should be offered 3 ultrasound scans (Figure 3).

**Discussion**

As is noted in the recent ISUOG guideline, the purpose of the mid-trimester fetal anomaly scan is "to provide accurate diagnostic information for the delivery of optimized antenatal care".[7] The Eurofetus study, involving 14 European countries, reported an overall detection rate of 56% for structural fetal anomalies, rising to 74% when only major anomalies are considered.[13] Prenatal diagnosis of a major fetal defect facilitates intrapartum and postpartum planning, allows psychological preparation on the part of the parents and may, in a few selected cases, allow the option of in utero fetal therapy to improve prognosis.[14-16] In addition antenatal diagnosis of a lethal fetal chromosomal defect avoids unnecessary caesarean section in the fetal interest. Some women may opt for pregnancy termination at this stage. For these reasons, both the RCOG and NICE support the offering of a mid-trimester anomaly scan to all pregnant women, ideally at the 18-20 weeks stage.[1,3]

Results from the present survey demonstrate a wide variation in the delivery of obstetric ultrasound services to pregnant women in Ireland. One of the more contentious results is the finding that, in 65% of Irish maternity units, women are not universally offered a mid-trimester scan for detection for fetal abnormalities. The concept of screening for fetal anomalies and the possibility of subsequent termination of pregnancy does raise certain ethical dilemmas for many patients and practitioners. Traditionally, religious and cultural considerations and the unavailability of pregnancy termination in Ireland have meant that Irish obstetric practice has been less "proactive" in identifying major structural fetal anomalies. There is also continuing debate on the benefits of routine 1st trimester pregnancy scanning. Although the RCOG recommends an early pregnancy ultrasound scan for all women,[2] a recent study found that routine booking ultrasound scans were associated with a small reduction in post-term pregnancy although there was little impact on the detection of clinically-significant anomalies.[17] The current survey finds that 35% of pregnant women in Ireland were not offered a routine 1st trimester ultrasound scan.

Expanding the availability of fetal anomaly scanning in Ireland would require close adherence to minimum standards of practice. The RCOG clearly recommends that all women should be provided with written information prior to the scan, that 20 minutes should be allocated to the anomaly survey and that, if required, referral to a fetal medicine specialist should be within 72 hours.[1] Furthermore, all scan results should be clearly documented and archived, with a move towards developing computer-based records.[1] A 2007 survey of Irish obstetric centres reported that only 19% of units were routinely performing routine fetal anomaly scanning.[8] Although the current survey demonstrates an increase in this proportion over the last 5 years, further progress is required. Improvements in the availability of obstetric ultrasound to pregnant women in Ireland will require increased staffing numbers at both the ultrasonographer and fetal specialist levels. There is a clear need for national guidelines on the provision of routine obstetric ultrasound in Ireland.

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**References**
1. Royal College of Obstetricians and Gynaecologists. Routine ultrasound screening in pregnancy, protocols, standards and training. Supplement to ultrasound screening for fetal abnormalities. Report of the RCOG Working Party. London: RCOG Press; 2000. (www.rcog.org.uk/womens-health/clinical-guidance/ultrasound-screening).
2. Royal College of Obstetricians and Gynaecologists. Report of the RCOG Working Party on Routine Ultrasound in Pregnancy. London: RCOG Press, 1984.
3. NICE clinical guideline: Antenatal care-routine care for the healthy pregnant woman. March 2008. www.nice.org.uk/CG062.
4. Ward P, Soothill P. Fetal anomaly ultrasound scanning: the development of a national programme for England. The obstetrician and gynaecologist. 2011; 13: 211–217.
5. http://fetalanomaly.screening.nhs.uk/.
6. ACOG Practice Bulletin No. 101: Ultrasonography in pregnancy. American College of Obstetricians and Gynecologists. Obstet Gynecol. 2009; 113: 451-61.
7. Salomon LJ, Alfirevic Z, Berghella V, Bilardo C, Hernandez-Andrade E, Johnsen SL, Kalache K, Leung KY, Malinger G, Munoz H, Prefumo F, Toi A, Lee W; ISUOG Clinical Standards Committee. Practice guidelines for performance of the routine mid-trimester fetal ultrasound scan. Ultrasound Obstet Gynecol. 2011; 37: 116-26.
8. Lalor J, Devane D, McParland P. Ultrasound screening for fetal abnormality in Ireland: a national survey. Ir J Med Sci. 2007; 176: 175-9.
9. NHS Screening Programmes: Ultrasound Survey of England 2008 www.fetalanomaly.screening.nhs.uk/getdata.php?id=11235.
10. HSE National Miscarriage Misdiagnosis Review April 2011. www.hse.ie/eng/services/Publications/services/Hospitals/miscarriagereview.html.
11. Economic and Social Research Institute: Perinatal Statistics Report 2011. http://www.esri.ie/UserFiles/publications/SUSTAT46.pdf.
12. National Perinatal Epidemiology Centre, Annual Report 2012. http://www.ucc.ie/en/npec/publications/reports/NPECAnnualReport2012.pdf.
13. Grandjean H, Larroque D, Levi S. The performance of routine ultrasonographic screening of pregnancies in the Eurofetus Study. Am J Obstet Gynecol. 1999; 181: 446-54.
14. Witlox RS, Lopriore E, Oepkes D. Prenatal interventions for fetal lung lesions. Prenat Diagn. 2011; 31: 628-36.
15. Morris RK, Kilby MD. Congenital urinary tract obstruction. Best Pract Res Clin Obstet Gynaecol. 2008; 22: 97-122.
16. Progression of fetal heart disease and rationale for fetal intracardiac interventions. Gardiner HM. Semin Fetal Neonatal Med. 2005; 10: 578-85.
17. Poggenpoel EJ, Geerts LT, Theron GB. The value of adding a universal booking scan to an existing protocol of routine mid-gestation ultrasound scan Int J Gynaecol Obstet. 2012; 116: 201-5.

# Clinical Tetanus in an 11 Year Old Boy
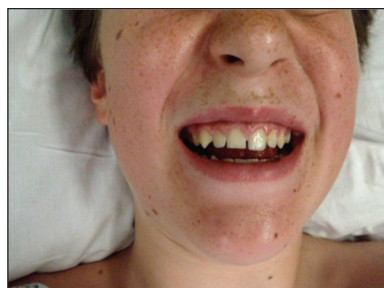
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## Introduction

Following the implementation of a successful vaccination programme, there are many infectious diseases we consider effectively dealt with, almost to the point of eradication, tetanus is one such condition that the majority of currently practicing clinicians will never encounter. We report a recent case of tetanus in an unvaccinated 11-year old Irish boy.

## Case Report

An 11- year old boy presented to the emergency department (ED) 12 days following a puncture wound to his right foot sustained while playing barefoot outdoors. Four days prior to presentation, he experienced pain in his left jaw and teeth, and over the following two days developed chest tightness, and became unable to open his mouth fully, tolerating only pureed food and liquids. He attended his general practitioner (GP), and was commenced on amoxicillin/clavulanic acid for a possible dental infection. Owing to worsening symptoms he represented to his GP at which time clinical tetanus was suspected and he was referred to the ED; no medical history of relevance; the child was unvaccinated. On examination, the patient was noted to be well in no acute distress, vital signs within normal range for age. Of significance, there was marked spasm of the patient's jaw muscles with limited opening demonstrated (Figure 1). Neurological exam revealed hypertonicity of upper and lower limbs with brisk deep tendon reflexes throughout; gait was scissoring in nature. At the site of the initial foot injury, was a small eschar with minimal local tenderness. The remainder of the examination was unremarkable.

Baseline laboratory investigations were all within normal range. Baseline tetanus toxoid level was negative. Wound debridement and cleansing of the puncture wound site revealed a one-inch thorn which was removed from the patient's foot (Figure 2). Intra-operatively obtained samples of purulent material failed to identify any anaerobic pathogens, *Staphylococcus aureus* was identified from aerobic plates. Intramuscular tetanus immunoglobulin 5000 IU (150 IU per kg) was administered. The patient completed a 10-day course of flucloxacillin and metronidazole. Apart from naso-gastric feeding (severe tongue swelling and ulceration) and repeated painful muscle spasms for a 7-day period, the patient had an uncomplicated hospital course. The patient remained hospitalised for 17 days, 9 in the intensive care unit. Tetanus immunisation (6:1 vaccine) was commenced prior to discharge; despite advice and education, his siblings remain unvaccinated.
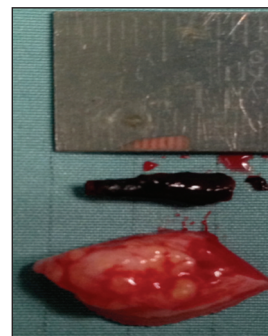


**Figure 2**

One-inch thorn removed from the plantar aspect of the patient's foot



**Figure 1**

Limited opening of the patient's mouth owing to severe muscle spasm

## Discussion

Tetanus can be acquired at any point in an unvaccinated child's life; a rare clinical entity but with associated mortality figures approaching 50%[1]. Tetanus has been a notifiable disease in

Ireland since November 1981, in the intervening 31 years there have been 12 reported cases (most recently in 2008), no reported cases in children to date. Of the 12 cases there were 2 deaths in individuals > 60 years old[2]. The last reported case in the United Kingdom was in 2004, an incompletely vaccinated 8-year old Asian child[3]. As with the case reported here 'trismus' or lockjaw is one of the classic presenting symptoms noted in infected individuals – due to painful spasm of the muscles of mastication. Additional clinical findings include, risus sardonicus, neck retraction, difficulty in swallowing, dysphasia, spasms, hyper-salivation and intense muscle rigidity. Diagnosis is typically based on clinical findings and is supported by isolation of *Clostridium tetani* from wound cultures (rare), or the detection of circulating unbound tetanus toxin (10% of cases).

The most common cause of death in individuals with severe tetanus in the absence of mechanical ventilation is spasm-related respiratory failure, whereas in ventilated patients it is tetanus-associated autonomic dysfunction. Benzodiazepines are typically indicated for the management of muscle spasms however doses required for clinical benefit typically result in excessive sedation. Current evidence suggests the benefit of magnesium sulphate for the control of both severe spasms and autonomic dysfunction[4,5]. Metronidazole (7 to 10 days) is the antibiotic of choice although evidence to support eradication of *C. tetani* with antibacterial therapy alone is not beneficial without adequate wound debridement[6].

Tetanus immunoglobulin (3000 to 6000 units) is administered once the diagnosis is clinically suspected to neutralize any unbound toxin, followed by active tetanus immunization two weeks later as immunity against tetanus is not produced following acute illness. Tetanus vaccine provides protection in 90-95% of children who are fully vaccinated. The childhood immunisation schedule in Ireland recommends children receive a dose of tetanus toxoid-containing vaccine at 2, 4, and 6 months of age and booster doses at 4-5 years and 11-14 years old. This case highlights the importance of awareness of tetanus especially in non-immunised individuals; the importance of ensuring adequate tetanus prophylaxis in the routine ED setting is also highlighted.

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**References**
1. Trujillo MH, Castillo A, España J, Manzo A, Zerpa R. Impact of intensive care management on the prognosis of tetanus. Analysis of 641 cases. Chest. 1987;92:63-5.
2. Tetanus. Health Protection Surveillance Centre. Annual Report 2008. www.hpsc.ie.
3. Padmakumar B, Date AR. Tetanus in an unvaccinated child in the United Kingdom: case report. J Public Health (Oxf). 2005;27:118-9.
4. Thwaites CL, Yen LM, Loan HT, Thuy TT, Thwaites GE, Stepniewska K, Soni N, White NJ, Farrar JJ. Magnesium sulphate for treatment of severe tetanus: a randomised controlled trial. Lancet. 2006;368:1436.
5. Attygalle D, Rodrigo N. Magnesium as first line therapy in the management of tetanus: a prospective study of 40 patients. Anaesthesia. 2002;57:811.
6. Campbell JI, Lam TM, Huynh TL, To SD, Tran TT, Nguyen VM, Le TS, Nguyen vV, Parry C, Farrar JJ, Tran TH, Baker S. Microbiologic characterization and antimicrobial susceptibility of Clostridium tetani isolated from wounds of patients with clinically diagnosed tetanus. Am J Trop Med Hyg. 2009;80:827-31.

# The Changing Epidemiology of the Bronchiolitis Epidemic in Tallaght Hospital

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**Abstract**
Bronchiolitis affects one third of babies in their first year of life. We investigated all bronchiolitis admissions to Tallaght Hospital in the last five years, with the hope of providing an insight into the epidemic in an Irish population. We analysed these 1,202 admissions on the basis of time of year (busiest being December at 24.2%), length of stay (mean 2.92 days), gender (62% male) and age (mean 30.29 weeks). There was a 102% increase in the average incidence of bronchiolitis in the first six months of 2011 and 2012 (186) compared to the previous four years (92.25). P value was statistically significant at 0.0469. Our findings were backed up by comparable data from OLCH, Crumlin (149.5 for 2011-2012 vs 36.25 for 2007-2010). There has been in a significant shift in the timing and incidence of bronchiolitis in Tallaght Hospital in the last two years. We explored the possible reasons for this, with special attention to RSV incidence, climate causes and vaccine programs.

## Introduction
Bronchiolitis affects one third of babies in their first year of life[1]. 10% of these babies will be hospitalised[2]. About half of all babies admitted to hospital with bronchiolitis develop a persistent cough and wheeze[2]. Bronchiolitis is therefore a major burden on our health care services. This study aims to address the issue of mapping out the characteristics of this epidemic in order to aid accurate planning and treatment provision into the future.

## Methods
We included in our study all cases where bronchiolitis was the primary admission criteria to Tallaght hospital in the last five years, irrespective of respiratory syncytial virus (RSV) status, as per the discharge summary and HIPE databases. These cases were then analysed and broken down into annual and subsequently monthly figures for the last five years. We also analysed the data according to age of child, sex and length of stay. Where appropriate, we used relevant statistical tests to evaluate and validate our results. To test the validity of our results, we compared figures from these parameters to those from Our Lady's Children's Hospital (OLCH), Crumlin, supplied by the RSV bronchiolitis service in OLCH.

## Results
Tallaght hospital had 1202 admissions due to bronchiolitis from 2007 – 2011 inclusive, with a further 206 cases up to the start of July 2012. There were 263 in 2007, 222 in 2008, 257 in 2009, 188 in 2010 and 272 in 2011. The mean age of children was 30.29 weeks, the median was 24 weeks. The most common week for admission was the 9th week of life. The majority of inpatients – 62% – were male. The average length of stay in hospital was 2.92 days over the 5 years. Median length of stay was 2 days. The average length of stay has been decreasing since 2008 when it stood at 3.35 days to 2.54 days in 2012. This compares favourably, or on a par, with most international figures.[9-11] 32% of

children stayed only one day, 24% 2 days and 17% 3 days. 5% of children stayed one week or more. The busiest month was December, with 24.2% of cases for the whole 5 years. This was followed by November with 16.1%, January with 15.1%, February with 9.5%, March with 8.4%, October with 6.3%, April with 6.1% and September with 4.7%. The other four months contributed less than 3.5% each to the total figures.
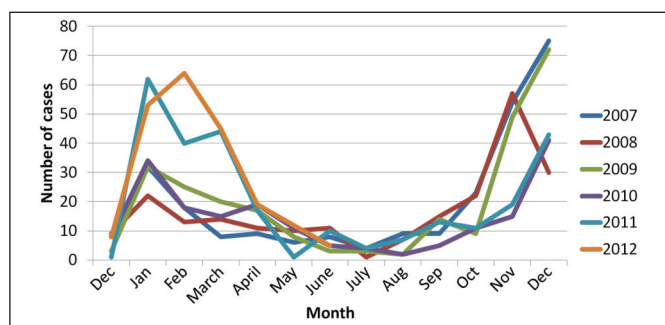


**Figure 1**    Large spike in numbers of admissions with bronchiolitis in the early part of 2011 and 2012, compared to the previous 4 years

Interestingly, however, there appears to have been a large increase in the occurrence of bronchiolitis in the early part of both 2011 and 2012. Compared to the previous three years, the spike in figures at the end of 2010 was less than what should have been expected (see Figure 1). This resulted in a substantially lower than average total for 2010. There was then a subsequent large rise in the early part of 2011. Again, the spike at the end of the year was less than what would have been expected for the years prior to 2010. However, the large increase in numbers at the start of the year was more than enough to compensate for this, and resulted in 2011 been the busiest year in our dataset. This rise in numbers in the early part of the year has continued into 2012, with the first 6 months of 2012 being the busiest of any year in our dataset. In fact, the first 4 months of 2012 had more admissions with bronchiolitis than all of 2010 (189 vs 188).

The average number of admissions for the first 6 months of the year for 2007-2010 was 92.25. The average number for 2011-2012 was 186 (Table 1). These averages were then analysed using the Wilcoxon signed rank test, which produced a p value of 0.0469. This implied than there was a statistically significant increase in the bronchiolitis figures for the first 6 months of 2011 and 2012 compared to the previous 4 years. To rule out possible confounding factors in Tallaght Hospital, we analysed the number of patients admitted to Our Lady's Children's Hospital (OLCH), Crumlin with RSV positive bronchiolitis in the same time period.

The pattern seen above was repeated in OLCH, with a large spike in the early part of the year for the last two years. The average number of admissions in OLCHC with RSV positive bronchiolitis for the first 6 months of the year for 2007-2010 was 36.25. The average for the first 6 months for 2011-2012 was 149.5.

| Table 1 | Average admission figures for the first 6 months of the year | |
|---|---|---|
| | **2007-2010** | **2011-2012** |
| January | 30 | 57.5 |
| Febuary | 18.5 | 52 |
| March | 14.25 | 44.5 |
| April | 14 | 18 |
| May | 8.75 | 6.5 |
| June | 6.75 | 7.5 |
| 6 month total | 92.25 | 186 |

**Discussion**
There was a statistically significant increase in the number of bronchiolitis cases in Tallaght Hospital in the early part of 2011 and 2012 compared to the previous four years. There was a similar increase in RSV positive bronchiolitis in Our Lady's Children's Hospital, Crumlin in the same time period. These figures correspond to those of the Irish Health Protection Surveillance Centre, which show an increase in RSV positive test results in the early part of 2011[3]. These figures have continued in a similar vein into 2012[4]. The cause for this increase is not fully apparent. It is postulated that variations in bronchiolitis and RSV epidemics can be due to both climate and climate independent factors[5]. Epidemiologic evidence of climate influences on RSV

epidemics is substantial. In Europe, annual RSV epidemics have traditionally begun in the coldest parts of the continent – Northern Russia/Finland first, in October. The epidemics then follow climatic conditions relatively closely until the epidemics start in the Mediterranean in the Spring[5]. Various factors have been theorised as being at play, such as a reduction in UVB radiation inactivation of the virus or an alteration in host resistance with temperature[6].

In Ireland, 2010 was an exceptionally cold year, with December temperatures nearly 5% lower than normal[7,8]. This difference may have been a significant contributor to the change in the epidemic pattern. With regard climate independent factors, from November 2009-March 2010, a national vaccination programme for H1N1 influenza was launched. It is possible that this had some effect on immunity levels for respiratory pathology in general, possibly shifting the timing of the bronchiolitis epidemic. Essentially it may never be known why there was a shift in the timing of the annual bronchiolitis epidemic into 2010, and why this continued into 2012. Future investigation is warranted to evaluate if this trend continues, and what factors may be contributing to it. As a large contributor to ill health in Ireland's paediatric population, close monitoring of it is vital to future planning of our health service.

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**References**
1.  Phelan P, Olinsky A, Robertson C. Respiratory illness in children. 4th edition. Blackwell Scientific Publications, London, UK; 1994.
2.  Scottish Intercollegiate Guidelines Network. Bronchiolitis in children. A national clinical guideline. November 2006.
3.  Influenza Surveillance Report 26/5/2011. www.hspc.ie.
4.  Influenza Surveillance Report 16/5/2012. www.hspc.ie.
5.  Stensballe LG, Devasundaram JK, Simoes EA. Respiratory syncytial virus epidemics: the ups and downs of a seasonal virus. Pediatr Infect Dis J. 2003 Feb;22:S21-32.
6.  Welliver R, The relationship of meteorological conditions to the epidemic activity of respiratory syncytial virus. Paediatr Respir Rev. 2009 Jun;10 Suppl 1:6-8.
7.  Irish Weather Network. Annual Report 2010.
8.  www.kilkennyweather.com.
9.  Pelletier AJ, Mansbach JM, Camargo CA Jr. Direct medical costs of bronchiolitis hospitalizations in the United States. Pediatrics 2006 Dec; 118:2418-23.
10.  Hospital Episode Statistics, England Department of Health.
11.  A prospective randomised trial comparing nasogastric with intravenous hydration in children with bronchiolitis (protocol) The comparative rehydration in bronchiolitis study (CRIB). BMC Pediatrics 2010, 10.

# Safety Comes First: Are Doctors Attentive Enough to their Initial Clinical Assessment Notes?

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**Abstract**
Accurate hospital admission/initial history and physical examination [H&P] notes are vital to support patient care. We aimed to assess the quality of H&P notes and to compare medical/surgical, and inpatient/outpatient H&P notes. A cross-sectional study examined 154 initial H&P notes for the adherence to a standard protocol in a tertiary referral hospital. 134 doctors (87.1%) adhered to the correct layout in accordance with the standard. Only 77 doctors (50%) recorded the names of the patient's medications. 106 (68.8%) documented the allergy status. Six doctors (3.9%) omitted an objective record of their own identity. Surgeons were superior at recording admission type (p=0.0001) and past surgical history (p=0.002) only. The data in this study show that the standard of completeness of the H&P documentation among doctors is suboptimal. We recommend the introduction of a standardised H&P template to reduce errors.

## Introduction

The medical record is valuable for research, audit and medico-legal purposes[1] but its primary function is to support patient care[2]. Admission and "first visit" clinical H&P notes represent the most frequently referenced evidence of a clinical encounter[3]. Inaccuracies/omissions at this time can lead to multiple errors[4]. While there is a justified move towards electronic medical records, the reality is that the majority of hospitals in Ireland, have limited resources[5]. There is, therefore, an ongoing need to maintain the quality of existing handwritten records. Many individual hospitals have guidelines governing the documentation of H&P notes. With this background, we asked the questions: how complete is the doctor's H&P note in an Irish tertiary referral hospital where a local policy exists; how frequently are potentially serious omissions encountered; how do the H&P notes of physicians compare to surgeons; and how do inpatient notes compare to outpatients?

## Methods

A cross-sectional survey method was chosen for the study design. The most recent H&P note from 154 active medical records was selected, from all inpatients on eight wards, at a given time, to minimise selection bias. Twenty active outpatient records were also reviewed, focusing on the first referral visit note. A data collection sheet with variables reflecting fields relevant to the institution's policy for H&P notes was designed (Table 1). The clinician's handwritten notes clerking in each admission/new outpatient visit were individually scrutinised to identify documentation of each variable, and scored from 1 to 40. At the authors' institution, H&P notes are written on continuation forms containing a request to label each page with the patient's name/hospital number/date of birth either by writing or by attaching an adhesive addressograph label.

Two-tailed Fishers exact tests were performed as appropriate in SPSSv18.

## Results

154 H&P notes were examined, 53.9% were medical and 46.1% surgical (Table 2). Of the 154 doctors authoring these notes, 27.3% were senior house officers, 21.4% were interns, 19.5% were registrars and 1.3% consultants. 30.5% didn't document any grade. Patient name/medical record number/date of birth was documented in 95.5% of notes. 4.6% of H&Ps had no unique identifier at all. Date of the assessment was recorded in 97.4% of instances, and time in 36.3%. Doctor's name was written in 50%, however 6.5% of these names were illegible. 22.1% documented the admission type (e.g. elective).

Presenting complaint was purposefully documented in 75.3%. However, 92.2% detailed the history of presenting complaint. Medications were listed by name in 62.3% of records. However only 41.6% recorded medication dose, 3.9% noted the strength,

**Table 1  Initial clinical assessment (H&P) note variables studied**

| Parameter | Variable |
|---|---|
| Gender | Male or Female |
| Age | Number |
| Medical/Surgical | Yes or No |
| Patient name | Yes or No |
| MRN/DOB | Yes or No |
| Date | Yes or No |
| Time | Yes or No |
| Dr. Name | Yes or No |
| Referral source | Yes or No |
| Admission Type | Yes or No |
| Presenting Complaint | Yes or No |
| History of PC | Yes or No |
| Past Medical History | Yes or No |
| Past Surgical History | Yes or No |
| Medication Name | Yes or No |
| Medication Dose | Yes or No |
| Medication Strength | Yes or No |
| Medication Route | Yes or No |
| Medication Frequency | Yes or No |
| Social History: Occupation | Yes or No |
| Social History: Marital Status | Yes or No |
| Social History: Living with | Yes or No |
| Functional History | Yes or No |
| Smoking History | Yes or No |
| Alcohol History | Yes or No |
| Family History | Yes or No |
| Review of Systems | Yes or No |
| General exam | Yes or No |
| Vitals: Temperature | Yes or No |
| Vitals: Blood Pressure | Yes or No |
| Vitals: Respiratory Rate | Yes or No |
| Vitals: Heart Rate | Yes or No |
| Cardiovascular exam | Yes or No |
| Respiratory exam | Yes or No |
| Gastro-intestinal exam | Yes or No |
| Neurological exam | Yes or No |
| Investigations | Yes or No |
| Impression | Yes or No |
| Plan | Yes or No |
| Signature | Yes or No |
| Pager number | Yes or No |
| Medical Council registration number | Yes or No |
| Grade | Yes or No |

**Table 2  Comparison of documentation rates for medical versus surgical patients**

| Parameter | Medical n=83 (%) | Surgical n=71 (%) | P-value | Total n (%) out of n=154[1] |
|---|---|---|---|---|
| Patient name | 81 (98) | 66 (93) | 0.2 | 147 (95.5) |
| MRN/DOB | 81 (98) | 66 (93) | 0.2 | 147 (95.5) |
| Date | 80 (96.4) | 70 (98.6) | 0.6 | 150 (97.4) |
| Time | 27 (32.5) | 29 (40.8) | 0.3 | 56 (36.4) |
| Dr. Name | 37 (44.6) | 40 (56.3) | 0.2 | 77 (50) |
| Referral source | 37 (44.6) | 17 (23.9) | 0.01 | 54 (35.1) |
| Admission Type | 8 (9.6) | 26 (36.6) | 0.0001 | 34 (22.1) |
| Presenting Complaint | 58 (69.9) | 58 (81.7) | 0.1 | 116 (75.3) |
| History of PC | 77 (92.8) | 65 (91.5) | 1.0000 | 142 (92.2) |
| Past Medical History | 74 (89.2) | 59 (83.1) | 0.3 | 133 (86.4) |
| Past Surgical History | 31 (37.4) | 45 (63.4) | 0.002 | 76 (49.4) |
| Medications (all 5 parameters)[2] | 144 (42.4) | 87 (31.6) | 0.007 | 231 (37.6) |
| Allergies | 57 (68.7) | 49 (69) | 1.0000 | 106 (68.8) |
| Social History (all 6 parameters)[3] | 208 (41.8) | 157 (36.9) | 0.1 | 365 (39.5) |
| Family History | 29 (34.9) | 17 (23.9) | 0.2 | 46 (29.9) |
| Review of Systems | 23 (27.7) | 18 (25.4) | 0.9 | 41 (26.6) |
| General exam/vitals (all 5 parameters)[4] | 238 (57.4) | 69 (19.4) | 0.0001 | 365 (47.4) |
| Cardiovascular exam | 74 (89.2) | 35 (49.2) | 0.0001 | 109 (70.8) |
| Respiratory exam | 79 (95.2) | 37 (52.1) | 0.0001 | 114 (74) |
| Gastro-intestinal exam | 73 (87.9) | 45 (63.4) | 0.0005 | 118 (76.6) |
| Neurological exam | 43 (51.8) | 2 (2.8) | 0.0001 | 45 (29.2) |
| Investigations | 62 (74.7) | 17 (23.9) | 0.0001 | 79 (51.3) |
| Impression | 59 (71.1) | 16 (22.5) | 0.0001 | 75 (48.7) |
| Plan (of care) | 78 (93.9) | 69 (97.2) | 0.5 | 147 (95.5) |
| Signature | 80 (96.4) | 68 (95.8) | 1.0000 | 148 (96.1) |
| Pager number | 56 (67.5) | 41 (57.7) | 0.2 | 97 (62.9) |
| Medical Council registration number[5] | 24 (28.9) | 23 (32.4) | 0.7 | 47 (30.5) |

[1] n refers to the number of patients out of a total of 154 patients, unless otherwise stated
[2] Data refers to the sum of any of the five medication parameters described in Table 1. Medical column includes data from 68 individuals (14 of the 83 were on no medications, one individual had unknown medication status). Surgical column refers to 55 individuals (15 patients of the 71 were not on medications, one individual had unknown medication status). Total column relates to a maximum of 615 possible recorded parameters (123 patients x 5 parameters).
[3] Data refers to the six Social History parameters outlined in Table 1. There was a possible total of 924 recorded parameters (154 patients x 6 parameters).
[4] Data refers to recording of a general exam and the four vital signs (five parameters). There was a possible total of 770 recorded parameters (154 patients x 5 parameters).
[5] All doctors practicing medicine in Ireland must register with the Irish Medical Council.

5.2% the administration route and 36.4% the administration frequency. Regarding patient social history documentation, 37.7% mentioned occupation, 50% cited living arrangements and 35.1% outlined marital status. Only 20.8% described ability to self-care, though 53.5% of studied patients were ≥65 years old. 52.6% documented smoking history and 46.1% alcohol intake. Patient's general appearance/mental status was mentioned in 45.5% of instances. Vitals were entered inconsistently i.e. 49.4% recorded heart rate, 46.1% noted blood pressure, 38.9% recorded patient temperature, and 19.5% respiratory rate. 3.2% simply wrote "vitals stable". Documentation of focused body system examination varied from 76.6% for gastrointestinal system to 29.2% for neurological system.

| Table 3  Comparison of documentation rates for inpatient versus outpatient | | | | |
|---|---|---|---|---|
| Parameter | Inpatient n=134 | Outpatient n=20 | P-value | Total n (%) out of n=154[1] |
| Patient name | 127 (94.8) | 20 (100) | 0.60 | 147 (95.5) |
| MRN/DOB | 127 (94.8) | 20 (100) | 0.60 | 147 (95.5) |
| Date | 130 (97) | 20 (100) | 1.00 | 150 (97.4) |
| Time | 56 (41.8) | 0 (0) | 0.0001 | 56 (36.4) |
| Dr. Name | 74 (55.2) | 3 (15) | 0.001 | 77 (50) |
| Referral source | 48 (35.8) | 6 (30) | 0.80 | 54 (35.1) |
| Admission Type | 34 (25.4) | 0 (0) | 0.008 | 34 (22.1) |
| Presenting Complaint | 103 (76.9) | 13 (65) | 0.27 | 116 (75.3) |
| History of PC | 123 (91.8) | 19 (950 | 1.0000 | 142 (92.2) |
| Past Medical History | 118 (88) | 15 (75) | 0.18 | 133 (86.4) |
| Past Surgical History | 69 (51.5) | 7 (35) | 0.23 | 76 (49.4) |
| Medications (all 5 parameters)[2] | 215 (39.1) | 16 (24.6) | 0.03 | 231 (37.6) |
| Allergies | 97 (72.4) | 9 (45) | 0.02 | 106 (68.8) |
| Social History (all 6 parameters)[3] | 331 (41.2) | 34 (28.3) | 0.007 | 365 (39.5) |
| Family History | 39 (29.1) | 7 (35) | 0.61 | 46 (29.9) |
| Review of Systems | 39 (29.1) | 2 (10) | 0.10 | 41 (26.6) |
| General exam/vitals (all 5 parameters)[4] | 289 (43.1) | 18 (90) | 0.0001 | 307 (39.9) |
| Cardiovascular exam | 101 (75.4) | 8 (40) | 0.003 | 109 (70.8) |
| Respiratory exam | 107 (75.4) | 9 (45) | 0.002 | 116 (75.3) |
| Gastro-intestinal exam | 109 (81.3) | 9 (45) | 0.001 | 118 (76.6) |
| Neurological exam | 42 (31.3) | 3 (15) | 0.19 | 45 (29.2) |
| Investigations | 72 (53.7) | 7 (35) | 0.15 | 79 (51.3) |
| Impression | 70 (52.2) | 5 (25) | 0.03 | 75 (48.7) |
| Plan | 131 (97.8) | 16 (80) | 0.006 | 147 (95.5) |
| Signature | 131 (97.8) | 17 (85) | 0.03 | 148 (96.1) |
| Pager number | 94 (70.1) | 3 (15) | 0.0001 | 97 (62.9) |
| Medical Council Registration number | 45 (33.6) | 2 (10) | 0.04 | 47 (30.5) |

[1] n refers to the number of patients out of a total of 154 patients, unless otherwise stated
[2] Data refers to the sum of any of the five medication parameters described in Table 1. Inpatient column includes data from 110 individuals (22 of the 134 were on no medications, 2 individuals had unknown medication status). Outpatient column refers to 13 individuals (7 patients of the 20 were not on medications). Total column relates to a maximum of 615 possible recorded parameters (123 patients x 5 parameters).
[3] Data refers to the six Social History parameters outlined in Table 1. There was a possible total of 924 recorded parameters (154 patients x 6 parameters).
[4] Data refers to recording of a general exam and the four vital signs (five parameters). There was a possible total of 770 recorded parameters (154 patients x 5 parameters).

73.6% noted investigations ordered but only 51.3% documented investigation results. 48.7% alluded to differential diagnoses of the patient's illness. 95.5% documented a patient care plan. While 96.1% of doctors signed their note, only 62.9% wrote their pager number and 30.5% documented their medical council registration number, a uniquely assigned identification number for regulatory purposes. Regarding overall adequacy of H&P documentation, 87.1% presented the information using a majority of the variables (as per the reference standard in Table 1). 1.9% of new admissions were commenced on an old page (i.e. continued from a previous admission) and 5.2% were filed as loose pages (i.e. without the institutional medical record).

Concerning differential rates of documentation by physicians versus surgeons, physicians recorded significantly more medications, systematic physical examination findings, investigation results and clinical impressions (p<0.006 all comparisons, Table 2). Surgeons were best at recording admission type (p=0.0001) and past surgical history (p=0.002). While many parameters were recorded at significantly higher rates in inpatient compared with outpatient episodes, notably time and pager number (p=0.0001), vital signs were better recorded in outpatient notes (p=0.0001, Table 3).

## Discussion

Results of this cross-sectional study show a majority of doctors are correctly adhering to the layout of how a doctor's H&P should be documented. However, of the 154 H&P notes examined, not one documented all 40 variables analysed. This suggests that although standards exist at the authors' institution, they are not strictly adhered to. Reassuringly, 92.2% highlight the history of presenting complaint and 95.4% outline a patient care plan. However, worryingly, more than 1 in every 25 H&P notes have no individual identifier at all. Therefore, if separated from the medical record, there is no link of the H&P to that patient's records. Furthermore, some patients were admitted without a formal chart, with loose admission notes that may easily become lost.

A quarter of hospital prescribing errors are attributable to incomplete medication histories at the time of admission[6]. Although >50% of doctors recorded medication names, the frequent failure to document dose, route, strength and frequency can lead to prescribing errors, which in the extreme, invite harmful, indefensible mistakes[7]. In addition, poor documentation of drug allergy risks serious consequences[8]. Many H&P parameters were better documented by physicians versus surgeons, suggesting a need for more detailed H&P notes in physician practice compared to surgical, with surgeons focusing more on elective/emergency admission type, and past surgical history. Social history is often overlooked in favour of less holistic aspects of the H&P[9]. Patient discussions concerning return to work/financial and family pressures are informed by knowledge of their occupation, marital status and family composition[9]. The patient's family history and tobacco/alcohol intake are relevant to risk assessment for atherosclerosis and cancers[10-12] yet only a minority of admissions studied documented these variables.

Peixoto described the physical examination as "the physician's trademark"[13], however, many H&P notes bypass a thorough record of the patient examination, making diagnostic mistakes less defensible if subsequently challenged[14]. Documentation of vital signs has proved to be inconsistent, especially in inpatients versus outpatients, likely reflecting nurse involvement in outpatient settings. Respiratory rate notation is often omitted, or replaced by pulse oximetry despite evidence showing it is a less accurate measurement of respiratory distress[15]. Interestingly, gastrointestinal examination was performed most frequently, likely reflecting a common clinical priority among physicians and surgeons. Many new outpatient notes documented a targeted exam only, e.g. a hand examination at a plastic surgery clinic, which some may be reasonable given the time constraints in these consultations.

Regarding author identity, while more than 95% signed their H&P, most names were illegible and two-thirds omitted a pager number. The most recent Medical Practitioners Act in Ireland requires doctors to document their medical council registration number for practitioner identification[16], yet in this study less than one-third of doctors abided by this regulation. Interestingly, there was no correlation between documentation comprehensiveness and grade of professional seniority. Electronic medical records can incorporate mandatory fields of data entry that must be completed in order to proceed. The use of password encryption could circumvent issues of author identity/timing. In the absence of such technology, doctors could involve patients by having them complete a template form comprising the main fields of a standard patient history, which is then augmented during the consultation. Ideally these efforts should be coordinated through high-level committees charged with responsibility for improving documentation, and be widely promoted within individual healthcare institutions.

The present study shows that the completeness of the H&P, set out by the author's institutional policies, is suboptimal among admitting doctors. While some results are encouraging, the majority of H&Ps are incomplete and there is considerable potential for improvement. There is a continued need, for the

benefit of all, to promote more comprehensive documentation of the "new" patient encounter. The introduction of a prepared template encompassing all the above variables may help to achieve this. Future work in this area could investigate the factors that make one doctor write less complete notes than others, such as prior training and academic performance, how onerous or structured their current post is and awareness of relevant institutional policies. This information might help to prevent adverse outcomes arising from incomplete documentation of clinical encounters.

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**References**
1. Chamisa I, Zulu BM. Setting the records straight—a prospective audit of the quality of case notes in a surgical department. S Afr J Surg. 2007 Aug;45:92, 94-5.
2. Mann R, Williams J. Standards in medical record keeping. Clin Med. 2003 Jul-Aug;3:329-32.
3. Yu KT, Green RA. Critical aspects of emergency department documentation and communication. Emerg Med Clin North Am. 2009 Nov;27:641-54, ix.
4. O'Donovan M. Are medical records in their current form a liability? IHRIM. 1996 Feb;37:8-9.
5. Jha AK, DesRoches CM, Campbell EG, Donelan K et al. Use of electronic health records in U.S. hospitals. N Engl J Med. 2009 Apr 16;360:1628-38.
6. Tam VC, Knowles SR, Cornish PL, Fine N et al. Frequency, type and clinical importance of medication history errors at admission to hospital: a systematic review. CMAJ 2005 Aug 30;173:510-5.
7. Velo GP, Minuz P. Medication errors: prescribing faults and prescription errors. Br J Clin Pharmacol. 2009 Jun;67:624-8.
8. Khalil H, Leversha A, Khalil V. Drug allergy documentation-time for a change? Int J Clin Pharm. 2011 Aug;33:610-3.
9. Srivastava R, Complicated Lives — Taking the Social History. N Engl J Med 2011; 365:587-589 August 18, 2011.
10. Anderson R, Schiedermayer D. The Social History Matters! Acad Med. 2010 Jul;85:1103.
11. Rich E, Burke W, Heaton C, Haga S, Pinsky L, Short MP, Acheson L. Reconsidering the Family History in Primary Care J Gen Intern Med. 2004 March; 19: 273–2.
12. Rodriguez RM, Dean K, Backster A, Aiken L, McClung C. Focusing on a "serious" review of systems in the emergency department. J Emerg Med. 2010 Nov;39:539-43.
13. AJ Peixoto. Birth, death, and resurrection of the physical examination: clinical and academic perspectives on bedside diagnosis. Yale J Biol Med. 2001 Jul-Aug; 74: 221–228.
14. Verghese A, Culture Shock — Patient as Icon, Icon as Patient. N Engl J Med 2008; 359:2748-2751.
15. Cretikos MA, Bellomo R, Hillman K, Chen J, Finfer S, Flabouris A. Respiratory rate: the neglected vital sign. Med J Aust. 2008 Jun 2;188:657.
16. Part 6 Registration of Medical Practitioners, Section 43, Subsection 8. Office of the Attorney General. Irish Statute Book. Medical Practitioners Act 2007.

# Validation of the VitalPACTM Early Warning Score (ViEWS) in Acutely Ill Medical Patients Admitted

Sir

The VitalPACTM early warning score was derived from 198,755 vital sign sets and has an area under the receiver operator characteristic curve (AUROC) for death of acute unselected medical patients within 24 h of 88%[1]. It is currently the best performing early warning score and is the basis of the National Early Warning Scores of the UK and Ireland. ViEWS was derived from acutely ill unselected medical patients with an in-hospital mortality of 8% and a 24 hour mortality of 1%. Although the score's discrimination has been validated in North America[2] and sub-Saharan Africa[3] it has not been validated in an Irish hospital.

The vital signs of all patients admitted to Nenagh Hospital through its Medical Assessment Unit (MAU) between August 6th 2011 and November 23rd 2012 were entered into a computer program that automatically calculated ViEWS[4]. During the study period 3117 patients were admitted to the hospital of whom 86 died (2.8%) – the MAU admitted 81% of these patients. Data on 2519 individual patients and 8,823 sets of vital signs were recorded and available for analysis. Seventy seven of the 2519 patients entered into the study (3.1%) died in hospital and 36 of these patients (1.4%) died within 24 hours of their vital signs being recorded. No deaths occurred within 24 hours in the 982 patients with a ViEWS value of zero, and only 5 deaths occurred in patients with a ViEWS value from 1-3. The AUROC for ViEWS was 90.8% (95% CI 84.2-97.3%). The discrimination of ViEWS, therefore, in Nenagh General Hospital is the same as originally reported in UK, and in North America and sub-Saharan Africa patients.

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**References**
1. Prytherch DR, Smith GB, Schmidt PE, Featherstone PI. ViEWS— towards a national early warning score for detecting adult inpatient deterioration. Resuscitation 2010;81:932–7.
2. Bleyer AJ, Vidya S., Russell G.B., Jones C.M., Sujata L., Daeihagh P., Hire D. Longitudinal analysis of one million vital signs in patients in an academic medical center. Resuscitation. 2011;82:1387–1392.
3. Opio M.O., Nansubuga G., Kellett J. Validation of the VitalPAC™ Early Warning Score (ViEWS) in acutely ill medical patients attending a resource-poor hospital in sub-Saharan Africa. Resuscitation 2013;84:743-746.
4. Hickey A., Gleeson M., Kellett J. (2012) READS: the Rapid Electronic Assessment Documentation System. British Journal of Nursing, 21:1333-8.

# Continuing Professional Development

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

**Cancer Incidence and Mortality due to Alcohol: An Analysis of 10-Year Data**

M Laffoy, T Mc Carthy, L Mullen, D Byrne, J Martin. Ir Med J. 2013; 106: 294-7.

### Question 1
The number of males in the study was

a)    4185
b)    4285
c)    4385
d)    4485
e)    4585

### Question 2
The number of females in the study was

a)    4193
b)    4293
c)    4393
d)    4493
e)    4593

### Question 3
In males the proportion of upper aero-digestive cancers attributable to cancer was

a)    32.9%
b)    42.9%
c)    52.9%
d)    62.9%
e)    72.9%

### Question 4
In females the proportion of upper aero-digestive cancers attributable cancer was

a)    25.2%
b)    35.2%
c)    45.2%
d)    55.2%
e)    65.2%

### Question 5:
Every year the number of new cancer cases attributable to alcohol is

a)    500
b)    600
c)    700
d)    800
e)    900

**Are Irish Adult General Practice Consultation Rates as Low as Official Records Suggest? A Cross Sectional Study at Six General Practices**

W Behan, D Molony, C Beame, W Cullen. Ir Med J. 2013; 106: 297-9.

### Question 1
The study population was

a)    16,706
b)    17,706
c)    18,706
d)    19,706
e)    20,706

### Question 2
The mean consultation rate was

a)    4.17
b)    5.17
c)    6.17
d)    7.17
e)    8.17

### Question 3
The consultation rate among GMS patients was

a)    3.7
b)    4.7
c)    5.7
d)    6.7
e)    7.7

### Question 4
The number of GMS consultations annually are

a)    14.4 million
b)    15.4 million
c)    16.4 million
d)    17.4 million
e)    18.4 million

### Question 5
It is estimated that a total free GP service would increase the annual number of consultations by

a)    1.4 million
b)    2.4 million
c)    3.4 million
d)    4.4 million
e)    5.4 million

**Adverse Event Recording Post Hip Fracture Surgery**

K Doody, KMS Mohamed, A Butler, J Street, B Lenehan. Ir Med J. 2013; 106: 300-2.

### Question 1
The sample size was

a)    29
b)    39
c)    49
d)    59
e)    69

### Question 2
The mean age was

a)    75.5 years
b)    80.5 years
c)    85.5 years
d)    90.5 years
e)    95.5 years

### Question 3
The number of adverse events was

a)    40
b)    45
c)    50
d)    55
e)    60

### Question 4
The number of cases of urinary retention was

a)    5
b)    6
c)    7
d)    8
e)    9

### Question 5
The number of cases of anaemia was

a)    6
b)    8
c)    10
d)    12
e)    14

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