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# British Journal of Medical Practitioners

Volume 5 Number 2 (June 2012)

BJMP March 2012 Volume 5 Number 2

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## Editorial

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- Fibromyalgia, psychiatric comorbidity, and the somatosensory cortex 4  
Francis J Dunne and Ciaran A Dunne

---

## Research Articles

---

- Accuracy of visual estimation in diagnosing obese individuals- a blinded study 7  
Masliyana Husin, Sazzli Kasim and Antoinette Tuthill
- Availability of computerised reminders in primary care doesn't reduce heart-failure repeated hospitalisations 11  
Luca Degli Esposti, Alessandro Filippi, Chiara Verones, Stefano Buda, Gaetano D'Ambrosio, Cinzia Germinario, Italo Paolini and PierClaudio Brascesco
- Sensitivity, Specificity and Diagnostic Efficiency of Serum Sialic Acid as a Biochemical Marker in Alcohol Abuse 14  
Veerendra Kumar Arumalla, G Narender, R Kathaini and A Pullaiah

---

## Case Reports/Series

---

- Differential diagnosis of an abdomino-pelvic mass: Ganglioneuroma must be considered. A case history and literature review. 18  
Mahmood Tariq, Khan Sadaqat Ali, Sarwar Zeeshan, Rasool S Hamad, Anjum S Hasan and Tahir M Mohsin
- Solitary metastasis to the pancreas from colorectal cancer- A case report and literature review 21  
Suvadip Chatterjee, John Scott, Viney Wadehra, Steve White and Manu Nayar
- Utilising Therapeutic Hypothermia in the Control of Non-convulsive Status Epilepticus in a Patient with Creutzfeldt-Jakob Encephalopathy 24  
Matthew J. Missert, Khalid J. Qazi and Catalina C. Ionita
- Afebrile malaria patient with multisystem involvement and Hepatitis B infection: A case report 28  
Rabindra Ghimire, Kaushal Raj Pandey, Prabhat Adhikari, Ashna Pokhrel, Maximo Mora and Mirela Sam

---

## Clinical Practice

---

- Paediatric fracture clinic referrals: what does it consist of? 31  
Ravindra Thimmaiah and Alf Bass

---

## Education and Training

---

- Critical Analysis of Case Based Discussions 35  
J M L Williamson and A J Osborne

## Fibromyalgia, psychiatric comorbidity, and the somatosensory cortex

Francis J Dunne and Ciaran A Dunne

In rheumatology clinics chronic painful conditions are the norm. Although many pain syndromes are associated with low mood and sometimes clinical depression, the mood disorder often goes unrecognised. Fibromyalgia is one such chronic pain syndrome, 'chronic' arbitrarily defined as lasting longer than six months. It is a common, poorly understood, musculoskeletal disorder which more often affects women between the ages of 25-50 years generally.

In nearly all patients three symptoms predominate, namely, neuropathic pain (nerve injury pain), fatigue and non-restorative sleep disturbance. The chronic neuropathic diffuse pain, described as whole body pain, is felt particularly in deep tissues such as ligaments, joints, and muscles of the axial skeleton in mainly the lower cervical and lumbar spine. The pain is often characterised by an exaggerated and prolonged response to a noxious stimulus (hyperalgesia). Patients may be considered to be malingering because there is no obvious explanation for the symptoms. Anxiety, stress and depression caused by fibromyalgia add insult to injury, with personality and cognitive factors coming into play in addition.<sup>1</sup> Paraesthesiae (abnormal sensory sensations) or dysaesthesiae (painful sensations) of the extremities may also occur. There is no objective muscular weakness or neurological disorder to account for the symptoms, which adds to the diagnostic dilemma. For example, fibromyalgia affecting the supraspinatus muscle of the shoulder would limit initial abduction of the arm because of pain, not because of any muscle weakness. Cognitive function is sometimes described as 'fibrofog' or 'conscious confusion' and may be a primary symptom of fibromyalgia, reflecting impairments in working memory (a form of short-term memory), episodic (memory for events), and semantic memory (memory for words, rules, language).

Nociception refers to the process of information about harmful stimuli conveyed by neuronal activity up to the point of perception in the dorsal horn of the spinal cord where primary afferents synapse.<sup>2</sup> Evidence is accumulating which shows that atypical sensory processing in the central nervous system (CNS) and dysfunction of skeletal muscle nociception are important in the understanding of fibromyalgia and other chronic pain

syndromes<sup>3</sup>. The concept of 'central pain sensitization' or 'central sensitivity syndrome' considers fibromyalgia to be a disturbance of nociceptive processing which causes a heightened experience of pain or pain amplification.<sup>4</sup> Because pain signals are subject to variation in amplitude, the modulation of sensory processing may be the key to understanding the pain response not only in fibromyalgia but also in other conditions, such as irritable bowel syndrome. Descending spinal noradrenergic and serotonergic neurons inhibit the neurotransmitters noradrenaline and serotonin, released from primary afferent neurons and dorsal horn neurons. Therefore, when descending inhibition is decreased, irrelevant nociceptive stimuli are more readily felt. Put another way, in patients with chronic pain syndromes descending inhibition may not be functioning adequately to prevent or mask irrelevant pain stimuli. When appropriate medication is used this normal descending inhibition is enhanced and pain is no longer troublesome.

The release of neurotransmitters (ligands) also requires a mechanism that involves voltage-sensitive calcium and sodium channels. Repetitive action potentials cause the calcium channels to open with the ensuing release of neurotransmitters into the synaptic cleft. The postsynaptic neurons are thus stimulated leading to molecular and structural changes (sprouting) which cause neuropathic pain. Drugs such as Pregabalin and Gabapentin bind to voltage-sensitive calcium channels and reduce calcium influx, which in turn diminishes pain. The concept of central pain sensitization now incorporates affective spectrum disorders and functional somatic syndromes. It seems that the more painful symptoms one has which are difficult to explain, the more likely the patient is suffering from a mood disorder. Dopamine may be involved in the regulation of cognition in the dorsolateral prefrontal cortex and could account for the cognitive deficits.<sup>5</sup> Because cingulate and prefrontal cortices are particularly implicated in pain modulation (inhibition and facilitation of pain), structural changes in these systems could contribute to the chronic pain associated with fibromyalgia.<sup>6</sup>

Many patients with fibromyalgia have an increased sensitivity to sensory stimuli that are not normally or previously painful (allodynia). In other words, minor sensory stimuli that

ordinarily would not cause pain in most individuals induce disabling, sometimes severe pain in patients with fibromyalgia.<sup>7</sup> In normal individuals 4 kg/square cm<sup>2</sup> pressure (approximately the pressure needed to blanch the skin at the top of one's thumb) causes patients with fibromyalgia to wince with pain or suddenly withdraw when the tender point is palpated. This indicates that pain occurs at a lower pain threshold in fibromyalgia sufferers when this pressure is applied.

The pain of fibromyalgia may be aggravated by emotional stress though the latter is difficult to quantify and evaluate. For instance, corticosteroid hormones are released in high amounts after stress yet fibromyalgia is associated in some patients with a decreased cortisol response to stress. Stress may therefore initiate, inhibit or perpetuate alterations in the corticotrophin-releasing hormone (CRH) neuron, with associated effects on the hypothalamic pituitary axis (HPA) and other neuroendocrine axes.<sup>8</sup>

There are many other possible explanations for fibromyalgia pain. One of the major neurotransmitters involved in nociception is substance P, found in high concentrations in the spinal cord, limbic system, hypothalamus, and nigrostriatal system. It is involved in the transmission of pain impulses from peripheral afferent receptors to the central nervous system. Nerve growth factor (NGF), a cytokine-like mediator may indirectly exert its effect through enhancing glutaminergic transmission and could account for sustained central sensitization in fibromyalgia.<sup>9, 10</sup> Another neuropeptide, calcitonin gene-related peptide, a potent vasodilator, present in non-myelinated afferent neurons, may also play a role in pain pathology.<sup>5</sup>

Levels of the neurotransmitter serotonin have been found to be low in some studies in fibromyalgia patients. Although serum levels of serotonin are lower than in some patients with rheumatoid arthritis and healthy controls, the variation is too broad and therefore measurement of serotonin has not proved useful tool in determining a diagnosis of fibromyalgia.<sup>11</sup>

Logically, pharmacologic agents used to treat pain in fibromyalgia would act by either increasing levels of inhibitory neurotransmitters or decreasing levels of excitatory neurotransmitter. In the United States of America (USA), Pregabalin was the first drug to be approved by the Food and Drug Administration (FDA) for the treatment of fibromyalgia and has been shown to improve pain, sleep and quality of life. It is ineffective against depression. The main inhibitory mediator in the brain, gamma amino butyric Acid (GABA), is formed from glutamate (excitatory) by the enzyme glutamate decarboxylase (GAD). It is particularly plentiful in the nigrostriatal pathways. About 20% of CNS neurons are GABAergic and it serves as a neurotransmitter at some 30% of all CNS synapses.<sup>12</sup> Pregabalin increases neuronal GABA levels by producing a dose-dependent increase in glutamate decarboxylase activity. In a meta-analysis of 21 clinical trials to

estimate treatment differences vs. placebo, statistically significant improvement was observed with Duloxetine, Milnacipran 200 mg/day, Pregabalin 300 or 450 mg/day, and Tramadol plus Paracetamol. The meta-analysis showed a statistically increased risk of discontinuation because of adverse events related to Milnacipran and Pregabalin.<sup>13</sup>

Antidepressants may improve fibromyalgia symptoms by reducing pain, stabilizing mood and improving sleep, though the effect seems to be modest. If abnormal sleep, and hence subsequent tiredness, precedes the development of fibromyalgia the effect of antidepressants may be primarily associated with improved sleep. However, the efficacy of tricyclic antidepressants is difficult to quantify and their limited superiority over placebo lasts no more than a few months. A meta-analysis of ten randomized double-blinded, placebo-controlled studies revealed only poor to moderate evidence for a beneficial effect at low doses of Amitriptyline (25mg daily) over 6-8 weeks. Even when given in higher doses or prescribed for a longer duration, Amitriptyline did not make a great deal of difference.<sup>14</sup>

The efficacy of Selective Serotonin Reuptake Inhibitors (SSRIs) is also inconclusive. More promising results have been demonstrated with Serotonin and Noradrenaline Reuptake Inhibitors (SNRIs) such as Duloxetine. Both serotonin (5-HT) and noradrenaline (NA) exert analgesic effects via descending pain pathways. Pain is a prominent feature of depression and vice versa and the alleviation of one modifies the other.<sup>15, 16</sup> The reduction in pain reduces fatigue and Duloxetine improves mood.

Other drugs used in this condition include Milnacipran and Cyclobenzaprine (a muscle relaxant structurally related to tricyclic antidepressants). Milnacipran and Cyclobenzaprine are not available in the United Kingdom (UK). Tramadol (a serotonin and noradrenaline reuptake inhibitor) is a weak mu-receptor opioid agonist used to control pain but its adverse effects are those of opiates in general, mainly nausea and dependence.

Although other adjunctive non-pharmacological treatments have been advocated the results are disappointing. Assessments of non-drug treatments are generally mediocre. Aerobic exercises benefit some patients, especially when combined with biofeedback, patient education and cognitive therapy. A whole gamut of treatments such as graded exercises, yoga, dietary advice, balneotherapy (heated pool bathing), homeopathy, massage, acupuncture, patient education, group therapy and cognitive behaviour therapy, have been suggested and tried, but few of them demonstrated clear-cut benefits in randomized controlled trials. Support groups may help some patients.<sup>17, 18, 19</sup>

Fibromyalgia is now considered to be, in part, a disorder of central pain processing. Central sensitization manifests as pain hypersensitivity, particularly allodynia, and hyperalgesia. It is

believed that central sensitization occurs in part through the action of glutamate on the N-methyl-D-aspartate (NMDA) receptor, resulting in an increase in intracellular calcium and kinase activation, leading to hyperalgesia and allodynia.<sup>20</sup>

Response to standard analgesics is erratic and more promising results have emerged with drugs such as the SNRIs Duloxetine and Milnacipran, the anticonvulsants Gabapentin and Pregabalin, either used alone or in combination, or with other agents such as Amitriptyline. There is only modest evidence to support SSRIs and Tramadol. Treatment needs to be holistic and multidisciplinary, focussing on both physical pain management and psychological dysfunction. The multidisciplinary approach, though difficult to measure, may help by imparting a sense of empathy and support for patients. Overall, most patients with fibromyalgia continue to have chronic pain and fatigue with symptoms persisting for many years, but it is not necessarily a progressive disorder and some patients may show moderate improvement.

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#### Competing Interests

None declared

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## Accuracy of visual estimation in diagnosing obese individuals- a blinded study

Masliyana Husin , Sazzli Kasim and Antoinette Tuthill

### ABSTRACT

**Background:** Obesity is a recognised risk factor for metabolic diseases. The clinic visit allows a platform to identify patients at risk but consultation time may be limited. Visual estimation is routinely used when addressing obesity. This may lead to either an accurate or misdiagnosis of BMI, which affects management. The validity of visual scoring in engaging BMI and waist circumference is yet to be tested.

**Methods:** Questionnaires estimating weight, height, BMI and WC were randomly distributed to doctors and patients attending different outpatient clinics. True measurements were recorded and blinded. Data was matched and analysed using SPSS.

**Results:** In patient only analysis, 49% of patients under reported their own weight and 68% under reported their waist circumference. In physician group analysis, we found that in patients who are obese, 81% were estimated as obese by doctors. In patients who are overweight, 63% were estimated as overweight, and 25.7% as normal. In the normal weight group, 69.5% were estimated as normal. Overall, 72% of BMI was estimated correctly by doctors. There is no accuracy difference in doctor's and patient's weight estimation. Patients are not aware of the effect of abdominal obesity to health with poor insight.

**Conclusions:** Visual estimation would miss accurate diagnosis in overweight individuals and should not replace true anthropometric measurements.

**KEYWORDS :** Obesity, BMI, waist circumference, diagnosis, visual estimation

### Introduction:

There are approximately over 1.6 billion overweight people with a body mass index (BMI) greater than 25 kg/m<sup>2</sup> annually, around 2.8 million deaths are attributed to overweight and obesity worldwide<sup>(1)</sup>. Many overweight individuals underestimate their weight and despite acknowledging their overweightness, many are not motivated to losing weight<sup>(2)</sup>. Accurate measurement is important as it identifies patients with diagnoses which subsequently impact on their management. Self-reported weight is often used as a means of surveillance but has been shown to bias towards under reporting of body weight and BMI as well as over reporting on height<sup>(3)</sup>. Several estimation techniques has been devised to quantify anthropomorphic measurements when actual measurement cannot take place<sup>(4),(5),(6)</sup>, however, these methods are associated with significant errors for hospitalised patients<sup>(7)</sup>. There is no published study that questions the validity of visual estimation of obesity in daily clinical setting despite its relevance to the daily practice. We aim to investigate the accuracy of visual estimation compared to actual clinical measurements in the diagnosis of overweight and obesity.

### Methods:

This is a case control study. Patients for this study were attending the endocrinology, cardiology and chest pain outpatient clinic in Cork University Hospital, Cork, Ireland. The questionnaire session was carried out at every endocrinology, cardiology and chest pain clinic for 5 consecutive weeks. A total

of 100 patients were recruited allowing for a 10% margin of error at 95% confidence level in a sample population of 150 000. Ten doctors of varying grades were chosen randomly to visually score the subjects. Exclusion criteria included patients who were pregnant and who are wheelchair bound. Consent was obtained from patients prior to filling questionnaires. Ethical approval was received from the Clinical Research Ethics Committee of the Cork Teaching Hospitals.

In the waiting room, patients were asked to self-report their weight, height and waist circumference to the best of their estimate. Demographics and cardiovascular risk were obtained from medical charts and presented in Table 1. The questionnaires have a section that specifically tests patients' awareness of abdominal obesity and patients were asked to choose between obesity and abdominal obesity, relying on their own knowledge of markers of cardiovascular risks. Clinical measurements were taken in the nurses' assessment room. Weight was measured by using portable SECA scales (Seca 755 Mechanical Column Scale) and was measured to the nearest 0.1 kilogram. All patients were measured on the same weighing scale to minimize instrumental bias. Patients were asked to remove their heavy outer garments and shoes and empty their pockets and to stand in the centre of the platform, so that weight is distributed evenly to both feet.

Height was measured by using a height rule attached to a fixed measuring rod (Seca 220 Telescopic Measuring Rod). Patients were asked to remove their shoes and are asked to stand with their back to the height rule. It was ensured that the back of the



head, back, buttocks, calves and heels are touching the wall. Patients were asked to remain upright with their feet together. The top of the external auditory meatus is leveled with the inferior margin of the bony orbit. The patients were asked to look straight. Height is recorded to the resolution of the height rule (i.e. nearest millimeter).

Waist circumferences were measured using a myotape. Patients were asked to remove their outer garments and stand with their feet close together. The tape is placed horizontally at a level midway between the lower rib margin and iliac crest around the body. They were then asked to breathe normally and the reading of the measurement was taken at the end of gentle exhaling. This prevents patients from holding their breath. The measuring tape is held firmly, ensuring its horizontal position and loose enough that it allows placement of one finger between the tape and the subject's body. A single operator who has been trained to measure waist circumference as per the WHO guidelines is used repeatedly in order to reduce measurement bias<sup>(8)</sup>.

The doctors were asked to visually estimate the patients' weight, height, waist circumference and BMI. The estimation is recorded on a separate sheet. All doctors were blinded to the actual clinical measurements. The questionnaires were then collected at the end of the clinic and matched to individual patients. Data entry was performed in Microsoft Excel and exported for statistical analysis on SPSS version 16.

**Findings**

The study enrolled 100 patients. Demographic and cardiovascular risk details are shown in Table 1. Among these, 42 were obese, 35 were overweight and 23 patients had a normal BMI. The sample has a mean BMI of 29.9kg/m<sup>2</sup> (95% CI 28.7-31.1) with a mean waist circumference (WC) of 103.2cm (95% CI 100.7-107.2). The average male waist circumference is 105.8 cm while the average female waist circumference is 101.6cm. The mean measured weight was 84.6kg (95% CI 81.0-88.2) and the mean height measurement was 1.68m (95% CI 1.66-1.70).

Table 1: Cardiovascular risk factors

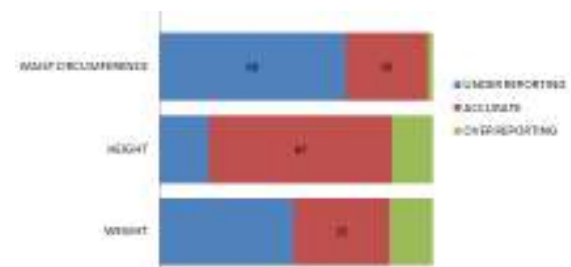
Sex	Male(n=55)	Female(n=45)
Mean age	53.6(19-84)	56.7(23-84)
Diabetes	17	14
Hypertension	16	20
Hypercholesterolaemia	24	19
Active smoker	10	5
Ex- smoker (>10years)	8	3
Previous stroke or heart attack	6	6
Previous PCI	6	3

Patient's perception and doctor's estimation of anthropomorphic measurements were compared to actual measurements and is displayed in Table 2.

Table 2. Deviation from actual measurement values in both groups

Patient's Estimation	Mean estimated	Mean deviation (estimated – actual measurements)	95% Confidence interval of Mean Deviation
Weight	81.16	-3.71	-5.10 to -2.32
Height	1.6782	0.0039	-0.0112 to 0.0033
Waist	90.85	-13.09	-15.48 to -10.70
BMI	28.68	-1.24	-1.87 to -0.61
Doctor's visual estimation			
Weight	80.85	-3.78	-5.54 to -2.02
Height	1.6710	-0.0113	-0.224 to 0.002
Waist	92.10	-11.84	-13.87 to -9.81
BMI	29.08	-8.47	-1.54 to -0.15

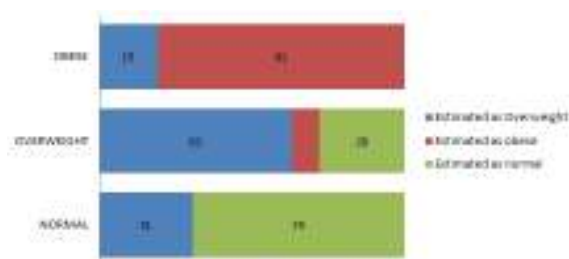
In terms of patients own estimation of height, weight and waist circumference, 49% of patients under estimated their weight by up to 1.5kg, 35% reported accurately to 1.5 kg and 16% over reported weight. 67% of patients estimated height accurately, 18% of patients under-estimated, and 15% over-estimated. When asked to estimate their waist circumference, 68% of patients under estimated by up to 5cm, 30% over estimated and 2 patients estimated accurately to 5cm (Figure 1). We found that 70% of patients regarded obesity as the higher threat to health compared to abdominal obesity. There were no differences in patient's self reported weight and doctor's weight estimation (p= 0.236).



**Figure 1.** Graphical representation of patients estimated weight, height and waist circumference

We then analysed the doctor's estimation of height, weight, waist circumference and BMI. For the purpose of interpreting the data on BMI, the estimates that is recorded by doctors that matches the patient's real BMI by clinical measurement is considered accurate. Therefore, for patients who have a normal BMI, 69.5% were correctly estimated as normal and the rest (30.5%) were estimated as overweight. For those patients who are obese, 81% were estimated as obese and by the doctors as a group and the rest (19%) is estimated to be overweight. In

patients who are overweight, 63% were correctly estimated as being overweight by doctors, 9% were estimated as being obese and the rest (28%) were mistakenly estimated as having a normal BMI. Accurate BMI estimation by doctors was achieved in 72% patients (Figure 2).



**Figure 2.** Doctors estimation of BMI compared to actual clinical measurement

Doctors were noted to underestimate the patients' weight in 53 patients, over estimated in 26, while being accurate in their estimation in 21 patients. Estimation of waist circumference to the nearest 5 cm shows marked under estimation of waist circumference in 71% of patients, over reporting in 3% of patients and 26% accurate estimation. The majority of underestimation of waist circumference happens in the region of 10 to 15cm. For patients who are obese, doctors were able to estimate waist circumference correctly in 58% of obese individuals.

#### Discussion:

This is the first study demonstrating the relationship of visual estimation of a cardiovascular risk factor and comparing to actual clinical measurements. As obesity and abdominal obesity becomes an increasingly common phenomenon, our perception of the 'normal' body habitus may be distorted<sup>(9)</sup>.

It is observed that in the bigger hospitals out-patient departments, physicians and nurses are commonly affected by clinical workload and tend to spend a limited amount of time with patients in order to achieve a quicker turnaround time. Cleator et al looked at whether clinically significant obesity is well detected in three different outpatient department and whether they are managed appropriately once diagnosed<sup>(10)</sup>. In all the outpatient departments involving the specialties of rheumatology, cardiology and orthopedics, the actual cases of clinical obesity is higher than what is being diagnosed and the management of obesity was heterogeneous and minimal in terms of intervention. With the ever increasing obese patients attending hospitals, it is understandable that healthcare providers such as physicians, nurses, dietician and physiotherapist resort to relying on visual estimation.

In terms of patient's own estimation of height, weight and waist circumference, we gained that patients were reasonably good at estimating their own height but tend to under estimate weight. This is probably due to the fact that these patients have not had

a recent measurement of weight and their weight estimation is based on previous historical measurement from months to years back, which in the majority of people, is less than their current weight. This also explains why their height estimation is more accurate, as adult heights do not undergo significant changes and are relatively constant.

When attempting to obtain patient's own estimation of waist circumference, we found that most patients are not at all aware of the method used to measure waist circumference. Some patients even mistaken waist circumference as being their trousers' waist size. In those who were able to give estimation, a large proportion would under estimate.

The majority of patients think that general obesity is more predictive of cardiovascular outcome compared to abdominal obesity. This lack of awareness is reflective on clinician's effort in addressing abdominal obesity as an important cardiovascular risk factor to patients during consultations. The lack of proper awareness campaign by healthcare providers along with the evolving markers of cardiovascular risk may further confuse the general public.

Recently, waist circumference, waist to hip ratio along with many serum biomarkers have been noted to correlate to adverse outcomes in obese individuals, independent of BMI. Waist circumference measurement is a relatively new tool compared to the measurement of BMI. This would explain the discrepancy between doctors' estimation of BMI and waist circumference. Visual estimation is further compromise as many patients would be covered in items of clothing during consultations. In order to obtain a better estimation of waist circumference, the individual have to be observed from many angles, a task that may be impossible in a busy clinic.

Although BMI is a convenient method to quantify obesity, recent studies have shown that waist circumference is a stronger predictor of cardiovascular outcomes<sup>(11),(12),(13),(14)</sup>. The importance of waist circumference in predicting health risk is thought to be due to the relationship between waist circumference and intra-abdominal fat<sup>(15),(16),(17),(18),(19),(20)</sup>. We now know that the presence of intra-abdominal visceral fat is associated with a poorer outcome in that patients are prone to develop metabolic syndrome and insulin resistance<sup>(21)</sup>. We have yet to devise a more accurate measurement on visceral fat and at present limited to using waist circumference measurements.

Although doctors are generally good at BMI estimation, we found that in estimating overweight patients' BMI, close to 30% were wrongly estimated as having normal BMI. Next to the obese, these groups of patients are likely to have metabolic abnormalities and increased cardiovascular risk. If actual measurement of BMI is not routinely done, we may neglect patients who would benefit from intervention. A simple, short counseling during the outpatient visit with emphasis on weight loss, the need to increase their daily activity levels and the

morbidity related to being overweight may be all that is needed to improve the population health in general. Further intervention may include referrals to hospital or community dieticians and prescribed exercise programmes. These intervention tools already exist in the healthcare system and could be accessed readily.

The nature of our study design exposes it to several potential selection and measurement biases. Future studies should include patients of differing ages and socioeconomic background. Additionally, clinicians of differing appointments from various different specialties should be included to obtain a more applicable result. A measure of diagnostic efficacy should also be employed to further assess the value of clinical measurement and therapeutic intervention.

### Conclusion:

The appropriateness of visual scoring of markers of obesity by doctors is flawed and limited to the obese individuals. True anthropometric measurements would avoid misdiagnosing overweight individuals as normals. We can conclude that patients' own estimation of weight is unreliable and that they are unaware of the impact of high abdominal fat deposition on cardiovascular outcome. The latter should be addressed in consultations by both hospital physicians and general practitioners. Further emphasis and education in schools and awareness campaigns should also advocate this emerging cardiovascular risk factor.

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### Competing Interests

None declared

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## Availability of computerised reminders in primary care doesn't reduce heart-failure repeated hospitalisations

Luca Degli Esposti, Alessandro Filippi, Chiara Verones, Stefano Buda, Gaetano D'Ambrosio, Cinzia Germinario, Italo Paolini and PierClaudio Brascesco

### ABSTRACT

Computerised reminders can be a support for clinical improvement. We verified their effect on heart-failure (HF) re-hospitalisation rate. **Methods and Results:** A software (Millewin<sup>®</sup>) widely used in Italian general practice embedded an automatic reminder to help general practitioners (GPs) to identify HF patients and to prescribe them with recommended drugs. This reminder system was already activated in the first 2004 release, but required voluntary activation in the successive releases. We had no possibility to know who decided to keep using the reminders. We examined the 2004-2009 HF hospitalisations in Puglia, a Southern Italian Region with a population of over 4000000, and with high HF hospitalisation rate compared with the Italian mean<sup>7</sup>. We compared the hospitalisations for patients cared for by GPs who used Millewin<sup>®</sup> in 2004 to those of the patients cared for by GPs who never used Millewin<sup>®</sup>. Data were provided by the local Health Authority, and were extracted from the administrative database. Users of Millewin<sup>®</sup> cared for 4969 patients (mean age 76 y, sd 12; 48.6% men), the non-users cared for 48781 patients (mean age 76 y, sd 11; 50% men): no significant difference as far as age and gender are concerned. We examined 17810 patients with  $\geq 2$  hospitalisation. No difference in re-hospitalisations was observed. **Conclusions:** Availability of computerised automatic reminders aimed to improve detection of HF patients and prescription of recommended drugs doesn't decrease repeated hospitalisation; these tools should be probably part of a more complex strategy, such as a long-term audit.

**KEYWORDS:** Computerised reminder; heart failure; hospitalisation

### INTRODUCTION

The widespread use of office-software in general practice makes the idea of simple, automatic computerised support an attractive one. Different tools for different diseases have been tested with mixed results, and in 2009 a Cochrane review<sup>1</sup> concluded that "Point of care computer reminders generally achieve small to modest improvements in provider behavior. A minority of interventions showed larger effects, but no specific reminder or contextual features were significantly associated with effect magnitude". One year later another review<sup>2</sup> reached similar conclusion: "Computer reminders produced much smaller improvements than those generally expected from the implementation of computerised order entry and electronic medical record systems". Despite this, simple, non-expensive, automatic reminders are frequently part of GPs' software, even if their real usefulness is seldom tested in real life.

Repeated hospitalisation for heart failure is an important problem for every National Health System; it is estimated that about half of all re-hospitalisation could be avoided<sup>3</sup>. Adherence to guidelines can reduce re-hospitalisation rate<sup>4</sup>, and pharmacotherapy according to treatment guidelines is associated with lower mortality in the community<sup>5</sup>. In 2004 a software commonly used in Italian primary care implemented a simple reminders' system to help GPs to improve prescription of drugs recommended for heart failure. We evaluated if this could lead to a decrease in re-hospitalisation rate.

### METHODS

In 2003, using Millewin<sup>®</sup>, a software commonly used by Italian GPs, we showed that appropriate prescription could increase using a simple pop-up reminders<sup>6</sup>; a year later, using the Italian General Practitioners database 'Health Search – CSD Patient database (HSD) ([www.healthsearch.it](http://www.healthsearch.it)), we observed a lower than expected prevalence of codified diagnosis of heart failure and of prescription of both beta-blockers and ACE-Inhibitors/ARBs (data on file). Therefore in 2004 Millewin<sup>®</sup> embedded a simple reminder system to help heart failure (HF) management. The first reminder aimed to identify patients with HF, but without codified diagnosis: in case of loop diuretic and/or digoxin prescription without codified HF diagnosis a pop-up told the GP that the patients could be affected by HF and invited the physician to verify this hypothesis and eventually to record the diagnosis. The second reminder appeared when a patient with codified HF diagnosis had no beta-blocker and/or ACE-inhibitor/ARB prescription: a pop-up invited the GP to prescribe the missing drug. This reminder system was already activated in the 2004 release of the software, but required voluntary activation in the successive releases. This is a common choice in real life, where positive choices in clinical practice by software-house neither are welcomed nor accepted by GPs. We had no possibility to know who decided to keep using the reminders.

We examined the 2004-2009 HF hospitalisations in Puglia, a Southern Italian Region with a population of over 4000000, and with high HF hospitalisation rate compared with the Italian mean<sup>7</sup>. We compared the hospitalisations for patients cared for by GPs who used Millewin<sup>®</sup> in 2004 to those of the patients cared for by GPs who never used Millewin<sup>®</sup>. Data were provided by the local Health Authority, and were extracted from the administrative database.

## RESULTS

We identified 64591 patients (mean age 76 y, sd 12; 49.9% men) with one or more HF hospitalisation; 17810 had  $\geq 2$  hospitalisations, and were analysed for the current study.

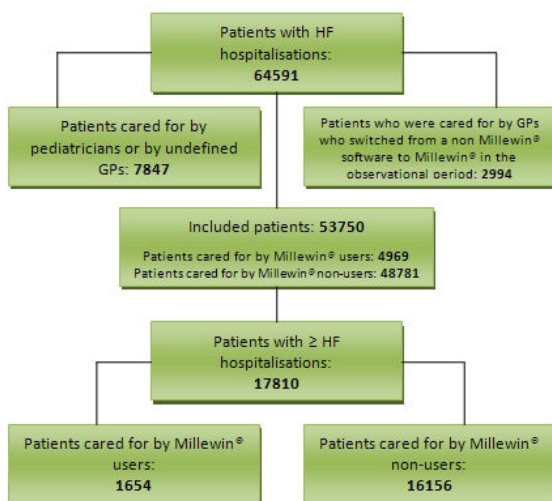


Figure 1 - Selection process leading to the identification of the patients with  $\geq 2$  HF hospitalisations

The selection that led to this group is summarised in figure 1. There was no statistically significant difference between patients cared for GPs using or non using Millewin<sup>®</sup> software as far as age and gender are concerned. The re-hospitalisation rate according to the use or non-use of Millewin<sup>®</sup> of patients' GPs is summarised in table 1.

Table 1: Re-hospitalisation rate of patients cared by Millewin<sup>®</sup> users and non-users

Time	Patients with $\geq 2$ hospitalisation (N, %)			
	No MW users	MW users	Total	P
Within 1 year	11260 (23.1%)	1136 (22.9%)	12396 (23.1%)	=N.S.
Within 2 years	13851 (28.4%)	1410 (28.4%)	15261 (28.4%)	=N.S.
Within 3 years	15144 (31.0%)	1543 (31.1%)	16687 (31.0%)	=N.S.
Within 4 years	15803 (32.4%)	1612 (32.4%)	17415 (32.4%)	=N.S.
Within 5 years	16083 (33.0%)	1643 (33.1%)	17726 (33.0%)	=N.S.
Within 6 years	16156 (33.1%)	1654 (33.3%)	17810 (33.1%)	=N.S.

MW = Millewin<sup>®</sup>, N.S = Not significant

The mean time before the first re-hospitalisation was 108.5 day +/- 103.3 for Millewin<sup>®</sup> non-users and 116.4 +/- 107.5 for users ( $p < 0.05$ ).

## DISCUSSION

Even if reasonable and clinically sound, the availability of computerised reminders aimed to help GPs to identify HF patients and to prescribe them with recommended drugs didn't reduce re-hospitalisation rate. The first possibility to explain this result is that, after the first year, GPs didn't re-activate the reminders' system. Unfortunately we couldn't verify this hypothesis, but it is known that the level of use of such a system may be low in usual care<sup>8</sup>; furthermore providers may agree with less than half of computer generated care suggestions from evidence-based CHF guidelines, most often because the suggestions are felt to be inapplicable to their patients or unlikely to be tolerated<sup>9</sup>. Epidemiological studies have shown that heart failure with a normal ejection fraction is now a more common cause of hospital admission than systolic heart failure in many parts of the world<sup>10-11</sup>. Despite being common, this type of heart failure is often not recognised, and evidence based treatment—apart from diuretics for symptoms—is lacking<sup>12</sup>. It is therefore possible that increasing ACE-I/ARBs and beta-blockers use in these patients doesn't influence the prognosis and hospitalisation rate. Unfortunately administrative databases do not permit to distinguish the characteristic of HF. We must also consider that the use of appropriate drugs after HF hospitalisation could spontaneously increase in the last years; a survey in Italian primary care showed that 87% of HF patients used inhibitors of the renin-angiotensin system, and 33% beta-blockers<sup>13</sup>. A further relevant increase in ACE-I/ARBs is therefore unlikely, while an improvement is clearly needed for beta-blockers. Could more complex and information-providing reminders be more useful? This is unlikely since adding symptom information to computer-generated care suggestions for patients with heart failure did not affect physician treatment decisions or improve patient outcomes<sup>14</sup>. Furthermore, consultation with a cardiologist for starting beta-blocker treatment is judged mandatory by 57% of Italian GPs<sup>13</sup>, thus reducing the potential direct effect of reminders on prescription. Finally we must remember that part of the hospitalisation due to HF worsening can be due to non-cardiac disease, such as pneumonia, anemia, etc; all these cause cannot be affected by improved prescription of cardiovascular drugs.

Albeit simple and inexpensive, computerised reminders aren't a neutral choice in professional software. Too many pop-ups may be disturbing and may lead to systematic skipping the reminders' text. This can be a problem, since computerised reminders have proved to be useful for other important primary-care activity, such as preventive interventions<sup>15</sup>. In our opinion, at the moment, a computerised reminder-system should be proposed only as a part of a more complex strategy, such as long-term self or group audit and/or pay for performance initiative.

## CONCLUSIONS

Availability of computerised automatic reminders aimed to improve detection of heart-failure patients and prescription of recommended drugs doesn't decrease repeated hospitalisation; these tools should be probably tested in the context of a more complex strategy, such as a long-term audit.

### Competing Interests

None declared

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## Sensitivity, Specificity and Diagnostic Efficiency of Serum Sialic Acid as a Biochemical Marker in Alcohol Abuse

Veerendra Kumar Arumalla , G Narender , R Kathaini and A Pullaiah

### ABSTRACT

**Background:** Many biochemical markers have been used for detection of alcohol abuse, but each of them has clinical limitations. Sialic acid (SA) has been suggested as a new potential marker of excessive alcohol consumption.

**Aim:** To compare the sensitivity, specificity and diagnostic efficiency of serum Sialic acid with other traditional markers like AST (Aspartate amino transaminase), ALT (Alanine amino transaminase), GGT (Gamma Glutamyl Transferase), as a marker of alcohol abuse.

**Methods:** This was a case-control study conducted on 100 subjects. Alcohol dependent subjects without liver disease (cases = 50) and healthy subjects (controls = 50) were considered for the study. Sera from the subjects were analyzed for SA manually by modified Warren's Colorimetric assay and AST, ALT, GGT were estimated by auto analyzer.

**Statistical analysis:** Student t test (two tailed, independent) has been used to find the significance of study parameters between controls and cases. Receiving Operating Characteristics (ROC) tool has been used to find the diagnostic performance of study parameters.

**Results:** There was significant elevation ( $p < 0.001$ ) of AST, ALT, GGT and SA in alcohol dependent subjects when compared to the controls. Diagnostic efficacy was more for GGT followed by AST and SA as a marker of alcohol abuse.

**Conclusion:** Sialic acid can be used as a biochemical marker in alcohol abuse, where secondary effects of liver disease hamper the use of traditional markers.

**KEYWORDS :** Sialic acid ; Alcoholism; GGT; AST; ALT; Sensitivity; Specificity.

### INTRODUCTION:

The prevalence of current use of alcohol in India ranged from 7% in western states of Gujarat (officially under prohibition) to 75% in the North eastern state of Arunachal Pradesh<sup>1</sup>. The prevalence of hazardous use of alcohol was 14.2% in rural south India<sup>2</sup>. Thus, alcohol abuse has a major public, family and health related problems with impairment of social, legal, inter personal and occupational functioning in those individuals who have been addicted to alcoholism.

A wide variety of biochemical and haematological parameters are affected by regular excessive alcohol consumption. The blood tests traditionally used most commonly as markers of recent drinking are the liver enzymes, gamma glutamyltransferase (GGT), aspartate aminotransferase (AST) and alanine aminotransferase (ALT), and the mean volume of the red blood cells (mean corpuscular volume (MCV)). But they were not sensitive or specific enough for use as single tests<sup>3</sup>.

Elevated Gamma glutamyltransferase levels are an early indicator of liver disease; chronic heavy drinkers, especially those who also take certain other drugs, often have increased GGT levels. However, GGT is not a very sensitive marker, showing up in only 30–50 percent of excessive drinkers in the general population. It is not a specific marker of chronic heavy

alcohol use, because other digestive diseases, such as pancreatitis and prostate disease, also can raise GGT levels<sup>4</sup>.

AST and ALT are enzymes that help metabolize amino acids, the building blocks of proteins. They are an even less sensitive measure of alcoholism than GGT; indeed, they are more useful as an indication of liver disease than as a direct link to alcohol consumption. Nevertheless, research finds that when otherwise healthy people drink large amounts of alcohol, AST and ALT levels in the blood increase. Of the two enzymes, ALT is the more specific measure of alcohol-induced liver injury because it is found predominantly in the liver, whereas AST is found in several organs, including the liver, heart, muscle, kidney, and brain. Very high levels of these enzymes (e.g., 500 units per liter) may indicate alcoholic liver disease. Clinicians often use a patient's ratio of AST to ALT to confirm an impression of heavy alcohol consumption. However, because these markers are not as accurate in patients who are under age 30 or over age 70, they are less useful than some of the other more comprehensive markers<sup>5</sup>.

AST /ALT ratio of more than 1.5 strongly suggests and ratio  $> 2.0$  is almost indicative of alcohol induced damaged to liver<sup>6</sup>. It has been suggested that an AST/ ALT ratio greater than 2 is highly suggestive or indicative of alcoholic etiology of liver disease. But extreme elevations of this ratio, with AST level

greater than five times the normal should suggest non-alcoholic cause of hepatocellular necrosis<sup>7</sup>.

Sialic acid, which is a derivative of acetyl neuraminic acid, attached to non-reducing residues of carbohydrate chain of glycoproteins and glycolipids is found to be elevated in alcohol abuse<sup>8</sup>.

In this study we compared sensitivity, specificity and diagnostic efficiency of serum Sialic acid with other traditional markers like AST (Aspartate amino transaminase), ALT (Alanine amino transaminase), GGT (Gamma Glutamyl Transferase), as a marker of alcohol abuse.

**MATERIALS AND METHODS:**

This was a case-control study which was conducted on 100 male subjects aged 20-60 years, 50 cases and 50 controls. Cases comprised of patients diagnosed to have Alcohol Dependant Syndrome (ADS) who were admitted in Psychiatry-ADS ward, at Mahathma Gandhi Memorial Hospital, Warangal. Study was approved by the Institutional ethical committee. Amount, duration and the type of alcohol in the form of Rum, Whisky, Brandy, Vodka, Gin, Arrack, etc consumed was enquired, those subjects who consumed more than half bottles of these spirits daily (or intermittently with abstinence of 2-3 days), for more than 5 years were chosen for this study. Dependence of their alcoholism was enquired in the form of CAGE questionnaire<sup>9</sup>.

- C : Cut down drinking,
- A : Annoyed others by drinking,
- G : Guilty feeling of drinking.
- E : Eye-opener

Those who satisfied two or more questions were taken as cases<sup>10</sup> and their blood samples were collected for the study after their informed consent. Controls were selected from healthy subjects came for master health check up at MGMH health clinic, with no history of alcoholism.

**Exclusion criteria:**

Patients with history of Diabetes mellitus, Cardiac disease, Viral/Bacterial Hepatitis, Alcoholic hepatitis, tumors, meningitis and history of current use of hepatotoxic and nephrotoxic drugs were excluded from the study.

4ml of blood was collected from each subject from median cubital vein by venipuncture, serum was separated and the different parameters were analyzed. Estimation of serum Sialic acid was done by modified thiobarbituric acid assay of warren<sup>11</sup> (Lorentz and Krass) by colorimetric method. Estimations of Aspartate transaminase<sup>12, 13, 14</sup> Alanine transaminase<sup>13, 15, 16</sup> Gamma glutamyl transferase<sup>17, 18</sup> were done by IFCC recommended methods on Dimension Clinical chemistry system (auto analyzer).

**Statistical analysis:** Student t test (two tailed, independent) has been used to find the significance of study parameters between controls and cases. Receiving Operating Characteristics (ROC) tool (SPSS 17 version) has been used to find the diagnostic performance of study parameters.

**RESULTS:**

It was observed that all the study parameters were significantly increased (p value < 0.001) in subjects with alcohol abuse when compared to the controls as shown in the Table 1. The ROC analyses of the different parameters were shown in Fig 1 and Table 2. GGT was having highest Diagnostic efficacy followed by AST and SA as a marker of alcohol abuse.

Figure 1: ROC Curve analysis of different parameters

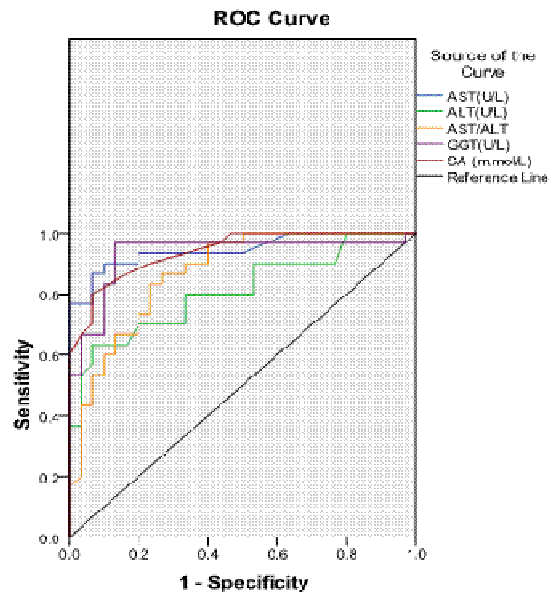


Table1: Comparison of study parameters between controls and cases

Parameters	controls	cases	P value
AST(U/L)	24.83±7.57	87.9 ±53.72	<0.001
ALT(U/L)	47.63 ±18.77	88.83± 46.53	<0.001
AST/ALT	0.58 ± 0.23	0.982 ± 0.29	<0.001
GGT(U/L)	39.36 ±v 20.23	264.13± 298.74	<0.001
SA(m mol/L)	1.81 ± 0.42	2.92±0.706	<0.001

Table 2: ROC Analysis of different study parameters

Parameters	Best-Cutoff value	Sensitivity	Specificity	Diagnostic efficacy	AUC
AST(U/L)	37.50	86.66 %	93.33%	90%	0.946
ALT(U/L)	71.00	63.33%	93.33%	78.33%	0.811
AST/ALT	0.732	83.33%	76.66%	80%	0.869
GGT(U/L)	55.50	96.66%	86.66%	91.66%	0.929
SA(m mol/L)	2.3	80%	93.33%	86.66%	0.939



**DISCUSSION:**

Alcoholism is a serious health issue with major socio-economic consequences. Significant morbidity is related to chronic heavy alcohol use and alcoholics seek advice only when a complication of drinking sets in. The diagnosis is often based on patients self-reporting of alcohol consumption, which is unreliable and requires high degree of clinical suspicion.

Clinical histories and questionnaires are the commonest initial means of detection of alcohol abuse. They are cheap, easily administered but are subjective. If the history remains uncertain and there is suspicion of alcohol abuse, biological markers provide objectivity. A combination of markers remains essential in detection. Liver is the prime target organ for alcohol-induced disease. Liver enzymes are also important indicators of liver dysfunction, possibly as markers of alcohol dependence. Commonly used markers are GGT, AST and ALT. Laboratory markers help clinicians to raise the issue of excessive drinking as the possible cause of health problem, unfortunately because of lack of sensitive and specific methods, the detection of problem drinking in clinical settings has remained difficult. Therefore, findings of increased serum SA concentrations in alcoholics have raised the possibility of developing new tools for such purpose.

In the present study on analyzing the results it was found that an increased concentration of Serum Sialic acid and other traditional biochemical markers GGT, AST, ALT was observed in cases compared to that of controls. Over all GGT had a good sensitivity and specificity. The other traditional markers used in alcohol abuse varied considerably in their specificities and sensitivities. The increase in serum Sialic acid concentration in alcohol abusers in our present study is in accordance with the studies conducted by other investigators<sup>8, 19, 20, 21</sup>. The diagnostic accuracy of SA was in accordance with the study by Antilla P et al<sup>19</sup>. The increase in serum GGT, ALT and AST concentration in alcohol abusers were in accordance with the studies conducted by other investigators<sup>19, 22</sup>.

**CONCLUSION:**

In our study, Sialic Acid proved to be a good test with sensitivity of 80% and specificity of 93.33% with a diagnostic accuracy of 86.66% showing that SA can be used as a biochemical marker in alcohol abuse where secondary effects of liver disease hamper the use of traditional markers.

Limitations of the study are as follows: This study was done in small group of people only; a larger study consisting of alcohol abusers with and without specific liver disease should be conducted to confirm the role of SA as a new marker for alcohol abuse where the traditional markers will be altered by the different liver diseases.

**Competing Interests**

None declared

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## Differential diagnosis of an abdomino-pelvic mass: Ganglioneuroma must be considered. A case history and literature review

Mahmood Tariq, Khan Sadaqat Ali Professor, Sarwar Zeeshan, Rasool S Hamad, Anjum S Hasan and Tahir M Mohsin

### ABSTRACT

An eleven year old female child presented with asymptomatic massive enlargement of the abdomen. It proved to be pelvic ganglioneuroma on complete surgical resection. Ganglioneuroma is a benign tumor of the sympathetic nervous system originating from the neural crest cells. Most common site is the posterior mediastinum. Pelvic ganglioneuroma is a rare entity and only a handful of cases have been published in the medical literature.

### Introduction:

Ganglioneuroma is a rare, benign, neuroblastic tumour that originates from the neural crest cells. Ganglioneuroma, ganglioneuroblastoma and neuroblastoma are three maturational manifestations of a common neoplasm in the progressive order of loss of differentiation. Ganglioneuromas may be found anywhere along the line of the embryonic neural crest, from clivus to sacrum and are very rare in the pelvis. Less than twenty cases have been described in the literature with various presentations based upon location including extradural, retroperitoneal, spinal, thoracic and one solely intradural medullary location. Ganglioneuromas may stay asymptomatic for a long period and give rise to no pressure symptoms either due to slow growth leading to progressive increase in size accompanied by adaptive changes. Ganglioneuromas demonstrate long-term disease-free survival even with an incomplete surgical removal. Here we present a case of a girl aged 11 years with pelvic ganglioneuroma.

### Case Report:

A girl aged eleven years was brought from a remote hilly area in Pakistan by her mother to the city hospital many miles away. She had noticed that her daughter's lower abdomen had progressively enlarged over last few months. Her menstrual cycle was normal so the mother was concerned that despite not being pregnant, her daughter had a distended abdomen as if she was pregnant. She had a good appetite and unaltered bowel and bladder function. She had no heartburn, regurgitation, nausea, vomiting, haematemesis or melaena. She denied any bleeding per rectum, shortness of breath, cough, loss of consciousness or convulsions. Her past medical history was mundane. She had not had any surgery in the past and was not taking any medication. Examination revealed a smooth, large, fixed hard

mass in the right lower abdomen and pelvis. It was palpable in the pelvis on rectal examination which was otherwise normal. Liver or spleen was not palpable and she had no ascites. Her chest was clear, heart sounds were normal and there were no neurological abnormalities. Laboratory tests including FBC, LFT, U&E and Creatinine were normal. Her MRI scan was not of a good quality due to limitation of resources and technology at place of her diagnosis, but it showed an 11.4 x 11.8cm solid, well-defined mass arising from pelvis and extending up to the umbilicus. The mass showed intermediate low signals on T1 and hyper intense signals on T2 images (Fig. 1). Mid line surgical exploration was undertaken which showed a large, solid, retroperitoneal mass arising from sacral nerves within the pelvis. Mass was lying in front of great vessels, overlapping the confluence of common iliac vessels. The left ureter was displaced laterally while the right ureter was lying over the mass. The mass was excised completely. Post operative course was uneventful and patient was discharged home on the fifth post operative day.

Macroscopically, the specimen was a 13x13x5cm rounded well-encapsulated mass (Fig. 2). Upon sectioning in vitro, mass was seen to be solid, whorled and grey white. Microscopically, groups and singly scattered ganglion cells were seen with surrounding neural tissue. There was no evidence of atypia, mitosis or necrosis. Features were suggestive of a ganglioneuroma. (Figure 3) The patient was well at two months follow up and required no further treatment.

### Discussion:

Neuroblastoma, ganglioneuroblastoma and ganglioneuromas are tumours of sympathetic nervous system that arise from the neural crest cells.<sup>1</sup>

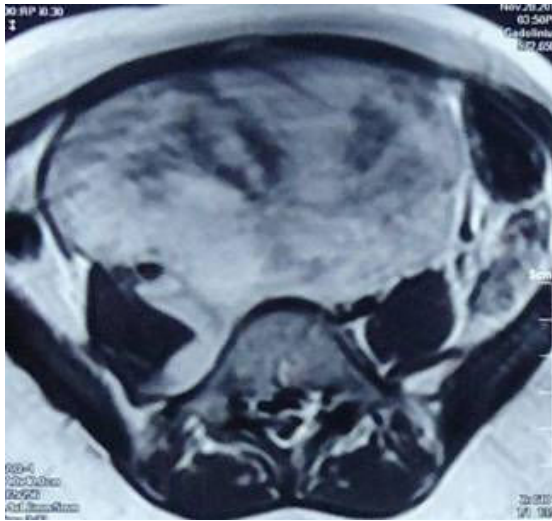


Figure1: MRI showing showing a large soft tissue mass.

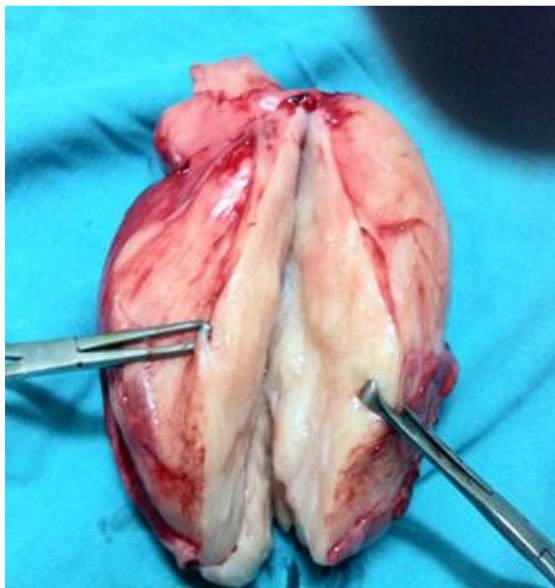


Figure2: Photograph of the resected specimen shows a well-encapsulated ovoid mass.

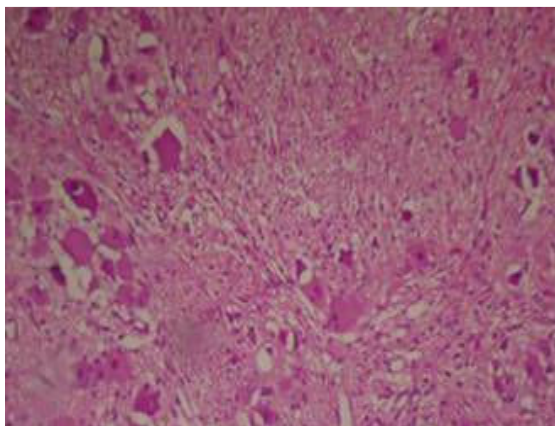


Figure 3 Microscopy showing scattered ganglion admist neuronal cells

These tumours differ only in their progressive degree of cellular and extracellular maturity, with ganglioneuroma being the most mature hence well differentiated and neuroblastoma being the least.<sup>2</sup> Ganglioneuroma are rare, benign and slow growing. They may occur spontaneously or as a down grading from therapy for Neuroblastoma with either chemotherapy or radiation.<sup>3</sup> International Neuroblastoma Pathology Classification (INPC) has been devised after studying 552 such tumours. Out of 300 with favourable prognosis three groups were identified as; ganglioneuroma maturing (GN-M), ganglioneuroblastoma intermixed (GNB-I) and ganglioneuroblastoma nodular with favourable subset (GNB-N-FS). These are resectable in 91% cases in one or more surgical sessions. In contrast, the remaining 252 tumours had unfavourable prognosis and were called ganglioneuroblastoma nodular unfavourable subset (GNB-N-US). This group was not amenable to surgical resection and usually already had metastasis at the time of presentation.<sup>4</sup>

Ganglioneuromas although are mostly sporadic, may be associated with Neurofibromatosis (Von Recklinghausens Disease) and Multiple Endocrine Neoplasia type II (MEN).<sup>1</sup> Ganglioneuroma usually presents before the second decade and rarely after the sixth.<sup>2</sup> The median age at diagnosis has been reported to be approximately 7 years. There is a slight female preponderance.<sup>5</sup> The common locations are the posterior mediastinum, and the retroperitoneal space. Retroperitoneal pelvic location is very rare and only few case histories have been reported.<sup>1</sup>

Although retroperitoneal ganglioneuromas are usually asymptomatic, some patients may get compression symptoms, diarrhea, hypertension, virilization and myasthenia gravis owing to release of certain peptides.<sup>1</sup> Radiological examination may localize the lesion. MRI may show low intensity on T1-weighted images and heterogenous hyper intensity on T2-weighted images with gradual increasing enhancement on dynamic images.<sup>6</sup>

Surgical excision is sufficient for treatment of ganglioneuromas. Chemotherapy or radiotherapy has no role in the treatment. Even with an incomplete excision, close follow up alone may be adequate. If any progression of the tumour is seen then repeat laparotomy may be indicated.<sup>2</sup>

**Conclusion:**

Although pelvic ganglioneuroma is a very rare lesion, it should be considered in the differential diagnosis of any abdomeno-pelvic mass. As it is a slow growing tumour, gross total surgical removal with preservation of organ function is a feasible surgical option.

**Competing Interests**

None declared

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## Solitary metastasis to the pancreas from colorectal cancer– A case report and literature review

Suvadip Chatterjee , John Scott , Viney Wadehra, Steve White and Manu Nayar

### Introduction

Majority of pancreatic tumours are of primary pancreatic origin. Nevertheless a multitude of extra pancreatic cancers can metastasize to the pancreas and may present a diagnostic and management dilemma. Our case demonstrates such a problem in a patient with a pancreatic lesion.

### Case report

A 82 year old man was referred to our hospital with computed tomogram (CT) scan showing a hypodense lesion in the pancreas. He had an anterior resection done 5 years prior for a Duke's B (pT3N0M0) colon cancer. He did not receive any post-operative chemotherapy or radiotherapy. Carcinoembryonic antigen (CEA) levels was normal. He underwent an MRI scan (Figure 1) of his abdomen which reported a 2.8cm ring enhancing lesion in the tail of pancreas. At endoscopic ultrasound (EUS) a 2 x 2 cm well circumscribed mass was demonstrated in the tail of the pancreas close to the splenic artery but, not involving the vessel.

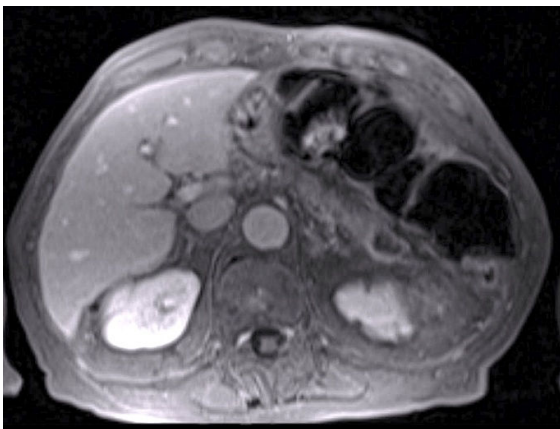


Figure 1: MRI after gadolinium showing a ring-enhancing lesion in the tail of pancreas.

Fine needle aspiration (FNA) of the lesion demonstrated a poorly differentiated mucin secreting adenocarcinoma. Immuno-histochemical staining was strongly positive for CK 20 but, CK 7 was only weak focally positive (Figure 2) thus,

suggesting metastasis to the pancreas from a colonic primary as opposed to a primary pancreatic malignancy.

The patient was given an option to undergo subtotal pancreatectomy or consider palliative chemotherapy. The patient chose neither and was discharged home with input from the Macmillan team.

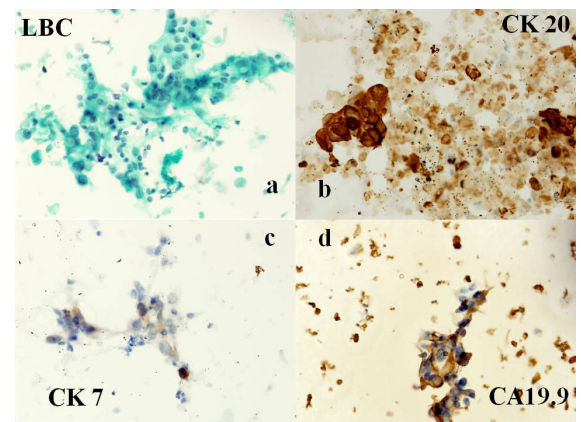


Figure 2: (a) Fine needle aspirate on liquid based cytology (x 400) shows irregular distribution of cells with nuclear palisading and pleomorphism. Immunocytochemistry performed on cytology smear shows (b) strong positivity for CK 20(c) negative for CK7 and (d) focal positivity for CA19.9.

### Discussion:

The pancreas is an uncommon site of metastasis from other primary cancers.<sup>1</sup> Most of the space occupying lesions seen in the pancreas on imaging are of primary pancreatic origin.<sup>1, 2</sup> Adsay, et al<sup>2</sup> performed analyses on surgical and autopsy database in 2004 and found that amongst a total of 4955 adult autopsies and 973 pancreatic specimens at surgery; the prevalence of different metastatic tumours to the pancreas was only 1.6% of all examined autopsy cases and 3.9% of pancreatic resections.

A study from Japan found that the commonest primary malignancies to metastasize to the pancreas were from the stomach, lung and bile duct in that order.<sup>3</sup> Other primary

tumours that have been reported to metastasize to the pancreas include renal cell carcinoma, lung, breast, small bowel, colon, rectum and melanoma.<sup>4,5</sup> Several mechanisms for development of pancreatic metastases (particularly from colorectal cancer) have been described: transfer via the lymphatic system, metastases from peritoneal carcinomatosis, and/or transfer via the haematogenous system.<sup>6</sup> Direct invasion of the pancreas by the primary tumour was also noted to be a method of spread from bile duct and gastric malignancies.<sup>3</sup>

CT scan is often unhelpful in differentiating primary from secondary pancreatic lesions. Pancreatic metastasis can present as solid or cystic structures, hypodense or hyper dense lesions.<sup>7</sup> A series by Klein, et al in which the CT features of pancreatic tumours are described suggested that multiplicity of tumours and/or hypervascularity were characteristic of secondary pancreatic tumours.<sup>9</sup> A recent study has suggested that Positron Emission Tomogram (PET) is a more sensitive investigative tool than CT in detecting metastatic colorectal cancer.<sup>10</sup> Most patients (as in our unit) usually have EUS guided FNA or biopsy to arrive at a diagnosis.

The differential diagnosis of primary pancreatic cancer versus metastasis from other carcinomas may be difficult using common histopathological techniques.<sup>11</sup> Immunohistochemical staining is often helpful in differentiating primary from secondary pancreatic tumours. Sometimes staining by a combination of different antibodies helps to reach a diagnosis. In a survey of 435 cases, the expression of CK 7 was positive in 92% of pancreatic cancers but in only 5% of colon cancers. On the other hand CK 20 was positive in 100% of colon cancers and in only 62% of pancreatic cancers.<sup>12</sup> Furthermore, CD X2 is frequently expressed in colorectal carcinoma but, rarely in pancreatic ductal adenocarcinoma.<sup>13</sup>

The choice between conservative chemotherapy and resection for solitary pancreatic metastasis from colorectal cancer is still undecided. The natural history of untreated patients with pancreatic metastasis from cancer of the colon or rectum is unknown and thus it is impossible to compare the survival rate of resected and unresected patients treated with chemotherapy.<sup>14</sup> Researchers from John Hopkins have reported only 4 colon metastasis to the pancreas (0.6%) among 650 pancreaticoduodenectomy procedures performed in their institution from 1990 to 1996.<sup>15</sup> Experience from an Italian centre<sup>14</sup> published that metastasis to the pancreas was the indication for surgery in a total of 18 out of 546 pancreatic resections (3.2%) performed over 27 years and colorectal cancer was the primary tumour in 50% of those cases. The median survival time was 16.5 months (range 8 – 105 months) with no peri-operative mortality being reported. In another study, all symptomatic (pain or jaundice) patients experienced complete relief of symptoms after surgery and no one experienced obstructive jaundice or abdominal pain until tumour recurrence.<sup>16</sup>

Oncologists may argue that chemotherapy can offer the same results as pancreatic resection but with less morbidity. Unfortunately, there is paucity of data in medical literature on comparisons of outcomes associated with surgical and chemotherapeutic treatment. We agree with Sperti et al<sup>14</sup> that resection of pancreatic metastasis from colorectal cancer is a palliative procedure with long-term survival being an exceptional event.

#### Conclusion:

Our case demonstrates that differential diagnoses for pancreatic masses should always include metastasis to the pancreas from other tumours particularly, when there is a history of previous or concurrent non-pancreatic malignancy. When disseminated malignancy is not present an aggressive surgical approach may offer successful palliation of symptoms and have a role in the multidisciplinary management of metastatic malignancy.

#### Competing Interests

None declared

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## Critical Analysis of Case Based Discussions

J M L Williamson and A J Osborne

### Introduction

Assessment and evaluation are the foundations of learning; the former is concerned with how students perform and the latter, how successful the teaching was in reaching its objectives. Case based discussions (CBDs) are structured, non-judgmental reviews of decision-making and clinical reasoning<sup>1</sup>. They are mapped directly to the surgical curriculum and “assess what doctors actually do in practice”<sup>1</sup>. Patient involvement is thought to enhance the effectiveness of the assessment process, as it incorporates key adult learning principles: it is meaningful, relevant to work, allows active involvement and involves three domains of learning<sup>2</sup>:

- Clinical (knowledge, decisions, skills)
- Professionalism (ethics, teamwork)
- Communication (with patients, families and staff)

The ability of work based assessments to test performance is not well established. The purpose of this critical review is to assess if CBDs are effective as an assessment tool.

### Validity of Assessment

Validity concerns the accuracy of an assessment, what this means in practical terms, and how to avoid drawing unwarranted conclusions or decisions from the results. Validity can be explored in five ways: face, content, concurrent, construct and criterion-related/predicative.

CBDs have high face validity as they focus on the role doctors perform and are, in essence, an evolution of ‘bedside oral examinations’<sup>3</sup>. The key elements of this assessment are learnt in medical school; thus the purpose of a CBD is easy for both trainees and assessors to validate<sup>1</sup>. In terms of content validity, CBDs are unique in assessing a student’s decision-making and which, is key to how doctors perform in practice. However, as only six CBDs are required a year, they are unlikely to be representative of the whole curriculum. Thus CBDs may have a limited content validity overall, especially if students focus on one type of condition for all assessments.

Determining the concurrent validity of CBDs is difficult as they assess the pinnacle of Miller’s triangle – what a trainee ‘does’ in clinical practice (figure1)<sup>4</sup>. CBDs are unique in this aspect, but

there may be some overlap with other work based assessments particularly in task specific skills and knowledge. Simulation may give some concurrent validity to the assessment of judgment. The professional aspect of assessment can be validated by a 360 degree appraisal, as this requests feedback about a doctor’s professionalism from other healthcare professionals<sup>1</sup>.

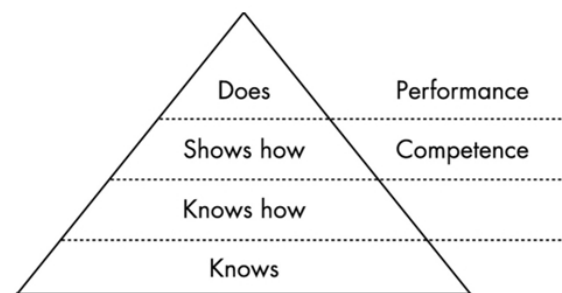


Figure 1: Miller’s triangle<sup>4</sup>

CBDs have high construct validity, as the assessment is consistent with practice and appropriate for the working environment. The clinical skills being assessed will improve with expertise and thus there should be ‘expert-novice’ differences on marking<sup>3</sup>. However the standard of assessment (i.e. the ‘pass mark’) increases with expertise – as students are always being assessed against a mark of competency for their level. A novice can therefore score the same ‘mark’ as an expert despite a difference in ability.

In terms of predictive validity performance-based assessments are simulations and examinees do not behave in the same way as they would in real life<sup>3</sup>. Thus, CBDs are an assessment of competence (‘shows how’) but not of true clinical performance and one perhaps could deduct that they don’t assess the attitude of the trainee which completes the cycle along with knowledge and skills (‘does’)<sup>4</sup>. CBDs permit inferences to be drawn concerning the skills of examinees that extend beyond the particular cases included in the assessment<sup>3</sup>. The quality of performance in one assessment can be a poor predictor of performance in another context. Both the limited number and lack of generalizability of these assessments have a negative influence on predictive validity<sup>3</sup>.

## Reliability of Assessment

Reliability can be defined as “the degree to which test scores are free from errors of measurement”. Feldt and Brennan describe the ‘essence’ of reliability as the “quantification of the consistency and inconsistency in examinee performance”<sup>5</sup>. Moss states that less standardized forms of assessment, such as CBDs, present serious problems for reliability<sup>6</sup>. These types of assessment permit both students and assessors substantial latitude in interpreting and responding to situations, and are heavily reliant on assessor’s ability. Reliability of CBDs is influenced by the quality of the rater’s training, the uniformity of assessment, and the degree of standardization in examinee.

Rating scales are also known to hugely affect reliability – understanding of how to use these scales must be achieved by all trainee assessors in order to achieve marking consistency. In CBD assessments, trainees should be rated against a level of completion at the end of the current stage of training (i.e. core or higher training)<sup>1</sup>. While accurate ratings are critical to the success of any WBA, there may be latitude in the interpretation of these rating scales between different assessors. Assessors who have not received formal WBA training tend to score trainees more generously than trained assessors<sup>7-8</sup>. Improved assessor training in the use of CBDs and spreading assessments throughout the student’s placement (i.e. a CBD every two months) may improve the reliability and effectiveness of the tool<sup>1</sup>.

## Practicality of Assessment

CBDs are a one-to-one assessment and are not efficient; they are labour intensive and only cover a limited amount of the curriculum per assessment. The time taken to complete CBDs has been thought to negatively impact on training opportunities<sup>7</sup>. Formalized assessment time could relieve the pressure of arranging ad hoc assessments and may improve the negative perceptions of students regarding CBDs.

The practical advantages of CBDs are that they allow assessments to occur within the workplace and they assess both judgment and professionalism – two subjects on the curriculum which are otherwise difficult to assess<sup>1</sup>. CBDs can be very successful in promoting autonomy and self-directed learning, which improves the efficiency of this teaching method<sup>9</sup>. Moreover, CBDs can be immensely successful in improving the abilities of trainees and can change clinical practice – a feature than is not repeated by other forms of assessment<sup>8</sup>.

One method for ensuring the equality of assessments across all trainees is by providing clear information about what CBDs are, the format they take and the relevance they have to the curriculum. The information and guidance provided for the assessment should be clear, accurate and accessible to all trainees, assessors, and external assessors. This minimizes the potential for inconsistency of marking practice and perceived lack of fairness<sup>7-10</sup>. However, the lack of standardization of this

assessment mechanism combined with the variation in training and interpretation of the rating scales between assessors may result in inequality.

## Formative Assessment

Formative assessments modify and enhance both learning and understanding by the provision of feedback<sup>11</sup>. The primary function of the rating scale of a CBD is to inform the trainee and trainer about what needs to be learnt<sup>1</sup>. Marks per se provide no learning improvement; students gain the most learning value from assessment that is provided without marks or grades<sup>12</sup>. CBDs have feedback built into the process and therefore it can be given immediately and orally. Verbal feedback has a significantly greater effect on future performance than grades or marks as the assessor can check comprehension and encourage the student to act upon the advice given<sup>11-12</sup>. It should be specific and related to need; detailed feedback should only occur to help the student work through misconceptions or other weaknesses in performance<sup>12</sup>. Veloski, et al, suggests that systemic feedback delivered from a credible source can change clinical performance<sup>8</sup>.

For trainees to be able to improve, they must have the capacity to monitor the quality of their own work during their learning by undertaking self-assessment<sup>12</sup>. Moreover, trainees must accept that their work can be improved and identify important aspects of their work that they wish to improve. Trainee’s learning can be improved by providing high quality feedback and the three main elements are crucial to this process are <sup>12</sup>:

- Helping students recognise their desired goal
- Providing students with evidence about how well their work matches that goal
- Explaining how to close the gap between current performance and desired goal

The challenge for an effective CBD is to have an open relationship between student and assessor where the trainee is able to give an honest account of their abilities and identify any areas of weakness. This relationship currently does not exist in most CBDs, as studies by Veloski, et al<sup>8</sup> and Norcini and Burch<sup>9</sup> who revealed that only limited numbers of trainees anticipated changing their practice in response to feedback data. An unwillingness to engage in formal self-reflection by surgical trainees and reluctance to voice any weaknesses may impair their ability to develop and lead to resistance in the assessment process. Improved training of assessors and removing the scoring of the CBD form may allow more accurate and honest feedback to be given to improve the student’s future performance. An alternative method to improve performance is to ‘feed forward’ (as opposed to feedback) focusing on what students should concentrate on in future tasks<sup>10</sup>

## Summative Assessment

Summative assessments are intended to identify how much the student has learnt. CBDs have a strong summative feel: a minimum number of assessments are required and a satisfactory standard must be reached to allow progression of a trainee to the next level of training<sup>1</sup>. Summative assessment affects students in a number of different ways; it guides their judgment of what is important to learn, affects their motivation and self-perceptions of competence, structures their approaches to and timing of personal study, consolidates learning, and affects the development of enduring learning strategies and skills<sup>12-13</sup>. Resnick and Resnick summarize this as “what is not assessed tends to disappear from the curriculum”<sup>13</sup>. Accurate recording of CBDs is vital, as the assessment process is transient, and allows external validation and moderation.

Evaluation of any teaching is fundamental to ensure that the curriculum is reaching its objectives<sup>14</sup>. Student evaluation allows the curriculum to develop and can result in benefits to both students and patients. Kirkpatrick suggested four levels on which to focus evaluation<sup>14</sup>:

Level 1 – Learner’s reactions

Level 2a – Modification of attitudes and perceptions

Level 2b – Acquisition of knowledge and skills

Level 3 – Change in behaviour

Level 4a – Change in organizational practice

Level 4b – Benefits to patients

At present there is little opportunity within the Intercollegiate Surgical Curriculum Project (ISCP) for students to provide feedback. Thus a typical ‘evaluation cycle’ for course development (figure 2) cannot take place<sup>15</sup>. Given the widespread nature of subjects covered by CBDs, the variations in marking standards by assessors, and concerns with validity and reliability, an overall evaluation of the curriculum may not be possible.

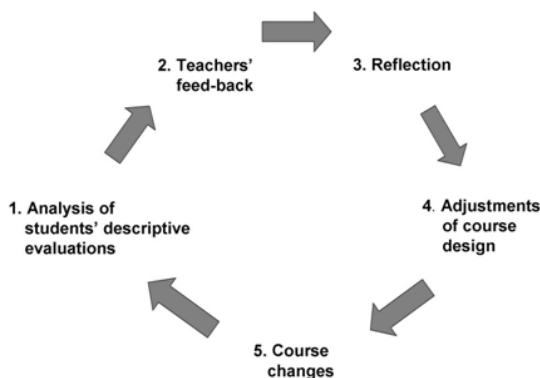


Figure 2: Evaluation cycle used to improve a teaching course<sup>15</sup>

However, regular evaluation of the learning process can improve the curriculum and may lead to better student engagement with the assessment process<sup>14</sup>. Ideally the evaluation process should be reliable, valid and inexpensive<sup>15</sup>. A

number of evaluation methods exist, but all should allow for ongoing monitoring review and further enquiries to be undertaken.

## Conclusion

CBDs, like all assessments, do have limitations, but we feel that they play a vital role in development of trainees. Unfortunately, Pereira and Dean suggest that trainees view CBDs with suspicion<sup>7</sup>. As a result, students do not engage fully with the assessment and evaluation process and CBDs are not being used to their full potential. The main problems with CBDs relate to the lack of formal assessor training in the use of the WBA and the lack of evaluation of the assessment process. Adequate training of assessors will improve feedback and standardize the assessment process nationally. Evaluation of CBDs should improve the validity of the learning tool, enhancing the training curriculum and encouraging engagement of trainees.

If used appropriately, CBDs are valid, reliable and provide excellent feedback which is effective and efficient in changing practice. However, a combination of assessment modalities should be utilized to ensure that surgical trainees are facilitated in their development across the whole spectrum of the curriculum.

### Competing Interests

None declared

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## Afebrile malaria patient with multisystem involvement and Hepatitis B infection: A case report

Rabindra Ghimire, Kaushal Raj Pandey, Prabhat Adhikari, Ashna Pokhrel, Mora Maximo and Mirela Sam

### ABSTRACT

Malaria is caused by obligate intraerythrocytic protozoa of the genus *Plasmodium*. Humans can be infected with one (or more) of the following five species: *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae* and *P. knowlesi*. Malaria typically produces a string of recurrent attacks, or paroxysms, each of which has three stages; chills, followed by fever, and then sweating. Although malaria without fever is rare, we present a complicated case of *P. ovale* malaria without fever associated with Hepatitis B virus infection, pre-excitation pattern ECG and secondary adrenal insufficiency in a young African American adult male who had travelled to Africa 9 months prior to clinical presentation. Our patient did not have any features to characterize severe malaria and the parasitemia was <5%.

KEYWORDS: Malaria, *Plasmodium ovale*, Preexcitation, Hepatitis B

Malaria is caused by obligate intra-erythrocytic protozoa of the genus *Plasmodium*. Humans can be infected with one (or more) of the following five species: *P. falciparum*, *P. vivax*, *P. ovale*, and *P. malariae* and *P. knowlesi*. Plasmodia are transmitted by the bite of an infected female Anopheles mosquito and these patients commonly present with fever, headache, fatigue and musculoskeletal symptoms.

Diagnosis is made by demonstration of the parasite in peripheral blood smear. The thick and thin smears are prepared for identification of malarial parasite and genotype respectively. Rapid diagnosis of malaria can be done by fluorescence microscopy with light microscope and interference filter or by polymerase chain reaction.

We report a complicated case of *P. ovale* malaria without fever associated with Hepatitis B virus infection, pre-excitation (WPW pattern), and secondary adrenal insufficiency.

### Case Report:

A 23 year old African American man presented to the emergency department with headache and dizziness for one week. He had 8/10 throbbing headaches associated with dizziness, nausea and ringing sensation in the ears and also complained of sweating but denied any fever. He had loose, watery bowel movements 3 times a day for a few days and had vomited once 5 days ago. He denied any past medical history or family history. He was a chronic smoker and smoked 1PPD for 8 years and denied alcohol or drug use. He had travelled to Africa 9 months before presentation and had stayed in Senegal for 1 month though he did not have any illnesses during or after returning from Africa.

On examination: T: 97.6, HR: 115/min, BP: 105/50, no orthostasis, SPO<sub>2</sub>: 100% in room air and RR: 18/min. Head, neck and throat examinations were normal and respiratory and cardiovascular system examinations were unremarkable except for tachycardia. Abdominal examination revealed no organomegaly and his CNS examination was unremarkable.

Laboratory examination revealed: WBC: 6.4, Hb: 14.4 and Hct: 41.3, Platelets: 43, N: 83.2, L: 7.4, M: 9.3, B: 0.1. His serum chemistry was normal except for a creatinine of 1.3 (BUN 14) and albumin of 2.6 (total protein 5.7). A pre-excitation (WPW Pattern) was seen on ECG and head CT and Chest X-ray were normal.

He was admitted to the telemetry unit to monitor for arrhythmia. Peripheral blood smear (PBS) was sent because of thrombocytopenia and mild renal failure and revealed malarial parasites later identified as *P. ovale* (Pic. 1 and 2).

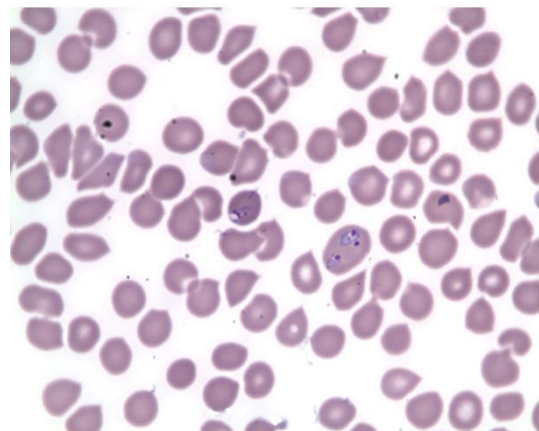


Figure 1: Thin Wright-Giemsa stained peripheral blood smear shows moderately enlarged red blood cells with an oval shape and slight amoeboid activity.

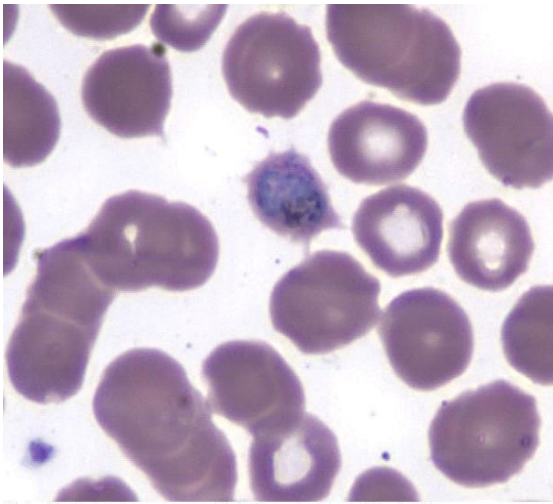


Figure 2 : Fimbriations are seen at both the ends of the red blood cell.

He was treated with Malarone; yet after 2 days of treatment, he was still complaining of headache, nausea and dizziness. There were no meningeal signs. His blood pressure readings were low (95/53) and he was orthostatic. His ECG showed sinus tachycardia and did not reveal any arrhythmias or QTc prolongation. His morning serum cortisol was 6.20 and subsequent cosyntropin stimulation test revealed a serum cortisol of 13.40 at one hour after injection. His Baseline ACTH was <1.1 suggesting a secondary adrenal insufficiency. His IGF-1, TSH, FT4, FSH, LH were all within normal limits. His bleeding and coagulation parameters were normal, CD4 was 634 (CD4/CD8: 1.46) and rapid oral test for HIV was negative. His Hepatitis B profile was as follows: HBsAg: positive, HBV Core IgM: negative, HBV core IgG: positive, HBeAg: negative, HBeAb: positive, HBV DNA: 1000 copies/ml, Log<sub>10</sub> HBV DNA: 3000 copies/ml.

His Blood cultures were negative, his G6PD levels and hemoglobin electrophoresis were normal, haptoglobin was <15 and LDH was 326. MRI of the brain was unremarkable. The abdominal sonogram revealed a normal echo pattern of the liver and spleen and spleen size was 12 cm. The secondary adrenal insufficiency was treated with dexamethasone resulting in gradual improvement of his nausea, vomiting and headache. Furthermore the platelet count improved to 309. Primaquine was prescribed to complete the course of malaria treatment and he was discharged home following 8 days of hospitalization. Unfortunately he did not return for follow up.

#### Discussion:

Malaria continues to be a major health problem worldwide. In 2007 the CDC received reports of 1,505 cases of malaria among person in the United States. 326 cases were reported from New York with all but one of these cases being acquired outside of the United States<sup>1</sup>.

While Plasmodia are primarily transmitted through the bite of an infected female Anopheles mosquito, infections can also occur through exposure to infected blood products (transfusion

malaria) or by congenital transmission. In industrialized countries most cases of malaria occur among travellers, immigrants, or military personnel returning from areas endemic for malaria (imported malaria). Exceptionally, local transmission through mosquitoes occurs (indigenous malaria). For non-falciparum malaria the incubation period is usually longer (median 15–16 days) and both *P. Vivax* and *P. Ovale* malaria may relapse months or years after exposure due to the presence of hypnozoites in the liver of which the longest reported incubation period for *P. vivax* being 30 years<sup>2</sup>.

Malaria without fever has been reported in cases of *Plasmodium falciparum* malaria in non-immune people<sup>3</sup>. Hepatitis B infection associated with asymptomatic malaria has been reported in the Brazilian Amazon<sup>4</sup>. This study was done in *P. falciparum* and *P. vivax* infected person with HBV co-infection though not in the *P. ovale* group. HBV infection leads to increased IFN-gamma levels<sup>5,6</sup> which are important for plasmodium clearance in the liver<sup>7</sup>, in addition to its early importance for malarial clinical immunity<sup>8</sup>. High levels of IFN gamma, IL6 and TNF alpha are detectable in the blood of malaria patients and in the spleen and liver in the rodents' model of malaria<sup>9,10</sup>. These inflammatory cytokines are known to suppress HBV replication in HBV transgenic mice<sup>9</sup>. This might explain the low levels of HBV viremia in our patient although human studies are required to confirm this finding.

The hypothalamic-pituitary- adrenocortical axis suppression and primary and secondary adrenal insufficiency has been reported in severe falciparum malaria<sup>10</sup>. In our case, the patient did not have any features to characterize severe malaria, and parasitaemia was <5%. Further, the MRI did not reveal any secondary cause for adrenal insufficiency. This might indicate that patients with malaria are more prone for hypothalamo-pituitary adrenocortical axis dysregulation yet further studies are required to prove this phenomenon in patients without severe malaria.

Cardiac complications after malaria have rarely been reported. In our patient pre-excitation on ECG disappeared after starting antimalarial treatment. Whether WPW pattern and its subsequent disappearance was incidental or caused by malarial infection that improved with treatment could not be determined. Lengthening of the QTc and severe cardiac arrhythmia has been observed, particularly after treatment with halofantrine for chloroquine resistant *Plasmodium falciparum* malaria<sup>11</sup>. Post-infectious myocarditis can be associated with cardiac events especially in combination with viral infections<sup>12</sup>. A case of likely acute coronary syndrome and possible myocarditis was reported after experimental human malaria infection<sup>13</sup>. To date, except for cardiac arrhythmias that developed after treatment with halofantrine and quinolines, no other arrhythmias has been reported in patients with malaria before treatment.

Transient thrombocytopenia is very common in uncomplicated malaria in semi-immune adults<sup>14</sup>. A person with a platelet count  $<150 \times 10^9/l$  is 4 times more likely to have asymptomatic malarial infection than one with a count  $\geq 150 \times 10^9/l$ <sup>15</sup>. In an observational study among 131 patients, patients with involvement of more than one organ system was found to have a lower mean platelet count compared to those with single organ involvement<sup>16</sup>.

#### Conclusions:

Our case highlights the need for further studies to understand the multi-organ involvement in patients without severe malaria as well as early recognition of potential complications to prevent mortality and morbidity in this subgroup of patients.

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#### Competing Interests

None declared

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## Paediatric fracture clinic referrals: what does it consist of?

Ravindra Thimmaiah and Alf Bass

### ABSTRACT

**Aim:** To assess the pattern of new cases referred to fracture clinic at a large paediatric university teaching hospital.

**Materials and Methods:** The study was carried out over a four-week period in May and June of 2010. A total of 864 patients were seen during this period, which included 310 new cases and 554 follow up cases. The radiographs and reports were analysed to collect the data.

**Results:** Two hundred and ninety two new cases were analysed as 18 cases did not have radiographs available. One hundred and one (34%) cases did not have any fractures and 14 (5%) were suspected fractures. Fractures of the distal radius and ulna were the predominant cases (23%) followed by hand fractures (15%).

**Conclusion:** Significant number of patients (34%) did not have fractures. Considerable amount of time can be saved especially in a busy fracture clinic if protocols are developed to manage new referrals.

### Introduction

Injuries in children are common.<sup>1</sup> In the UK, incidence is found to be 20.2 fractures per 1000 per year. The peak age of incidence is on average of 9.7 years.<sup>2</sup> Up to 42 per cent of boys and 27 per cent of girls will sustain at least one fracture during the paediatric age.<sup>3</sup>

A study conducted in Northern Sweden in the age group of 0 - 19 years showed that there is a rise in injury related visits to emergency department over the years. Fractures and dislocations accounted for 21.4 per cent of the cases.<sup>1</sup> Consequently, this will put a pressure on fracture clinics as new cases take a considerable in fracture clinic.

The purpose of this audit was to assess the pattern of new cases referred to fracture clinic at a large paediatric university teaching hospital

### Materials and Methods

This prospective audit was carried out over a four-week period in May and June of 2010 and it was approved by the institutional clinical audit department. There were a total of 18 working days. A total of 864 patients were seen in the fracture clinic during this period, which included 310 new cases and 554 follow up cases. Data was collected from the fracture clinic patient list for the respective days and the new patient list was extracted from this. Using the picture archiving and communication system (PACS), the radiographs and reports were analysed to collect the data regarding the fracture sustained.

### Results

Total number of cases seen during the 4 week period were 864, which included 310 new cases and 554 follow up cases. Two hundred and ninety two cases out of 310 were analysed, as 18 cases did not have radiographs available.

There were 170 males and 140 females. The average age was 9 years (range 1 month to 16 years).

One hundred and seventy seven (61%) showed fractures. One hundred and one (34%) cases did not have any fractures and 14 (5%) were suspected fractures.

The following figure 1 shows the pattern of cases on each working day. Those, which are left blank, are non working days or cancelled clinics. The average number of cases seen per day were 48 and of these, the average of new cases seen were 17.2 and the average number of follow up cases seen were 30.7.

As shown in figure 2, fractures of the distal radius and ulna were the predominant cases (23%) followed by hand fractures (15%). Other fractures included: lower limb excluding foot [23 (8%)], elbow and humerus [14 (5%)], clavicle [11 (4%)], foot [12 (4%)] and others [5 (2%)].

Further analysis of the fractures sustained showed that forearm injuries were the predominant cases and majority of them were buckle or greenstick fractures. The detailed distribution is shown in the figure 3 below.



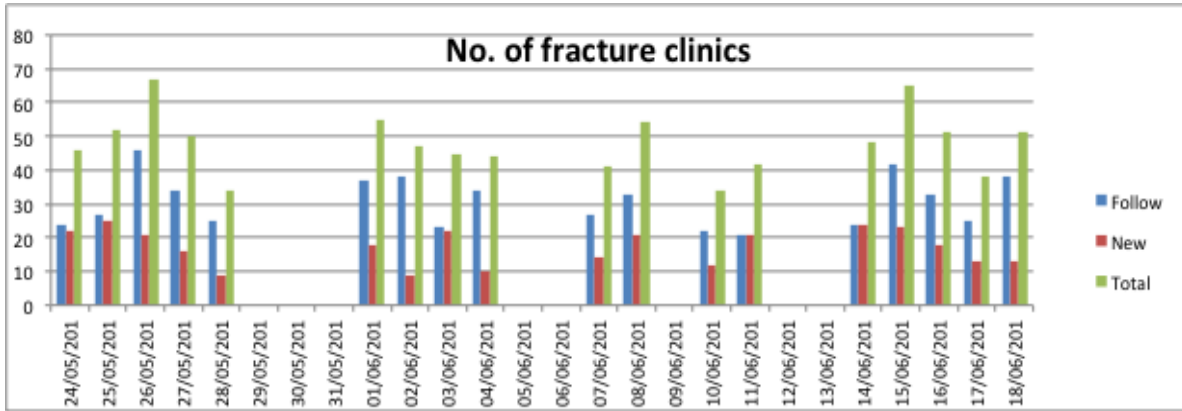


Figure 1 showing the daily pattern of cases

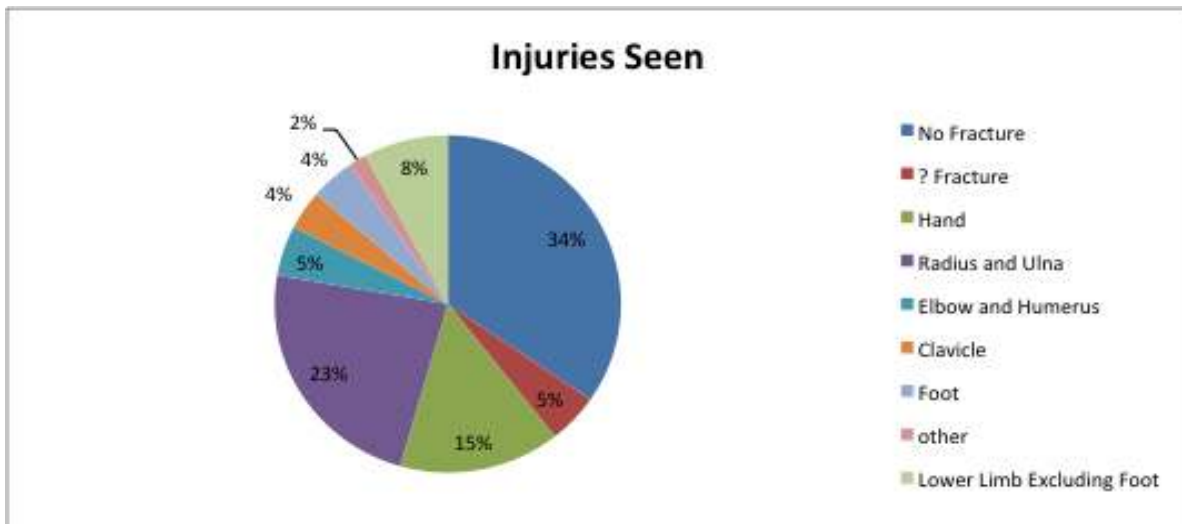


Figure 2 showing the area involved

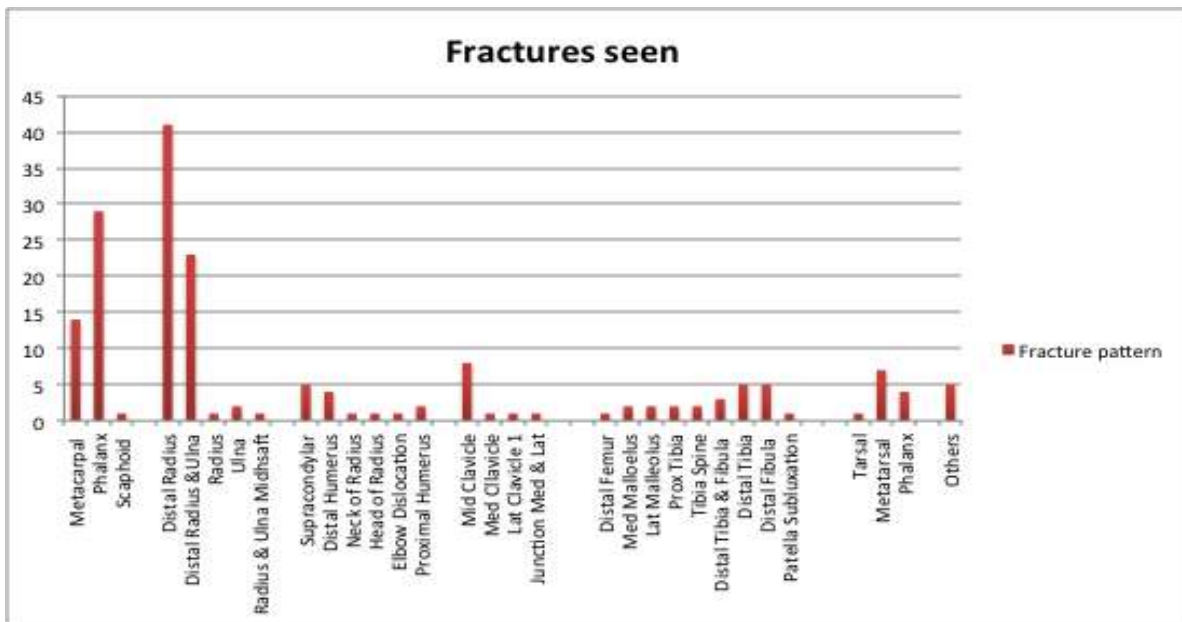


Figure 3 showing the pattern of fracture

## Discussion

Fracture clinics are a part of any trauma and orthopaedic department. One must consider the benefits of providing such a service and routine audits are necessary to improve the efficiency, accuracy and above all, best possible patient care.

Although there is evidence that simple fracture like buckle fractures of the distal radius do not need orthopaedic input and can be safely treated in emergency department using a splint, and can be discharged without follow up<sup>4</sup>, concerns have been raised against the possibility of a misdiagnosis and providing patient information<sup>5</sup>.

Radiographic interpretation is often done by junior doctors in the emergency department. Guly<sup>6</sup> demonstrated that there is significant issue in misreading radiographs and missing the injuries. The second problem was noted to be not requesting a radiograph. It has been suggested that better training in interpreting radiographs and rapid reporting by radiologist could solve this problem.

Others have adapted local departmental audits and guidelines and have shown to reduce the risk.<sup>7</sup>

Another possibility is a rapid review of radiographs by orthopaedic consultants on the same day as suggested by Beiri et al.<sup>8</sup> But if the hospital is covering a large population area including peripheral walk in centres, this becomes difficult due to accessibility and logistic reasons.

Toeh and colleagues<sup>9</sup> investigating attitudes of parents towards paediatric fracture clinic found that mothers were the one who predominantly accompanied their children and most children had to take time off school to attend the clinic. It was also interesting to note that parents perception of severity of injury prompted attendance at follow up clinics.

In another study, ninety nine per cent of the parents thought attendance at the fracture clinic was important. However, when evaluating the socio economic costs, they found that this led to loss of 0.25 working days of parents, 0.18 daily wages and 0.54 schooling days per visit.<sup>1</sup>

A combination of factors may lead to fracture clinic appointments especially in paediatric population. Departmental protocols and guidelines may help in reducing the fracture clinic visits, however careful consideration must be given while drawing up these for a successful outcome.

Inappropriate referrals lead to usage of time and resources, which can lead to delay of service meant for those in need of specialist opinion. In our audit, 34% of the cases seen did not have any fractures and 5% were suspected fractures.

One of the drawbacks of this audit includes lack of case note review of those cases where fractures were not present. It would

have been ideal to investigate the nature of cases seen, and whether this was treated as soft tissue injuries, or seen just for reassurance or used as a safety net.

The following recommendations could be used as possible solutions to decrease inappropriate referrals to fracture clinic.

If the patient is seen in Accident and Emergency (A&E), where appropriate and when diagnosis is in doubt, there should be an opportunity for the patient to be seen or discussed with a more senior doctor in A&E.

With regards to Peripheral Walk In Centres, there should be an opportunity to discuss it with the on call Orthopaedic team with the integration of PACS, so that images are readily available for viewing, and to consider rapid reporting of images.

The use of Specialist Physiotherapists for soft tissue injuries in A&E with follow up in physiotherapy clinics were shown to have high patient satisfaction rates and reduce fracture clinic follow up. Similar strategy could be considered.<sup>11, 12</sup>

## Conclusion

This study has shown that although the majority of patients needed treatment, a significant number (34%) did not have fractures. Considerable amounts of time can be saved, especially in a busy fracture clinic if unnecessary appointments could be avoided. It would also benefit patients by avoiding unnecessary visits to the fracture clinic. A repeat study following the consideration of recommendations would reveal any benefit of such a strategy.

### Competing Interests

None declared

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## Critical Analysis of Case Based Discussions

J M L Williamson and A J Osborne

### Introduction

Assessment and evaluation are the foundations of learning; the former is concerned with how students perform and the latter, how successful the teaching was in reaching its objectives. Case based discussions (CBDs) are structured, non-judgmental reviews of decision-making and clinical reasoning<sup>1</sup>. They are mapped directly to the surgical curriculum and “assess what doctors actually do in practice”<sup>1</sup>. Patient involvement is thought to enhance the effectiveness of the assessment process, as it incorporates key adult learning principles: it is meaningful, relevant to work, allows active involvement and involves three domains of learning<sup>2</sup>:

- Clinical (knowledge, decisions, skills)
- Professionalism (ethics, teamwork)
- Communication (with patients, families and staff)

The ability of work based assessments to test performance is not well established. The purpose of this critical review is to assess if CBDs are effective as an assessment tool.

### Validity of Assessment

Validity concerns the accuracy of an assessment, what this means in practical terms, and how to avoid drawing unwarranted conclusions or decisions from the results. Validity can be explored in five ways: face, content, concurrent, construct and criterion-related/predicative.

CBDs have high face validity as they focus on the role doctors perform and are, in essence, an evolution of ‘bedside oral examinations’<sup>3</sup>. The key elements of this assessment are learnt in medical school; thus the purpose of a CBD is easy for both trainees and assessors to validate<sup>1</sup>. In terms of content validity, CBDs are unique in assessing a student’s decision-making and which, is key to how doctors perform in practice. However, as only six CBDs are required a year, they are unlikely to be representative of the whole curriculum. Thus CBDs may have a limited content validity overall, especially if students focus on one type of condition for all assessments.

Determining the concurrent validity of CBDs is difficult as they assess the pinnacle of Miller’s triangle – what a trainee ‘does’ in clinical practice (figure1)<sup>4</sup>. CBDs are unique in this aspect, but

there may be some overlap with other work based assessments particularly in task specific skills and knowledge. Simulation may give some concurrent validity to the assessment of judgment. The professional aspect of assessment can be validated by a 360 degree appraisal, as this requests feedback about a doctor’s professionalism from other healthcare professionals<sup>1</sup>.

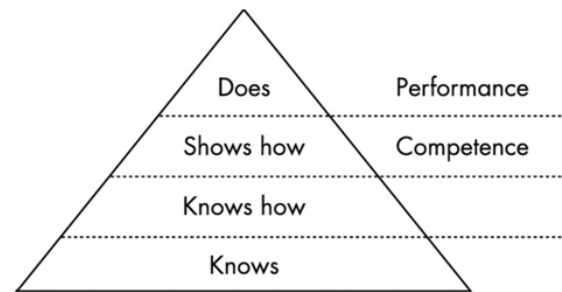


Figure 1: Miller’s triangle<sup>4</sup>

CBDs have high construct validity, as the assessment is consistent with practice and appropriate for the working environment. The clinical skills being assessed will improve with expertise and thus there should be ‘expert-novice’ differences on marking<sup>3</sup>. However the standard of assessment (i.e. the ‘pass mark’) increases with expertise – as students are always being assessed against a mark of competency for their level. A novice can therefore score the same ‘mark’ as an expert despite a difference in ability.

In terms of predictive validity performance-based assessments are simulations and examinees do not behave in the same way as they would in real life<sup>3</sup>. Thus, CBDs are an assessment of competence (‘shows how’) but not of true clinical performance and one perhaps could deduct that they don’t assess the attitude of the trainee which completes the cycle along with knowledge and skills (‘does’)<sup>4</sup>. CBDs permit inferences to be drawn concerning the skills of examinees that extend beyond the particular cases included in the assessment<sup>3</sup>. The quality of performance in one assessment can be a poor predictor of performance in another context. Both the limited number and lack of generalizability of these assessments have a negative influence on predictive validity<sup>3</sup>.

## Reliability of Assessment

Reliability can be defined as “the degree to which test scores are free from errors of measurement”. Feldt and Brennan describe the ‘essence’ of reliability as the “quantification of the consistency and inconsistency in examinee performance”<sup>5</sup>. Moss states that less standardized forms of assessment, such as CBDs, present serious problems for reliability<sup>6</sup>. These types of assessment permit both students and assessors substantial latitude in interpreting and responding to situations, and are heavily reliant on assessor’s ability. Reliability of CBDs is influenced by the quality of the rater’s training, the uniformity of assessment, and the degree of standardization in examinee.

Rating scales are also known to hugely affect reliability – understanding of how to use these scales must be achieved by all trainee assessors in order to achieve marking consistency. In CBD assessments, trainees should be rated against a level of completion at the end of the current stage of training (i.e. core or higher training)<sup>1</sup>. While accurate ratings are critical to the success of any WBA, there may be latitude in the interpretation of these rating scales between different assessors. Assessors who have not received formal WBA training tend to score trainees more generously than trained assessors<sup>7-8</sup>. Improved assessor training in the use of CBDs and spreading assessments throughout the student’s placement (i.e. a CBD every two months) may improve the reliability and effectiveness of the tool<sup>1</sup>.

## Practicality of Assessment

CBDs are a one-to-one assessment and are not efficient; they are labour intensive and only cover a limited amount of the curriculum per assessment. The time taken to complete CBDs has been thought to negatively impact on training opportunities<sup>7</sup>. Formalized assessment time could relieve the pressure of arranging ad hoc assessments and may improve the negative perceptions of students regarding CBDs.

The practical advantages of CBDs are that they allow assessments to occur within the workplace and they assess both judgment and professionalism – two subjects on the curriculum which are otherwise difficult to assess<sup>1</sup>. CBDs can be very successful in promoting autonomy and self-directed learning, which improves the efficiency of this teaching method<sup>9</sup>. Moreover, CBDs can be immensely successful in improving the abilities of trainees and can change clinical practice – a feature than is not repeated by other forms of assessment<sup>8</sup>.

One method for ensuring the equality of assessments across all trainees is by providing clear information about what CBDs are, the format they take and the relevance they have to the curriculum. The information and guidance provided for the assessment should be clear, accurate and accessible to all trainees, assessors, and external assessors. This minimizes the potential for inconsistency of marking practice and perceived lack of fairness<sup>7-10</sup>. However, the lack of standardization of this

assessment mechanism combined with the variation in training and interpretation of the rating scales between assessors may result in inequality.

## Formative Assessment

Formative assessments modify and enhance both learning and understanding by the provision of feedback<sup>11</sup>. The primary function of the rating scale of a CBD is to inform the trainee and trainer about what needs to be learnt<sup>1</sup>. Marks per se provide no learning improvement; students gain the most learning value from assessment that is provided without marks or grades<sup>12</sup>. CBDs have feedback built into the process and therefore it can be given immediately and orally. Verbal feedback has a significantly greater effect on future performance than grades or marks as the assessor can check comprehension and encourage the student to act upon the advice given<sup>11-12</sup>. It should be specific and related to need; detailed feedback should only occur to help the student work through misconceptions or other weaknesses in performance<sup>12</sup>. Veloski, et al, suggests that systemic feedback delivered from a credible source can change clinical performance<sup>8</sup>.

For trainees to be able to improve, they must have the capacity to monitor the quality of their own work during their learning by undertaking self-assessment<sup>12</sup>. Moreover, trainees must accept that their work can be improved and identify important aspects of their work that they wish to improve. Trainee’s learning can be improved by providing high quality feedback and the three main elements are crucial to this process are <sup>12</sup>:

- Helping students recognise their desired goal
- Providing students with evidence about how well their work matches that goal
- Explaining how to close the gap between current performance and desired goal

The challenge for an effective CBD is to have an open relationship between student and assessor where the trainee is able to give an honest account of their abilities and identify any areas of weakness. This relationship currently does not exist in most CBDs, as studies by Veloski, et al<sup>8</sup> and Norcini and Burch<sup>9</sup> who revealed that only limited numbers of trainees anticipated changing their practice in response to feedback data. An unwillingness to engage in formal self-reflection by surgical trainees and reluctance to voice any weaknesses may impair their ability to develop and lead to resistance in the assessment process. Improved training of assessors and removing the scoring of the CBD form may allow more accurate and honest feedback to be given to improve the student’s future performance. An alternative method to improve performance is to ‘feed forward’ (as opposed to feedback) focusing on what students should concentrate on in future tasks<sup>10</sup>

## Summative Assessment

Summative assessments are intended to identify how much the student has learnt. CBDs have a strong summative feel: a minimum number of assessments are required and a satisfactory standard must be reached to allow progression of a trainee to the next level of training<sup>1</sup>. Summative assessment affects students in a number of different ways; it guides their judgment of what is important to learn, affects their motivation and self-perceptions of competence, structures their approaches to and timing of personal study, consolidates learning, and affects the development of enduring learning strategies and skills<sup>12-13</sup>. Resnick and Resnick summarize this as “what is not assessed tends to disappear from the curriculum”<sup>13</sup>. Accurate recording of CBDs is vital, as the assessment process is transient, and allows external validation and moderation.

Evaluation of any teaching is fundamental to ensure that the curriculum is reaching its objectives<sup>14</sup>. Student evaluation allows the curriculum to develop and can result in benefits to both students and patients. Kirkpatrick suggested four levels on which to focus evaluation<sup>14</sup>:

Level 1 – Learner’s reactions

Level 2a – Modification of attitudes and perceptions

Level 2b – Acquisition of knowledge and skills

Level 3 – Change in behaviour

Level 4a – Change in organizational practice

Level 4b – Benefits to patients

At present there is little opportunity within the Intercollegiate Surgical Curriculum Project (ISCP) for students to provide feedback. Thus a typical ‘evaluation cycle’ for course development (figure 2) cannot take place<sup>15</sup>. Given the widespread nature of subjects covered by CBDs, the variations in marking standards by assessors, and concerns with validity and reliability, an overall evaluation of the curriculum may not be possible.

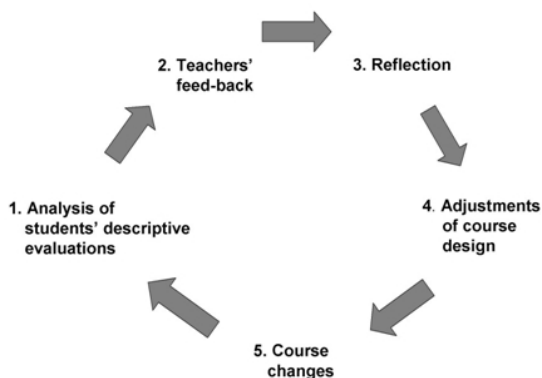


Figure 2: Evaluation cycle used to improve a teaching course<sup>15</sup>

However, regular evaluation of the learning process can improve the curriculum and may lead to better student engagement with the assessment process<sup>14</sup>. Ideally the evaluation process should be reliable, valid and inexpensive<sup>15</sup>. A

number of evaluation methods exist, but all should allow for ongoing monitoring review and further enquiries to be undertaken.

## Conclusion

CBDs, like all assessments, do have limitations, but we feel that they play a vital role in development of trainees. Unfortunately, Pereira and Dean suggest that trainees view CBDs with suspicion<sup>7</sup>. As a result, students do not engage fully with the assessment and evaluation process and CBDs are not being used to their full potential. The main problems with CBDs relate to the lack of formal assessor training in the use of the WBA and the lack of evaluation of the assessment process. Adequate training of assessors will improve feedback and standardize the assessment process nationally. Evaluation of CBDs should improve the validity of the learning tool, enhancing the training curriculum and encouraging engagement of trainees.

If used appropriately, CBDs are valid, reliable and provide excellent feedback which is effective and efficient in changing practice. However, a combination of assessment modalities should be utilized to ensure that surgical trainees are facilitated in their development across the whole spectrum of the curriculum.

### Competing Interests

None declared

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