

Bulletin of Geriatric and Stroke Medicine

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From the Editor

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available from

<http://www.dok.org.uk>

Welcome back to the newsletter for those interested in stroke and have an interest in the care of older patients. This is the third edition of this journal and there has been a little bit of a gap mainly due to the demands of work and family but I am determined to keep the momentum going.

I am very fortunate this month to have had some superb articles to share with you. Dr F M Awadel-Kariem has produced a fascinating history of hospital acquired infections which is a good primer for all of us involved in reducing HAIs. Dr Henstridge has produced a comprehensive guide to delirium, its definition, diagnosis, investigation and management. Lastly Kate Mehaffey and Dr Rachel Troke have finished with some wise words on managing diabetes in the elderly.

The Bulletin is distributed freely as a PDF file. Please forward it on to your colleagues in hospital, general practitioners, trainees, junior doctors or medical students and nursing and therapy staff.

Thanks to all the contributors and if you would like to contribute please email me with your topic, or I am always happy to suggest one to someone who would like to write a short piece. I am also happy to have interesting cases, important learning points or if you have something you want to say about a particular matter then share it with us. The journal is a little stroke-light this month but hope to rectify that next issue.

Debate

Hospital acquired infections (HAI): yesterday, today and tomorrow

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In recent years, Hospital Acquired Infection (HAI) have gained increasing prominence. This increase has been the direct result of a rise in the number of reports in the popular media that had raised the alarm about serious infections caused by the so-called "superbugs" in hospital patients. Furthermore, these reports have linked these superbugs with dirty hospitals and poor hygiene. At the same time, HAI has entered the political arena culminating in political parties making pledges relating to the control of HAI in their election manifesto. However, at this time of sensationalised coverage, it may be helpful to assess the growing profile of HAI in a calm and rational manner. It is interesting to note that the need to control HAI is well-established in the history of medicine.

Learning points

- Hospital acquired infections have existed as long as hospitals have.
- The causes and the necessary and fundamental preventative measures have been recognised for over 160 years
- Many new interventions are old ones rebadged and relaunched
- There are new challenges with new immunomodulator drugs and therapies and new infections
- The fundamental issues remain much the same – ward hygiene, handwashing, occupancy rates, bed spacing.



A famous painting of Dr Semmelweis insisting that physicians and medical students wash their hands in antiseptic solution before entering obstetric wards and again before examining each patient. (Editor : One can see he is arguing with a couple of well known dissenting Consultants and Sprs who keep questioning the evidence base for hand washing)

Yesterday: Spread of infection within health-care establishments and by healthcare workers, as we recognise it in medical practice today, has been recorded as early as 1847 (Jay, 1999). At that time Ignaz Semmelweis, a Hungarian physician, introduced a measure of hand hygiene for medical staff and students when they moved from the cadaver dissection room to the maternity unit in Vienna General Hospital in Austria. This simple measure, that could be seen as a precursor to the modern hand hygiene campaign, resulted in a dramatic reduction in the rates

of the fatal puerperal fever (caused by one of the first “flesh-eating superbugs”: Group A β -haemolytic streptococci) from 10% to 1% (Jay, 1999). In 1855, a second pioneer, Florence Nightingale, a volunteer nurse during the Crimean War, had laid down the foundation for modern hospital infection control during her work in Scutari, Turkey (Joint Commission on Accreditation of Healthcare Organization, 1999). Working in a military hospital dedicated to the care of injured soldiers, she introduced measures to control the spread of infection within the hospital. These measures included: de-cluttering of wards and other clinical areas, proper antiseptic cleaning of surfaces (including walls and ceilings), reducing bed numbers and implementing minimum distance between beds and improvement of sanitation and ventilation. These measures had resulted in the control of hospital acquired infections, such as infective diarrhoea, and reduced mortality rates from 42% to 2.2% (Joint Commission on Accreditation of Healthcare Organization, 1999). In 1867, Joseph Lister, an English surgeon at the University of Glasgow, introduced phenol as a surgical antiseptic agent (Lister, 1867). He also forced surgeons to wear clean gloves and wash their hands in phenol before and after operations. Phenol was also used to wash surgical instruments and was sprayed in surgical theatres. Lister was also the first to recommend the use of non-porous material in the handles of surgical equipment to facilitate better antisepsis. All of these principles, introduced by Semmelweis, Nightingale and Lister, are firmly enshrined in today’s infection control practice.

More recently: The modern era of HAI surveillance and control could be considered to have started with the fight against a second “flesh-eating Superbug” *Staphylococcus aureus*. In the 1960s in the USA, careful monitoring and reporting of outbreaks of virulent organisms such as *S aureus* phage type 80/81 resulted in change of behaviour of hospital staff such that the incidence of the infection fell (Hayley et al, 1980). Thus, the discipline of infection surveillance was borne. This led to the setting up of the SENIC (Study of the Efficacy of Nosocomial Infection Control) project, which later showed that 1/3 of HAI may be preventable (Goldmann, 1986). This study firmly established the value of formal surveillance, which is now common in the UK, Europe and other developed countries.

In the UK, following similar surveillance studies that established the importance and the impact of HAI, the Department of Health and the Public Health Laboratory Service (PHLS) issued a document that outlined the structure of infection control within an organisation: describing the structure of the infection control team, its programme and how it is supported within the organisation (Department of Health/PHLS 1995). Furthermore, the Nosocomial Infection National Surveillance Service (NINSS) was established by the PHLS in 1996 to provide information to help in the identification of, and reduction in, hospital-acquired infection (Emmerson et al, 1996). However, in 2000, the NAO in a classic report stated that HAI caused the NHS a billion pounds and that up to 15% of these infections are avoidable if hospitals were to employ simple infection control measures (NAO, 2000). This report focused minds on the potential savings that can be achieved if hospitals implemented effective infection control programmes. In the same year, the Minister of Health gave the undertaking that all hospital trusts will commence mandatory HAI monitoring. This started in April 2001, with the mandatory surveillance of MRSA bacteraemia, and was followed in 2003-2004 with the mandatory surveillance of vancomycin resistant enterococci, *Clostridium difficile* infection and the reporting of HAI as serious untoward incidents (CMO/CNO, 2003).

Today: The current infection control structure is largely based on the 1995 PHLS document. All hospitals in the UK have an infection control team and HAI surveillance systems. The infection control strategy of most hospitals is guided by a number of documents including: “Getting ahead of the curve” (Department of Health, 2002), “Winning Ways” (Department of Health, 2003), the two “Saving lives” documents (Department of Health, 2005, 2007) and the “Going further faster” documents (Department of Health, 2006, 2008). These documents introduced important tools such as the root cause analysis tool and the high impact interventions (the care bundles). Infection control has come a long way from the time of the NAO report in 2000, and in spite of some set backs considerable advances were made in the battle to combat HAI. In 2004, the NHS had set itself a target of halving the rate of MRSA bacteraemia by 2008. This has been considered an ambitious target. However, the fact that it was met indicates that the measures implemented to combat HAI (such as the re-structuring of the infection control team, the use of mandatory surveillance, root cause analysis and high impact interventions) were right, at least for MRSA (Department of Health, 2008).

Tomorrow (Are we there yet?): What all infection control experts will agree upon is the fact that we need to maintain vigilance. Past successes can only be maintained and built upon if we continue to apply proven infection control methods with vigour and determination (Department of Health, 2008). It is interesting to note that the fundamentals of hospital infection control have remained the same through time e.g. hand hygiene, de-cluttering, isolation, bed spacing.. etc, although their modern incarnation sound more intriguing e.g. deep clean procedure, clean-your-hand campaign, High Impact Interventions ..etc. What is now clear is that: to be effective these individual interventions (while will have significant success if implemented as stand-alone procedures), need to be implemented as an integrated approach coupled with zero tolerance to HAI. The fact that HAI rates are made use of in trusts’ performance management coupled with increasing political involvement should ensure that infection control continues to be a high priority for every hospital.

In conclusion, HAI are likely to continue to challenge clinicians as long as we continue to

manage inpatients in hospitals or similar healthcare establishments. It is ironic that advances in modern medicine that are saving many lives, could result in more opportunities for HAI (e.g. infection of prosthesis, vascular lines, pacemakers etc.). Developments in organ transplant and in anticancer and immune-modulator therapies may result in a significant proportion of hospitalised patients being immunocompromised and thus vulnerable to current or emerging HAI.

The 'war' against HAI will continue and new 'battle grounds' are likely to be introduced in the future. It is imperative, therefore, that we continue to maintain our vigilance, develop a holistic approach towards infection control and explore new and imaginative ways to deal with current and future HAI.

Review

Delirium – A comprehensive guide

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Definitions : *Delirium is an acute organic mental syndrome, characterised by fluctuating global cognitive impairment, with disturbance of attention, conscious level, psychomotor activity, perception and sleep-wake cycle.* Prevalent delirium refers to that present on admission, whilst incident delirium is that which develops during hospital stay.

Delirium occurs in approximately 15-50% of hospitalized elderly patients and is associated with in-hospital mortality rates of 10-65% and one-year mortality rates of 35-40% . Patients who experience an episode of delirium are also more likely to be discharged from hospital to long-term care facilities . **Thus delirium is more common and life threatening than Acute Coronary Syndrome or COPD-exacerbations.**

Presentation

It is rare for a patient to present to hospital with a putative diagnosis of delirium. The diagnosis is often a bit more subtle and a typical case will present non-specifically as poor mobility, falls, incontinence or even 'Acopia'. Delirium is a great mimic, hence the importance of maintaining a high index of suspicion.

Delirium Subtypes

Delirium is often subdivided into hyperactive, hypoactive and mixed subtypes on the basis of motor activity but this differentiation is artificial as the clinical presentation varies from patient to patient and with time for a particular patient. However, there are significant differences in terms of presentation, complications and prognosis .

In hyperactive delirium (20-25% cases), psychomotor activity is increased and there is prominence of agitation and anxiety. Patients may wander, and are at increased risk of falls. In hypoactive delirium (25-29% cases), psychomotor activity is decreased. The clinical features are commonly missed, and can mistaken for fatigue or depression. These patients often have prolonged hospital stay and are more likely to develop pressure sores or nosocomial infections. Approximately 10% cases of delirium will have no psychomotor disturbance, and the remainder (35-40%) present with a mixed picture.

Diagnosing delirium - **Confusion Assessment Method (CAM) for Delirium**

Criteria	Evidence
1. Acute change in mental status, AND	Observation by a family member, caregiver, or primary care physician
2. Symptoms that fluctuate over minutes or hours, AND	Observation by nursing staff or other caregiver
3. Inattention	Patient history Poor digit recall, inability to recite months of year backwards
PLUS	
4. Altered level of consciousness, OR	Hyperalertness, drowsiness, stupor, or coma
5. Disorganized thinking	Rambling or incoherent speech

The first 3 criteria PLUS the fourth OR the fifth criterion must be present to confirm a diagnosis of delirium. (Source: Inouye, S. Ann Int Med 1990;113:941-948.)

Delirium is significantly under-recognised, with as many as 50-90% cases missed. The British Geriatrics Society (BGS) recommends that cognitive testing should be carried out on all elderly patients admitted to hospital.

In practical terms, a combination of the MMSE, a simple pass/fail clock drawing test and the CAM should allow rapid assessment of all patients admitted through the acute take. The Abbreviated Mental Test (AMT) score has some use as a screening test as it is quick to administer, but lacks sensitivity and specificity.

For a DSM-IV diagnosis of delirium, a patient must satisfy the following criteria:

- Disturbance of consciousness (i.e. reduced clarity of awareness of the environment) with

Learning points

Delirium is a common acute medical emergency with significant mortality and morbidity. By understanding the risk factors and pathophysiology we may be able to reduce the incidence and complications

Diagnosis and assessment are straightforward and should be one of the skills on any doctor.

Its aetiology is often multifactorial, presentation variable, treatment requires multi-disciplinary team input, and prognosis may be unpredictable.

It is also associated with, and a marker of, frailty. The diagnosis is a clinical one, and as such it is often under-recognised and under-reported. Although understanding of risk factors and tools for recognition have improved, the pathophysiology is still relatively poorly understood.

INVESTIGATIONS

ALL PATIENTS

Full Blood Count
 Urea and Electrolytes
 Liver Function Tests
 Glucose
 Thyroid Function Tests
 C-Reactive Protein
 Blood Cultures
 Urinalysis +/- culture
 Electrocardiogram
 Chest radiograph

SELECTED PATIENTS

Amylase
 Erythrocyte Sedimentation Rate
 Serum Magnesium
 B12/Folate
 Troponin
 Toxicology Screen
 Arterial Blood Gases
 CT scan (focal neurological deficit, history of head injury)
 Lumbar Puncture
 Sputum/Stool cultures
 Electroencephalograph (EEG: ?non-convulsive status)

- reduced ability to focus, shift, or sustain attention.
- Change in cognition such as memory deficit, disorientation, language disturbance or the development of perceptual disturbance that is not better accounted for by a pre-existing, established or evolving dementia.
- The disturbance usually develops over a short period of time (hours or days) and tends to fluctuate during the course of the day.
- There is evidence from history, examination, or investigations that the disturbance is caused by the physiological consequences of a medical condition.

Overlap with Dementia syndromes

There is a significant overlap between delirium and dementia in terms of presentation, pathophysiology and prognosis. The traditional model of easily differentiated syndromes (table1) belies the spectrum of consciousness and cognitive disorder that these syndromes represent.

Characteristics of Delirium vs Dementia: Traditional Model

	Delirium	Dementia
Onset	Acute Hours/days	Chronic Month years
Progressive	No	Yes
Duration	Hours/Days/Weeks Reversible	Months/Years Permanent
Attention	Short attention and distractible	Attention usually reasonable
Consciousness	Fluctuates agitation to coma	Normal
Systemic cause	Usually found	Localised primary Brain disorder – Vascular, Alzheimer’s, other

Up to two thirds of cases of delirium occur in patients with dementia, and patients who suffer an episode of delirium are 3-10 times more likely to develop dementia than controls . Delirium is more likely to develop in those with underlying cognitive impairment and can persist for many months after diagnosis, sometimes leading to a premature diagnosis of dementia. Functional decline in dementia is hastened by an episode of delirium, and an episode of delirium may be the first presentation of a dementia syndrome. Non-recognition of delirium is associated with worse outcomes, particularly in patients with underlying dementia. Thus a combination of assessment tools and a comprehensive functional history and assessment are crucial in the care of patients with delirium, and the study of delirium may elicit vital information regarding treatment and prevention of dementia.

Patients with delirium are at increased risk of dementia and patients with dementia can develop delirium

Pathophysiology

There are a number of structural and physiological disturbances that appear to result in a final common pathway of neuronal dysfunction, thought to be reversible impairment of cerebral oxidative metabolism and multiple neurotransmitter abnormalities , affecting in particular the prefrontal, parietal and fusiform cortices. Cytokines may contribute directly or through an increased permeability of the blood-brain barrier. Low levels of IGF-1 have been associated with incident and prevalent delirium and its recovery. Other implicated cytokines include IL-1, IL-2, IL-6, IL-8, TNF- α and Interferon. An excessive stress response may contribute through increased cytokine levels, but also through the effect of increased endogenous cortisol levels on cerebral neurotransmission and serotonin levels. The relationship with dementia is strengthened by genetic studies. APOE genotype has been associated with recovery from delirium

Neurotransmitter Abnormalities in Delirium

Abnormality	Supporting evidence
Cholinergic deficiency	Anticholinergic drugs are a common precipitant of delirium Patients with impaired cholinergic transmission (eg Alzheimer’s disease) are at increased risk of delirium Serum anticholinergic activity is increased in patients with delirium Cholinergic inhibition produces EEG changes similar to those in delirium
Dopaminergic excess	A reciprocal relationship exists between cholinergic and dopaminergic activity in the brain Dopaminergic drugs are not uncommon precipitants of delirium Dopamine antagonists (eg Haloperidol) can be used to treat symptoms of delirium
Serotonin excess or deficiency	Serotonin is increased in patients with septic delirium Serotonin agonists can cause a delirium with psychotic features
GABA excess or	Decreases in CNS GABA levels have been shown in patients with

deficiency	benzodiazepine- and alcohol-withdrawal delirium GABAminergic drugs are well recognised causative agents in delirium
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Risk Factors for Delirium

There are a huge number of factors that may predispose or precipitate an episode of delirium which are listed in the table. Patients with a number of predisposing factors may need only a minor trigger to develop delirium, whereas less vulnerable patients with little co-morbidity may develop delirium only as a result of multiple insults. Risk factors for delirium, both prevalent and incident, can be thought of in terms of the individual, the environment and the insult. These are listed in the side column.

No examination of a patient with delirium is complete without a thorough examination of the drug chart, or GP letter listing medications used. Even one off doses of drugs can cause acute delirium. Medications with significant anticholinergic activity are important causes of delirium. Also look for sedatives, opiates and even high dose steroids.

The likeliest precipitants for patients presenting to hospital with delirium (i.e. prevalent delirium) are listed below with approximate frequency:

Other Causes of Prevalent Delirium

Cause	Cases %
Infections eg Chest, Urinary, other	20-40
Drugs due to toxicity or withdrawal	20-40
Metabolic abnormalities -Fluid and Electrolyte imbalance -Hypo- or Hyperglycaemia	5-10
Neurological – stroke, space occupying lesion	5-10
Malignancy	5

Patient Assessment and Investigation

All patients presenting to hospital with falls, syncope, stroke or behavioural disturbance as well as the elderly should have their mental state assessed on admission and as required during hospital stay. Once a diagnosis of delirium has been made, it is important to target investigations to potential risk factors and precipitants. Investigations are listed above.

Management of the Patient with Delirium

MANAGEMENT

Treat the precipitant - Treat any infection, Correct electrolyte abnormalities and hypoxia, Withdraw incriminated drugs, Ensure adequate pain control

Address Risk Factors - Ensure adequate nutrition, Check patient has their hearing aids and glasses available, Avoid adding medications, Monitor bowel and bladder function and address problems early, Avoid ward/bay moves

Environmental Factors - Adequate but time-relevant lighting, Well sign-posted ward, Visual clues to orientation (clocks, calendars, newspapers), Avoid noise irritants (cardiac monitors, pump alarms), Avoid restraints and allow to wander where safe to do so, Ensure staff members introduce themselves and explain treatments, Try to enable continuity of care, Encourage visits from family and friends

Once it is established that a patient is delirious a multidisciplinary holistic approach to management is essential. In practical terms this means addressing the risk factors, precipitants and environmental factors.

A calm, relaxed approach to patients with delirium can usually settle most episodes of aggression. However, if a patient remains at risk to themselves or others as a result of hyperactive delirium, is extremely distressed or co-operation is required for investigation, sedation may be considered. As sedative drugs carry a risk of worsening the delirium, the lowest possible dose should be used, and increased where necessary. Haloperidol is the usual first-line medication with Lorazepam as an alternative. Delirium secondary to alcohol withdrawal should be treated as per usual guidelines.

Management of patients with delirium in specialist units does improve adherence to best practice, but is uncommon in the UK at present. Given the prevalence rates within the hospital environment, it is essential that all healthcare workers have a good understanding of delirium and it's management, with the option of specialist input from Geriatricians, Psychiatrists and Nurse Specialists where required.

Patients with delirium should be reviewed on a regular basis during admission and following discharge in view of the high risk of developing complications (e.g. falls, pressure sores),

recurrent delirium or dementia. This includes patients discharged to Nursing or Residential Care, as an improvement in mental status may allow the patient to step-down to alternative accommodation, including their own home, months or even years after the initial delirium. For this reason, communication with primary care is essential.

Communication with both the patient and their carers is vital during and after an episode of delirium, and should include information relevant to the underlying cause, management and prognosis. The presence of delirium does not necessarily mean a patient is incompetent to make healthcare and other decisions, and their capacity to do so may alter over the course of their stay.

There is currently insufficient evidence that most management strategies improve outcomes. However, identification of at-risk patients and avoidance of precipitants has been shown to reduce the incidence of delirium in medical and surgical patients. By identifying at risk patients and caring for them as you would patients with delirium, it may be possible to prevent up to a third of cases.

A Practical Guide

Insulin conversion in the elderly and subsequent safe discharge

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Elderly patients who are on maximum doses of oral hypoglycaemic agents may need to commence insulin if their blood sugars are not controlled. However, in some elderly patients, the traditional blood glucose target of between 4-7mmol/l could potentially be more relaxed. The aim should be a reasonable level of glycaemic control in order to prevent admissions due to excessive hyperglycaemia, whilst (importantly) preventing hypoglycaemic episodes. Prevention of hypoglycaemia in the elderly can help prevent falls and episodes of confusion among other complications, and can lead to increased quality of life.

If a patient is already on oral hypoglycaemics the the addition of a long acting, once daily insulin may be enough to maintain adequate glycaemic control. This could be in combination with some of their existing medications. The NICE guidelines can help in deciding suitable combinations. Care is needed in adding insulin to sulphonylureas. The advantage of once daily insulin is to minimise the number of injections per day, so it is easier for the patient (or if necessary, practical for the district nurses) to manage.

Learning points

Diabetic control in the elderly should be pragmatic and aimed at preventing excessive hyperglycaemia and preventing hypoglycaemia

Once daily insulins may be useful and in some cases can be self administered

Involvement of the Inpatient Diabetes Specialist Nurse who performs many critical roles is vital prior to discharge

The General practitioner, District nurse and Community Diabetes Nurse Specialist are all key to the ongoing management post discharge.

Once daily insulin preparations include Insulatard, and Levemir. Insulatard comes in a cartridge that fits into a pen so the patient must have a reasonable level of dexterity and reasonable vision in order to be able to dial up and inject the insulin. We are currently not initiating treatment with Glargine. Levemir can be dispensed in a similar pen, or in a disposable device called an INNOLET. This requires less visual acuity and less dexterity, giving elderly people more control and autonomy over the management of their diabetes

Different devices for insulin administration



If adequate glycaemic control is not achieved through use of once daily insulin, a twice daily 'mix' insulin may be the next step. This is a pre-mixed insulin incorporating both long acting and short acting insulin. Examples are Novomix 30 or Mixtard 30. The '30' means they consist of a mix of 30% short acting, and 70% long acting insulins. Mixtard 30 can also be used with an INNOLET device, making it useful for those with reduced dexterity or visual acuity.

If an elderly patient is being discharged from hospital with a new prescription of insulin, it is essential they see the Inpatient Diabetes Specialist Nurse (DSN) prior to discharge. The DSN will

- teach self injection techniques
- teach home blood glucose monitoring
- discuss recognition and management of hypoglycaemia
- provide ongoing contact after discharge for advice
- inform the GP that the patient has been commenced on insulin

When the patient is discharged, a District Nurse referral should also be sent. If the patient is new to insulin injection, then the District Nurse can provide supervision for the first couple of

weeks to ensure injection technique and confidence. If the patient is unable to administer their own insulin despite use of appropriate devices, then the District Nurses can give it for them. If the District Nurse will be giving a once daily insulin injection, it is best prescribed for about 10am rather than as an evening dose.

There is also a Community Diabetes Nurse Specialist service to which patients can be referred. This can be very helpful for patients who are less straightforward, and for those who may need insulin dose titration. The inpatient DSN will be able to recommend patients suitable for referral, and can also provide details on the referral process.

For further information on medication choices in diabetes, please see the NICE guidance.

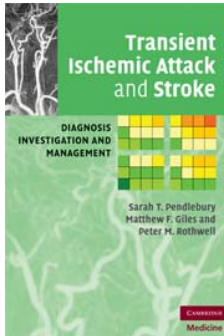
[Http://www.NICE.org.uk](http://www.NICE.org.uk)

Links and Reviews

Links

- **British Geriatric Society** <http://www.bgs.org.uk/>
- RCP – National clinical guideline for diagnosis and initial management of acute stroke and transient ischaemic attack (TIA) <http://www.rcplondon.ac.uk/pubs/contents/9c4488ac-d8f1-43d8-b9da-b801441bcdfb.pdf>
- RCP - National clinical guideline for stroke 3rd edition <http://www.rcplondon.ac.uk/pubs/contents/6ad05aab-8400-494c-8cf4-9772d1d5301b.pdf>
- American Heart association Guidelines for the Early Management of Adults With Ischemic Stroke <http://stroke.ahajournals.org/cgi/reprint/38/5/1655>
- British association of Stroke Physicians <http://www.basp.ac.uk/>

Book review



Transient Ischaemic Attacks and Stroke – Pendlebury, Giles and Rothwell. Cambridge Medical 2009

This book has just been released and comes from the leading group of Oxford stroke physicians. It is a comprehensive and broad assessment of stroke medicine and contains basically everything that a stroke trainee should know. The authors have done an excellent job and I doubt that it will be long before this will be the standard stroke textbook at least in the UK though I do note the Americanized spelling and its origin from the US side of Cambridge University press. There are detailed chapters on clinical diagnosis, imaging, epidemiology and risk factors, prognosis and treatment and much more. The book is littered with useful facts which are just not mentioned or explained in other texts. There are comprehensive reviews of the literature and references are detailed and useful. It is not often that a book so densely packed with useful information and still maintains its readability. Highly recommended for all of those involved or interested in stroke management.

Trivia – nearly last but not least this issue's question is ...

We all use it but where does the name Warfarin come from ?