Clinical Review

Clinical Review identifies issues in the medical literature of interest to clinicians in Africa. Essential references are given at the end of each section

AIDS Review

The year 2010 will be remembered for some inspiring rhetoric about halting the HIV/AIDS epidemic, continued good progress with scaling up antiretroviral therapy (ART) in low- and middle-income countries, and some notable advances in HIV prevention efforts. However, these accomplishments are tempered by the unwelcome realisation that the global HIV/AIDS response is threatened by global recession, massive debt in donor nations, and competing demands in health and other arenas. The theme underpinning the XVIII International AIDS Conference in Vienna, Austria, in July 2010 was 'Rights Here, Right Now', and this was also adopted by the World Health Organization (WHO) for World AIDS Day with Dr Margaret Chan calling on all sectors to protect human rights, including the right to health, and to combat discrimination. In May 2010, the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM) launched the 'Born HIV Free' campaign to mobilise public support for its work and for a world where no child is born with HIV after 2015. This campaign was supported by UNAIDS with their trumpet call for the 'three zeros' – zero new HIV infections, zero discrimination, and zero AIDS-related deaths.

Epidemiology of HIV/AIDS

The new 2010 UNAIDS report shows that the spread of HIV is beginning to reverse.[1] In 2009, there were an estimated 2.6 million new HIV infections, 1.8 million of which occurred in sub-Saharan Africa. This is nearly 20% fewer than the 3.1 million new infections that occurred 10 years earlier. In 33 countries, 22 of which are in sub-Saharan Africa, HIV incidence has fallen by more than 20% between 2001 and 2009, reflecting several factors that include the impact of HIV prevention efforts and the natural course of the HIV epidemic. There were an estimated 33.3 million people living with HIV/AIDS in 2009, compared with 26.2 million in 1999, this increase being due to a reduction in AIDS-related deaths consequent on the scaling up of antiretroviral therapy over the past few years. AIDS-related deaths among adults and children totalled 1.8 million in 2009.

Sub-Saharan Africa continues to bear an inordinate share of the global burden of HIV/AIDS, with an estimated 22.5 million people living with HIV (68% of the global total), with more of these being women, and 1.3 million AIDS-related deaths (72% of the global total).[1] The epidemics on the continent vary considerably, with southern Africa still the most severely affected: in 2009, 34% of all people living with HIV, 31% of new infections, and 34% of all AIDS-related deaths occurred in the 10 countries in southern Africa. South Africa's epidemic remains the largest in the world, with 5.6 million people living with HIV/AIDS. Since 2000, the epidemics in East Africa have declined or are stabilising, while those in West and Central Africa remain at comparatively low levels with many countries having adult HIV-prevalence rates of 2% or less.[1]

Although men who have sex with men (MSM) and injecting drug use feature in some of the region's epidemics, unprotected heterosexual intercourse and onward HIV transmission to newborns and breastfed babies continue to be the main drivers of the African epidemic. As these heterosexual epidemics evolve, the numbers of discordant couples (i.e. only one person of a couple is infected with HIV) increase. Research in 14 African countries shows that the prevalence of discordant couples is high, ranging from 35% to 85% and with women being as likely as men to be the HIV-positive index partner.[2] Prevention strategies currently do not adequately address these patterns of HIV transmission.

HIV treatment

At the end of 2009, 5.25 million people were reported to be receiving ART in low- and middle-income countries.[3] Sub-Saharan Africa had the greatest increase in the absolute number of people receiving treatment in 2009, from 2 950 000 in December 2008 to 3 910 000 1 year later. The WHO 2010 Guidelines recommend treatment initiation at CD4 cell counts at or below 350 cells/μL,[4] and, based on these criteria, ART coverage in sub-Saharan Africa was up to 37% from 28% 1 year previously: in Eastern and Southern Africa coverage was at 41%.

Many people receiving ART in Africa start treatment late, resulting in high patient attrition within the first year of starting ART. A randomised controlled trial in Haiti showed convincingly that early initiation of ART in HIV-infected patients at CD4 counts of 200–350 cells/μL was associated with lower risks of death and incident tuberculosis compared with waiting until CD4 counts had dropped to below 200 cells/uL.[5] This landmark study shows a clear benefit to starting treatment earlier rather than later, and supports the new WHO recommendations to start ART at higher CD4 counts of 350 cells/μL or less.

Retention on therapy and adherence to treatment are on-going concerns for ART programmes throughout the region. In Kenya, patients on ART were randomised to receive weekly mobile phone short message service (SMS) intervention messages from a clinic nurse or standard care (see *Medicine Review* on page 51).[6] The results support the use of ever expanding technology, such as cell phones, for healthcare interventions.

HIV prevention

HIV prevention efforts have continued to lag behind those of treatment and care, with two new HIV infections occurring for every one person started on ART.[1]

Access to services for preventing mother-to-child transmission (PMTCT) in low- and middle-income countries improved in 2009, albeit slowly. Twenty-six percent of pregnant women received an HIV test in 2009, up from 21% in 2008, and 53% of HIV-infected pregnant women in the region received antiretroviral drugs to prevent mother-to-child transmission, up from 45% in 2008.[1] However, early infant diagnosis remains problematic, and in 54 reporting countries only 15% of children born to HIV-infected mothers were tested for HIV in the first 2 months of life.

Biomedical interventions for HIV prevention in sub-Saharan Africa continue to focus on condom use, treatment of sexually transmitted infections, male circumcision, and quality-assured screening of blood for transfusion. Progress has been made in scaling up male circumcision: as of January 2010, over 130 000 male circumcisions had been carried out in six countries providing data on service delivery.[3] The safety of blood transfusions, however, remains questionable in many health facilities, with less than 50% of blood transfusions being screened in a quality assured manner in 2009.[3]

The PRO2000 vaginal gel study for prevention of HIV infection among over 9000 women in South Africa, Tanzania, Uganda, and Zambia showed a disappointing failure of efficacy, after a much heralded and promising interim analysis 1 year earlier.[7] However, this set-back was counter-balanced by an important randomised controlled study in South Africa (The Centre for the AIDS Program of Research in South Africa [CAPRISA] 004 trial) which demonstrated the effectiveness and safety of a 1% vaginal gel formulation of tenofovir for the prevention of HIV acquisition in women.[8] Protective efficacy was 39% overall, and 54% in women with high gel adherence. These encouraging findings could fill an important HIV prevention gap, especially for women unable to successfully negotiate mutual monogamy or condom use.

Another randomised multi-country trial (South Africa being one of the included countries) amongst HIV-negative men and transgender women (born male) who have sex with men showed that pre-exposure prophylaxis with two oral ART drugs (tenofovir and emtricitabine) was associated with a 44% reduction in HIV incidence compared with placebo, the prophylactic effect being strongly correlated with detectable blood levels of the two drugs.[9] On-going clinical trials will assess protective efficacy in other high-risk groups, and will also determine whether intermittent ART prophylaxis before risk exposure provides similar levels of efficacy.

The exciting and positive news of ART-based vaginal microbicides and pre-exposure oral ART prophylaxis opens up alternative HIV preventive options, and for discordant couples in Africa, these interventions might prove to be feasible and effective.

Finally very early ART may provide a way forward for prevention of generalised African HIV epidemics. Mathematical modelling suggests that a strategy of universal annual HIV testing followed by immediate ART (by making infected individuals less infectious) may curb HIV incidence by 95% within 10 years. Although this is a promising and potential approach, acceptability, feasibility and effectiveness need to be assessed.[10]

HIV prevention and treatment – financing the future response

At the third replenishment conference for the GFATM in October 2010, donors pledged US$11.7 billion from 2011 to 2013 in contrast to the 20 billion that is required to meet the target of universal access. This sum is enough to cover existing grants, payments for Round 9 and operating costs, leaving an insufficient US$2.9 billion for Rounds 10, 11, and 12. The funding shortfall reflects the effects of the global economic crisis, which may continue long into the future. The GFATM needs to think clearly about its priorities, maybe reducing financial support for middle-income countries and concentrating more on low-income countries that are more dependent on external financial support. Sub-Saharan Africa also needs to take stock. The continent should take on far greater responsibility for this epidemic than it has done in the past, and will have to work out how it is going to sustain the HIV response through a combination of strategic internal and external partnerships.

Anthony D Harries,
International Union against Tuberculosis and Lung Disease, Paris, France and
London School of Hygiene and Tropical Medicine, London, UK;
and Rony Zachariah, Médecins sans Frontières, Medical Department, Operational Research Unit, Brussels Operational Centre, Luxembourg

References

1. Global Report: UNAIDS report on the global AIDS epidemic 2010. UNAIDS/10.11E / JC1958E.
2. Eyawo O, de Walque D, Ford N, et al. HIV status in discordant couples in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Infect Dis* 2010; 10: 770–7.
3. WHO, UNAIDS, UNICEF. *Towards Universal Access. Scaling up priority HIV/AIDS interventions in the health sector*. Progress Report 2010. WHO, Geneva, 2010.
4. WHO. *Antiretroviral therapy for HIV infection in adults and adolescents. Recommendations for a public health approach*. 2010 Revision. WHO, Geneva, 2010.
5. Severe P, Juste MAJ, Ambroise A, et al. Early versus standard antiretroviral therapy for HIV-infected adults in Haiti. *N Engl J Med* 2010; 363: 257–65.
6. Lester RT, Ritvo P, Mills EJ, et al. Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTelKenya1): a randomised trial. *Lancet* 2010; 376: 1838–45.
7. McCormack S, Ramjee G, Kamali A, et al. PRO2000 vaginal gel for prevention of HIV-1 infection (Microbicides Development Programme 301): a phase 3, randomised, double-blind, parallel-group trial. *Lancet* 2010; 376: 1329–37.
8. Abdool Karim Q, Abdool Karim SS, Frohlich JA, et al. Effectiveness and safety of tenofovir gel, an antiretroviral microbicide, for the prevention of HIV infection in women. *Science* 2010; 329: 1168–74.
9. Grant RM, Lama JR, Anderson PL, et al. Pre-exposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med* 2010; 393: 2587–99.
10. Zachariah R, Harries AD, Philips M, et al. Antiretroviral therapy for HIV prevention: many concerns and challenges, but are there ways forward in sub-Saharan Africa? *Trans R Soc Trop Med Hyg* 2010; 104: 387–91.

Medicine Review

Cinnamon for diabetes

During my years working in Africa I came across a number of diabetic patients who claimed to be getting effective treatment from traditional practitioners. Once I was shown a brown powder which had been given to a patient by a herbalist, and I remember that it smelt strongly of cinnamon. There have been reports of cinnamon reducing blood glucose levels in the past, but study designs have been variable and results inconclusive. Recently, however, a properly designed and adequately powered trial has been carried out in the UK, randomly comparing cinnamon with placebo in type 2 diabetes.[1]

Type 2 patients on oral hypoglycaemic agents (OHA) only were recruited (i.e. not on insulin), with an HbA_{1c} level over 7.0%. Patients were randomised to receive either 2 g of cinnamon or placebo, for a total of 12 weeks. Mean HbA_{1c} was unchanged in the placebo group, but fell from 8.2% to 7.9% in those treated with cinnamon ($p<0.005$). Interestingly, there was also a reduction in blood pressure (BP) – 4 mm systolic and 5 mm diastolic (again, with no change in the placebo group). There were also beneficial changes in waist circumference, body mass index (BMI), and fasting plasma glucose (FPG).

These are certainly interesting results. The fall in HbA_{1c}, though significant, was relatively small; and perhaps the fall in blood pressure is of more significance (4 mm systolic and 5 mm diastolic in the 12 week observation period). Hypertension is known to be a stronger marker of mortality in type 2 diabetes than hyperglycaemia. The mechanism for the effect of cinnamon on either blood glucose or blood pressure is unknown.

What lessons can be learnt from this research? Firstly, it demonstrates that there are natural plant and herbal treatments in common use by traditional practitioners in Africa that are pharmaceutically active. Secondly, it shows that these preparations may form the basis of future orthodox drugs, subject to full safety and efficacy trials of course.

HIV treatment by mobile phone?

A recent paper in the *Lancet* shows how modern communication technology can improve the effectiveness of AIDS treatment.[2] Despite being one of the poorest areas in the world, mobile phone usage in sub-Saharan Africa is surprisingly widespread. A collaborative group of workers from Canada and Kenya here recently explored utilising this technology to see if adherence to anti-retroviral therapy (ART) in AIDS patients could be improved. The researchers used what we in Europe call 'texting' but what is generally known in Africa as 'SMS' (short-message service).

A total of 581 Kenyan patients with HIV infection were randomised to either 'standard intervention' (265) or 'SMS support' (273). The latter group received a weekly text message from a health worker enquiring how they were ('Mambo?' in kiSwahili), and inviting a dialogue between patient and health worker, with interventions if necessary. Outcome was measured by self-reported treatment adherence, and suppression of viral load (to less than 400 copies per ml). Adherence was 62% in the SMS group compared with 50% in the group with standard care ($p=0.006$). Viral suppression occurred in 57% of the SMS group and 48% of the controls ($p=0.04$).

Mobile phones have been previously used to improve adherence and treatment effectiveness. However, this is the first report showing a positive effect of text messaging as a health support technique for AIDS patients in Africa. Mobile phone use in the continent is already high, and is rapidly rising. This technique is a welcome addition to current management systems. It could usefully be extended to the management of a number of other diseases – notably chronic conditions such as diabetes, hypertension, and asthma.

Male circumcision and AIDS

The positive effects of male circumcision on reducing the risk of HIV transmission are well known and accepted. However, this has not been widely translated into public health policy. Uganda has now launched a campaign which ambitiously hopes to increase the proportion of circumcised adult men to 40% within the next 5 years.[3]

The campaign is known as 'SMC' or 'Safe Male Circumcision', and is being rolled out as an addition to existing public health measures such as abstinence, fidelity, and condom use. To help increase uptake, traditional circumcisers are being trained to carry out the procedure safely, and to use proper sterile techniques.

The campaign is not without its problems, as acknowledged by the Ugandan authorities. There are widespread concerns among young males that sexual performance will reduce after circumcision, or that prolonged abstinence will be needed after the operation. In fact, the latter misconception is something of a problem, as it is vital that sex without protection is avoided until the operative wounds are fully healed (about 3 weeks) – otherwise there is a significantly increased risk of HIV infection.

Circumcision can reduce the risk of HIV infection by up to 60%, and is recommended by the World Health Organization as an evidence-based prevention procedure. Uganda should be congratulated in taking on circumcision as an effective but socially difficult HIV control method.

Surgery for hypertension

It seems strange to think of hypertension as a disease that may be potentially treated by a surgical procedure, but a recent study describes the effect of endovascular renal sympathetic denervation on hypertensive patients.[4] The technique involves inserting a catheter into the renal artery, and delivering radiofrequency waves which can ablate the perivascular autonomic nerves.

The present study was a randomised controlled trial, comparing 52 patients who underwent autonomic denervation with 54 controls. After 6 months there was a mean blood pressure (BP) reduction of 32/12 mm (systolic/diastolic) though both figures had a wide standard deviation (32±23 mm systolic, 12±11 mm diastolic). Nevertheless, over 80% of the patients had a reduction

in systolic BP of over 10 mm. Defining the place of this treatment in the future is difficult. Longer-term studies are certainly needed, as there is a theoretical possibility of nerve regrowth. Patients with poorly controlled, drug-resistant hypertension may be suitable candidates, though possibly in the distant future this could be a standard treatment for hypertension, which is the commonest of non-communicable diseases, with devastating potential long-term complications.

Professor Geoff Gill,
Liverpool School of Tropical Medicine and
University Hospital Aintree, UK

References

1. Akilen R, Tsiami A, Devendra D, Robinson N. Glycated haemoglobin and blood pressure – lowering effect of cinnamon in multi-ethnic type 2 diabetic patients in the UK: a randomised, placebo-controlled, double-blind clinical trial. *Diabetic Medicine* 2010; 27: 1159–67.
2. Lester RT, Ritvo P, Mills EJ et al. Effects of a mobile phone short message service on anti-retroviral treatment adherence in Kenya (WelTel Kenya I): a randomised trial. *Lancet* 2010; 376: 1838–45.
3. Wakabi W. Uganda steps up efforts to boost male-circumcision. *Lancet* 2010: 376: 757–8.
4. Simplicity HTN-2 Investigations. Renal sympathetic denervation in patients with treatment-resistant hypertension (The Simplicity HTN-2 Trial): a randomised controlled trial. *Lancet* 2010: 376: 1903–9.

Paediatrics Review

Oxygen and neonatal resuscitation: dangers of high concentration

Oxygen was discovered by an English clergyman and amateur chemist, Joseph Priestly, in 1774.[1] However, he warned that 'the air which nature has provided us may be as good as we deserve.' In 1780 Chaussier used oxygen for newborns with failure to establish normal respiration and it has continued to be used in various forms for newborns ever since.[1] Retrolental fibroplasia, now known as retinopathy of prematurity (ROP) was described by Terry in 1942 and in the 1950s it was found that many children in institutions for the blind had been preterm and exposed to supplemental oxygen in the neonatal period, usually in incubators which were developed in the US in the 1940s.[1] This led to a practice of restriction of oxygen which was followed by a reduction in the incidence of ROP but, in parallel, an increase in neonatal mortality especially from hyaline membrane disease.

Oxygen is toxic to lung tissue and the immature brain especially through generation of free radicles.[2–4] Up until two decades ago 100% oxygen was regarded as the ideal concentration for neonatal resuscitation. A pilot study in New Delhi in 1993[5] followed in 1998 by a multicentre study in ten centres from six countries (n=609 infants),[6] compared room air (21% O_2) with 100% oxygen for resuscitation of newborns with asphyxia. A number of the studies were undertaken in developing countries. Room air was safe and resulted in a better outcome but this was not statistically significant. In 2004, a systematic review and meta-analysis of studies of newborn resuscitation with either 100% oxygen or room air concluded that room air could be safely used with oxygen reserved as back-up if initial resuscitation failed.[7] A recent updated meta-analysis of ten studies (six randomised) found a significant reduction in neonatal mortality and a trend towards reduction in risk of severe hypoxic–ischaemic encephalopathy in infants resuscitated in air.[8] Neonatal mortality was reduced from 12.8% in the oxygen to 8.2% in the room-air group (relative risk (RR) 0.69, 95% confidence interval (CI) 0.54–0.88).[3]

The following are adverse effects associated with resuscitation with 100% oxygen: increased neonatal mortality; evidence of increased oxidative stress at least 4 weeks after birth; increased myocardial and kidney injury; and delayed recovery from asphyxia.[9]

Oxidative stress may induce DNA damage and thus might be a factor in the occurrence of cancer.[2] A case control study in Sweden of 578 children with leukaemia and randomised selected controls, all of whom had been resuscitated with 100% oxygen with a facemask immediately post-partum, found an increased risk of leukaemia (odds ratio (OR)=2.57, 95% CI 1.21–6.82).[10] A study in USA found an association between exposure to neonatal oxygen supplementation for 3 minutes or longer and cancer in childhood especially in those under 12 months.[11]

There is a paucity of information on management of resuscitation in preterm infants. Preterm infants are more prone to oxidative stress than term infants. The pre-oligodendrocyte is extremely vulnerable to oxidative stress, there are low antioxidant levels in the preterm brain and excess free iron if there is intraventricular haemorrhage.[2] A two-centre, prospective, randomised controlled trial was undertaken in neonates of 23–32 weeks gestation, who were initially resuscitated with 100% oxygen (n=23) or room air (n=18).[12] Resuscitation using room air was inadequate to achieve the target oxygen saturation by 3 minutes. In a similar study of infants ≤ 28 weeks who required active resuscitation, the high oxygen group received FiO_2 (fraction of inspired oxygen) of 90%.[13] In the former group FiO_2 was decreased every 60–90 seconds in 10% steps if the infant was stable; in the latter group oxygen was increased if there was bradycardia. It was concluded that initial resuscitation of extremely low gestation infants can be safely undertaken with FiO_2 of around 30% and subsequently increased as required

Since 2006 a number of countries recommend room air for basic neonatal resuscitation of the newborn, viz. Canada, Australia, Sweden, Finland, UK, Netherlands, Belgium, Spain, and Russia.[3] However, up until now neither the American Academy of Pediatrics[14] nor the International Liaison Committee on Resuscitation (ILCOR)[3] have endorsed the policy.

In industrialised countries, facilities (e.g. air/oxygen blenders, and pulse oximeters) are available to commence resuscitation with 21% oxygen and titrate it according to the infant's oxygen saturation. In developing countries with limited equipment-term and near-term infants could be commenced on room air and then switched to 100% oxygen as required.

Resuscitation at birth and cognition at 8 years of age

It is generally presumed that if a newborn requires resuscitation for birth asphyxia and has no symptoms of encephalopathy in the neonatal period there should be no neurodevelopmental sequelae.

To test this hypothesis three groups of infants were selected from the Avon Longitudinal Study of Parents and Children in Bristol, England:

(i) infants resuscitated at birth but who were asymptomatic for encephalopathy and had no further neonatal care (n=815);

(ii) those who were resuscitated and required neonatal care because of encephalopathy (n=58);

(iii) a reference group who were not resuscitated, were asymptomatic for encephalopathy and had no further neonatal care (n=10 609).[15]

Cognitive function was assessed at a mean of 8 years of age on the Weschler intelligence scale for children.

As expected risk of low IQ was highest in group (ii) (23.1%). However, an IQ <80 was also significantly more frequent in group (i) than in group (iii) (9.8 vs. 6.5% OR 1.65, 95% CI 1.13–2.43). This suggests that in infants requiring neonatal resuscitation there may be a continuum of risk ranging from severe neurodevelopmental impairment to asymptomatic children but with a low IQ at school age. However, to demonstrate that group (i) children had lower IQ due to asymptomatic neonatal hypoxic–ischaemic encephalopathy requires more in-depth studies including results of foetal monitoring, and biochemical, EEG and neuroimaging investigations in infancy.[16] Also, some infants with a prenatal brain defect might require resuscitation at birth due to delay in establishing respiration but not because of perinatal asphyxia. Thus, requirement for neonatal resuscitation does not necessarily equate to hypoxic–ischaemic encephalopathy unless there is more objective evidence. Further studies are required on this very important subject.

J B S Coulter,
Honorary Clinical Lecturer in Tropical Child Health,
Liverpool School of Tropical Medicine, UK

References

1. Silverman WA. A cautionary tale about supplemental oxygen; the albatross of neonatal medicine. *Pediatrics* 2004; 113: 394–6.
2. Robertson NJ. Air or 100% oxygen for asphyxiated babies? Time to decide. *Crit Care* 2005; 9:128–30.
3. Saugstad OD. Resuscitation of newborn infants: from oxygen to room air. *Lancet* 2010; 376: 1970–1.
4. Vento M, Asensi M, Sastre J, et al. Six years of experience with the use of room air for the resuscitation of asphyxiated newly born term infants. *Biol Neonate* 2001; 79: 261–7.
5. Ramji S, Ahuja S, Thirupuram S, et al. Resuscitation of asphyxic newborn infants with room air or 100% oxygen. *Pediatr Res* 1993; 34: 809–12.
6. Saugstad OD, Rootwell T, Aalen O. Resuscitation of asphyxiated newborn infants with room air or oxygen; an international trial: the Resair 2 study. *Pediatrics* 1998; 102: e1.
7. Davis PG, Tan A, O'Donnell CP, et al. Resuscitation of newborn infants with 100% oxygen or air: a systematic review and meta-analysis. *Lancet* 2004; 364: 1329–33.
8. Saugstad OD, Ramji S, Soll RF,et al. Resuscitation of newborn infants with 21% or 100% oxygen: an updated systematic review and meta-analysis. *Neonatology* 2008; 94: 176–82.
9. Saugstad OD, Ramji S, Vento M. Oxygen for newborn resuscitation; how much is enough? *Pediatrics* 2006; 118: 789–92.
10. Naumburg E, Bellocco R, Cnattingius S, et al. Supplementary oxygen and risk of childhood lymphatic leukaemia. *Acta Pediatr* 2002; 91:1328–33.
11. Spector LG, Klebanoff MA, Feusner JH, et al. Childhood cancer following neonatal oxygen supplementation. *J Pediatr* 2005; 147: 27–31.
12. Wang CL, Anderson C, Leone TA, et al. Resuscitation of preterm neonates by using room air or 100% oxygen. *Pediatrics* 2008; 121: 1083–9.
13. Escrig R, Amuza L, Izquierdo I, et al. Achievement of targeted saturation values in extremely low gestation age neonates resuscitated with low or high oxygen concentrations : a prospective, randomized trial. *Pediatrics* 2008; 121: 875–81.
14. American Academy of Pediatrics. Special report. Pediatric Life Support:2010 American Heart Association Guidelines for Cardiopulmonary Emergency Cardiovascular Care. *Pediatrics* 2010; 126: e1345–60.
15. Odd DE, Lewis G, Whitelaw A, et al. Resuscitation at birth and cognition at 8 years of age: a cohort study. *Lancet* 2009; 373: 1615–22.
16. Hack M, Stork E. Resuscitation at birth and long-term follow-up. *Lancet* 2009; 373; 1581–2.

Africa HEALTH CPD Challenge
See page 53 for questions about this article