Sir,

Red reflex mimicking lens subluxation in a child undergoing orthokeratology

The red reflex or Bruckner test uses transmission of light from an ophthalmoscope through the subject's eye and comparison of the reflexes to assess strabismus, anisometropia, or any abnormality of the optical pathway.[1,2] The American Academy of Pediatrics currently recommends the assessment of the red reflexes in the neonatal period and during all subsequent routine physical examination visits.[3] We report a patient undergoing orthokeratology treatment who presented with abnormal red reflexes mimicking bilateral lens subluxation.

Case report

A 15-year-old neurodevelopmentally normal boy was seen in the paediatric neurology department after five episodes of generalized tonic–clonic seizures. He was referred for ophthalmology consultation, because his abnormal red reflexes suggested bilateral lens subluxation. On direct questioning, the patient reported that he had recently started orthokeratology treatment, wearing rigid contact lenses overnight for the previous 2 weeks to correct myopia of −4.0 D, OU. On examination, his uncorrected visual acuity was 20/20 in each eye. The Bruckner test showed abnormal red reflexes simulating lens subluxation (Figure 1), and the slit-lamp examination revealed corneal distortion, but no lens subluxation. The remainder of the eye examination was unremarkable.

Comment

The principle of orthokeratology is to flatten the central cornea by wearing rigid contact lenses overnight to temporarily correct low-to-moderate myopia.[4] The Canadian Ophthalmological Society does not endorse this procedure as it carries significant risks to the health of eyes and vision.[5] Changes in corneal curvature occurs rapidly, with 60% of the refractive change seen after 1 h of lens wear.[4] These contact lens-induced corneal changes can cause abnormal red reflex similar to that of lens subluxation, a finding which has not been previously reported. Physicians should be aware that alteration of red reflexes can occur in patients undergoing orthokeratology treatment.

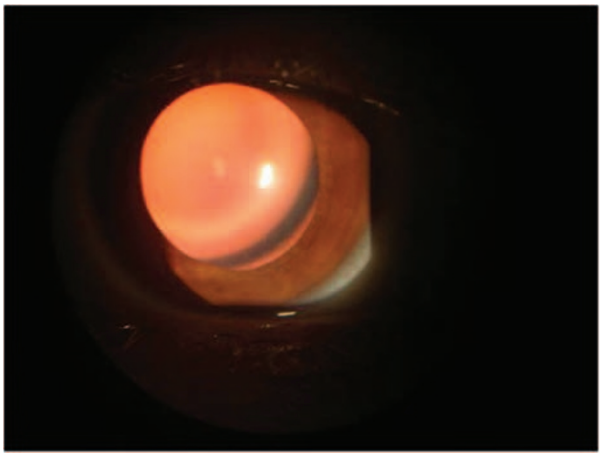

Figure 1 A slit-lamp view of the left eye of patient undergoing orthokeratology treatment; the red reflex mimicks lens subluxation.

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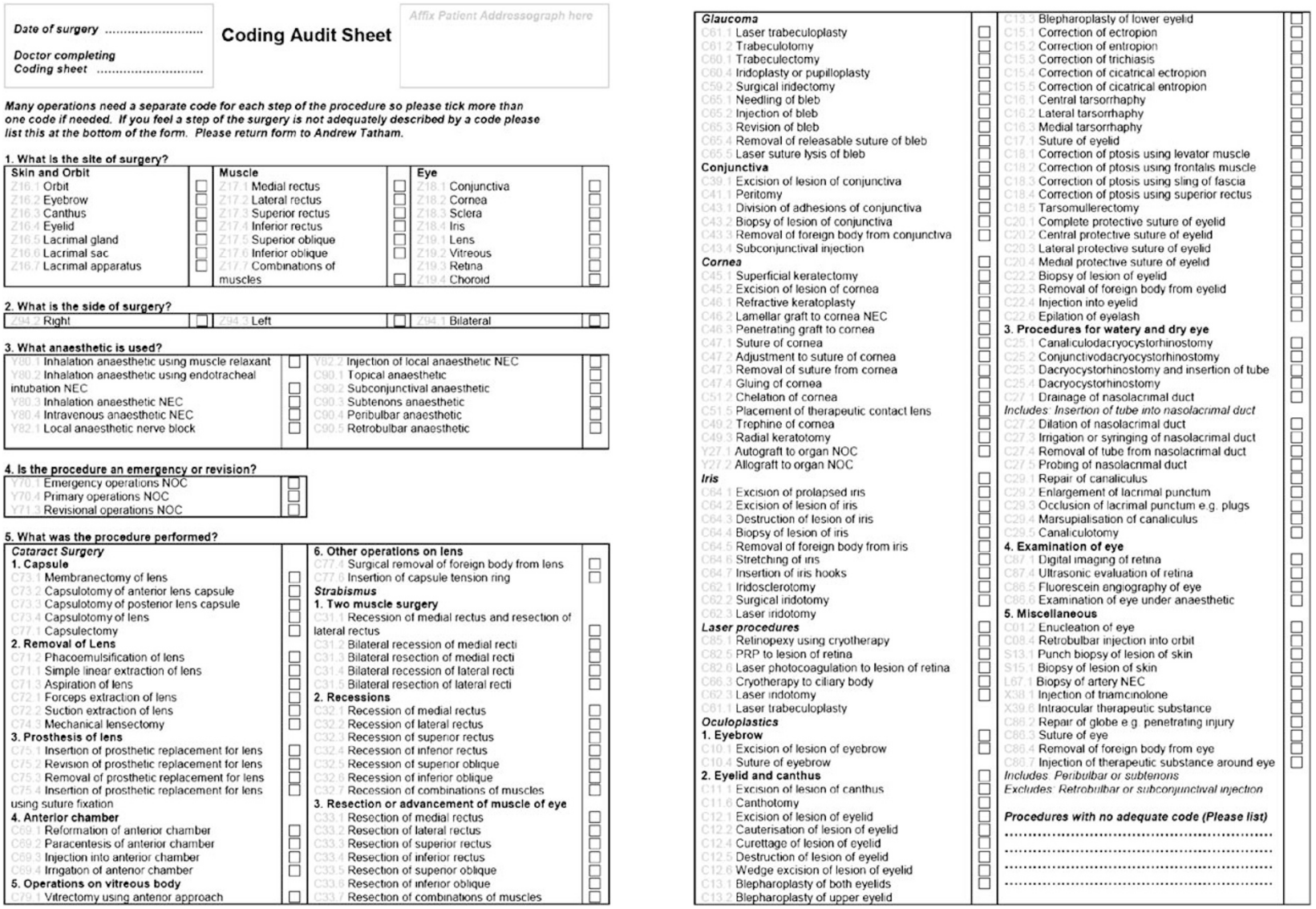
Sir,

Clinical coding of surgical procedures in the ophthalmology department

Clinical coding is a process by which descriptions of diseases, injuries or procedures are assigned a numeric or alphanumeric designation. Coding provides a mechanism for standardizing the recording of information and therefore, if accurate, is a valuable tool for audit, epidemiological studies, healthcare planning, and resource allocation.

In recent years clinical coding has become increasingly important and there are at least two main reasons for this. First, coded data is now used to calculate surgical complication statistics, which may be used to compare the performance of individual units or surgeons. If there are errors in clinical coding the reported complication rates will be inaccurate. Jain *et al*[1] examined 80 consecutive cataract extractions that had been coded by clinical coders as having had a surgical complication. Fifty percent of the patients were found to not actually



Date of surgery .....

Doctor completing Coding sheet .....

Coding Audit Sheet

Affix Patient Addressograph here

Many operations need a separate code for each step of the procedure so please tick more than one code if needed. If you feel a step of the surgery is not adequately described by a code please list this at the bottom of the form. Please return form to Andrew Tatham.

1. What is the site of surgery?

Skin and Orbit		Muscle		Eye	
Z16.1 Orbit	☐	Z17.1 Medial rectus	☐	Z18.1 Conjunctiva	☐
Z16.2 Eyebrow	☐	Z17.2 Lateral rectus	☐	Z18.2 Cornea	☐
Z16.3 Canthus	☐	Z17.3 Superior rectus	☐	Z18.3 Sclera	☐
Z16.4 Eyelid	☐	Z17.4 Inferior rectus	☐	Z18.4 Iris	☐
Z16.5 Lacrimal gland	☐	Z17.5 Superior oblique	☐	Z19.1 Lens	☐
Z16.6 Lacrimal sac	☐	Z17.6 Inferior oblique	☐	Z19.2 Vitreous	☐
Z16.7 Lacrimal apparatus	☐	Z17.7 Combinations of muscles	☐	Z19.3 Retina	☐
				Z19.4 Choroid	☐

2. What is the side of surgery?

Z94.2 Right	☐	Z94.3 Left	☐	Z94.1 Bilateral	☐

3. What anaesthetic is used?

Y80.1 Inhalation anaesthetic using muscle relaxant	☐	Y82.2 Injection of local anaesthetic NEC	☐
Y80.2 Inhalation anaesthetic using endotracheal intubation NEC	☐	C90.1 Topical anaesthetic	☐
		C90.2 Subconjunctival anaesthetic	☐
Y80.3 Inhalation anaesthetic NEC	☐	C90.3 Subtenons anaesthetic	☐
Y80.4 Intravenous anaesthetic NEC	☐	C90.4 Peribulbar anaesthetic	☐
Y82.1 Local anaesthetic nerve block	☐	C90.5 Retrobulbar anaesthetic	☐

4. Is the procedure an emergency or revision?

Y70.1 Emergency operations NOC	☐
Y70.4 Primary operations NOC	☐
Y71.3 Revisional operations NOC	☐

5. What was the procedure performed?

Cataract Surgery		**6. Other operations on lens**	
1. Capsule		C77.4 Surgical removal of foreign body from lens	☐
C73.1 Membranectomy of lens	☐	C77.8 Insertion of capsule tension ring	☐
C73.2 Capsulotomy of anterior lens capsule	☐	***Strabismus***	
C73.3 Capsulotomy of posterior lens capsule	☐	**1. Two muscle surgery**	
C73.4 Capsulotomy of lens	☐	C31.1 Recession of medial rectus and resection of lateral rectus	☐
C77.1 Capsulectomy	☐	C31.2 Bilateral recession of medial recti	☐
2. Removal of Lens		C31.3 Bilateral resection of medial recti	☐
C71.2 Phacoemulsification of lens	☐	C31.4 Bilateral recession of lateral recti	☐
C71.1 Simple linear extraction of lens	☐	C31.5 Bilateral resection of lateral recti	☐
C71.3 Aspiration of lens	☐	**2. Recessions**	
C72.1 Forceps extraction of lens	☐	C32.1 Recession of medial rectus	☐
C72.2 Suction extraction of lens	☐	C32.2 Recession of lateral rectus	☐
C74.3 Mechanical lensectomy	☐	C32.3 Recession of superior rectus	☐
3. Prosthesis of lens		C32.4 Recession of inferior rectus	☐
C75.1 Insertion of prosthetic replacement for lens	☐	C32.5 Recession of superior oblique	☐
C75.2 Revision of prosthetic replacement for lens	☐	C32.6 Recession of inferior oblique	☐
C75.3 Removal of prosthetic replacement for lens	☐	C32.7 Recession of combinations of muscles	☐
C75.4 Insertion of prosthetic replacement for lens using suture fixation	☐	**3. Resection or advancement of muscle of eye**	
4. Anterior chamber		C33.1 Resection of medial rectus	☐
C69.1 Reformation of anterior chamber	☐	C33.2 Resection of lateral rectus	☐
C69.2 Paracentesis of anterior chamber	☐	C33.3 Resection of superior rectus	☐
C69.3 Injection into anterior chamber	☐	C33.4 Resection of inferior rectus	☐
C69.4 Irrigation of anterior chamber	☐	C33.5 Resection of superior oblique	☐
5. Operations on vitreous body		C33.6 Resection of inferior oblique	☐
C79.1 Vitrectomy using anterior approach	☐	C33.7 Resection of combinations of muscles	☐

Glaucoma		C13.3 Blepharoplasty of lower eyelid	☐
C61.1 Laser trabeculoplasty	☐	C15.1 Correction of ectropion	☐
C61.2 Trabeculotomy	☐	C15.2 Correction of entropion	☐
C60.1 Trabeculectomy	☐	C15.3 Correction of trichiasis	☐
C60.4 Iridoplasty or pupilloplasty	☐	C15.4 Correction of cicatrical ectropion	☐
C59.2 Surgical iridectomy	☐	C15.5 Correction of cicatrical entropion	☐
C65.1 Needling of bleb	☐	C16.1 Central tarsorrhaphy	☐
C65.2 Injection of bleb	☐	C16.2 Lateral tarsorrhaphy	☐
C65.3 Revision of bleb	☐	C16.3 Medial tarsorrhaphy	☐
C65.4 Removal of releasable suture of bleb	☐	C17.1 Suture of eyelid	☐
C65.5 Laser suture lysis of bleb	☐	C18.1 Correction of ptosis using levator muscle	☐
Conjunctiva	☐	C18.2 Correction of ptosis using frontalis muscle	☐
C39.1 Excision of lesion of conjunctiva	☐	C18.3 Correction of ptosis using sling of fascia	☐
C41.1 Peritomy	☐	C18.4 Correction of ptosis using superior rectus	☐
C43.1 Division of adhesions of conjunctiva	☐	C18.5 Tarsomullerectomy	☐
C43.2 Biopsy of lesion of conjunctiva	☐	C20.1 Complete protective suture of eyelid	☐
C43.3 Removal of foreign body from conjunctiva	☐	C20.2 Central protective suture of eyelid	☐
C43.4 Subconjunctival injection		C20.3 Lateral protective suture of eyelid	☐
Cornea	☐	C20.4 Medial protective suture of eyelid	☐
C45.1 Superficial keratectomy	☐	C22.2 Biopsy of lesion of eyelid	☐
C45.2 Excision of lesion of cornea	☐	C22.3 Removal of foreign body from eyelid	☐
C46.1 Refractive keratoplasty	☐	C22.4 Injection into eyelid	☐
C46.2 Lamellar graft to cornea NEC	☐	C22.6 Epilation of eyelash	☐
C46.3 Penetrating graft to cornea	☐	**3. Procedures for watery and dry eye**	
C47.1 Suture of cornea	☐	C25.1 Canaliculodacryocystorhinostomy	☐
C47.2 Adjustment to suture of cornea	☐	C25.2 Conjunctivodacryocystorhinostomy	☐
C47.3 Removal of suture from cornea	☐	C25.3 Dacryocystorhinostomy and insertion of tube	☐
C47.4 Gluing of cornea	☐	C25.4 Dacryocystorhinostomy	☐
C51.2 Chelation of cornea	☐	C27.1 Drainage of nasolacrimal duct	☐
C51.5 Placement of therapeutic contact lens	☐	*Includes: Insertion of tube into nasolacrimal duct*	
C49.2 Trephine of cornea	☐	C27.2 Dilation of nasolacrimal duct	☐
C49.3 Radial keratotomy	☐	C27.3 Irrigation or syringing of nasolacrimal duct	☐
Y27.1 Autograft to organ NOC	☐	C27.4 Removal of tube from nasolacrimal duct	☐
Y27.2 Allograft to organ NOC		C27.5 Probing of nasolacrimal duct	☐
Iris	☐	C29.1 Repair of canaliculus	☐
C64.1 Excision of prolapsed iris	☐	C29.2 Enlargement of lacrimal punctum	☐
C64.2 Excision of lesion of iris	☐	C29.3 Occlusion of lacrimal punctum e.g. plugs	☐
C64.3 Destruction of lesion of iris	☐	C29.4 Marsupialisation of canaliculus	☐
C64.4 Biopsy of lesion of iris	☐	C29.5 Canaliculotomy	☐
C64.5 Removal of foreign body from iris	☐	**4. Examination of eye**	
C64.6 Stretching of iris	☐	C87.1 Digital imaging of retina	☐
C64.7 Insertion of iris hooks	☐	C87.4 Ultrasonic evaluation of retina	☐
C62.1 Iridosclerotomy	☐	C86.5 Fluorescein engiography of eye	☐
C62.2 Surgical indotomy	☐	C86.6 Examination of eye under anaesthetic	☐
C62.3 Laser iridotomy		**5. Miscellaneous**	
Laser procedures	☐	C01.2 Enucleation of eye	☐
C85.1 Retinopexy using cryotherapy	☐	C08.4 Retrobulbar injection into orbit	☐
C82.5 PRP to lesion of retina	☐	S13.1 Punch biopsy of lesion of skin	☐
C82.6 Laser photocoagulation to lesion of retina	☐	S15.1 Biopsy of lesion of skin	☐
C66.3 Cryotherapy to ciliary body	☐	L67.1 Biopsy of artery NEC	☐
C62.3 Laser indotomy	☐	X38.1 Injection of triamcinolone	☐
C61.1 Laser trabeculoplasty		X39.6 Intraocular therapeutic substance	☐
Oculoplastics		C86.2 Repair of globe e.g. penetrating injury	☐
1. Eyebrow	☐	C80.3 Suture of eye	☐
C10.1 Excision of lesion of eyebrow	☐	C86.4 Removal of foreign body from eye	☐
C10.4 Suture of eyebrow		C86.7 Injection of therapeutic substance around eye	☐
2. Eyelid and canthus	☐	*Includes: Peribulbar or subtenons*	
C11.1 Excision of lesion of canthus	☐	*Excludes: Retrobulbar or subconjunctival injection*	
C11.6 Canthotomy	☐		
C12.1 Excision of lesion of eyelid	☐	***Procedures with no adequate code (Please list)***	
C12.2 Cauterisation of lesion of eyelid	☐	.....	
C12.4 Curettage of lesion of eyelid	☐	.....	
C12.5 Destruction of lesion of eyelid	☐	.....	
C12.6 Wedge excision of lesion of eyelid	☐	.....	
C13.1 Blepharoplasty of both eyelids	☐		
C13.2 Blepharoplasty of upper eyelid			

Figure 1 Coding Audit Sheet for use in theatres by the surgeon performing the procedure.

have experienced a complication at all. Of the 40 patients who had experienced a surgical complication only 15 were coded accurately.[1]

The second reason for the increased focus on accurate clinical coding is the Payment by Results reimbursement scheme. In the past National Health Service (NHS) Trusts were paid according to block contracts or negotiated cost and volume contracts. Under Payment by Results, NHS Trust reimbursement is dependent on the actual patient-level clinical activity undertaken and accurate reimbursement relies on an accurate record of each patient's hospital episode.

In most institutions clinical coding is carried out by non-medically trained clinical-coding staff. Several earlier studies have indicated poor reproducibility of clinical coding.[2–4] We decided to investigate the coding of surgical procedures in the ophthalmology theatre at our institution with the hope that we might identify ways to improve the accuracy of clinical coding.

For a two-week period surgeons in the ophthalmology theatre at Lincoln County Hospital were asked to assign codes to each surgical procedure they carried out. A coding audit sheet was compiled that contained the 190 most common ophthalmology codes based on the Office of Population Census and Surveys (OPCS) 4.4 coding system (Figure 1). Surgeons were asked to tick as many boxes as they felt were relevant to fully describe the surgical procedure undertaken. Coding was also performed, as normal in our institution, by clinical coders who were not informed that an audit was taking place. The total number of procedures carried out during this period was ascertained from the theatre logbook and iPath Operating Room Management Information System (ORMIS). When there was disagreement between the codes assigned by the coders and surgeons the case notes were retrieved and analysed.

During the two-week period, 120 patients had surgical procedures carried out, including 87 cataract extractions, six strabismus procedures, four blepharoplasties, two trabeculectomies, two penetrating keratoplasties, and 19 other procedures ranging from an intraocular lens exchange to an eyelid laceration repair. Overall, the quality of coding provided by the coding department was excellent. The clinical coders identified 117 (97.5%) of these patients compared with the surgeons, who recorded details for 110 (91.8%) of the patients (Figure 2). The clinical coders made 2 (2/117, 1.7%) major coding errors (code for wrong procedure). The errors included coding a trabeculectomy as a trabeculotomy and coding a planned extracapsular cataract extraction as a phacoemulsification procedure. In addition, the clinical coders made nine minor coding errors that mainly related to miscoding the type of anaesthetic used. The surgeons made no major or minor coding errors. The codes provided by the surgeons were also more detailed than those from the clinical coders. The coders used a median of four codes for each procedure (range 2–4 codes) compared with the surgeons, who used a median of eight codes for each procedure (range 3–12 codes). The surgeons commented that there were no adequate codes for some procedures; for example, there was no code for trypan blue ophthalmic solution or capsular tension rings.

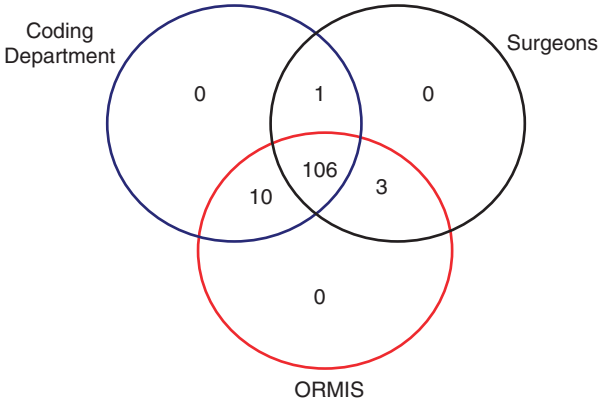


Figure 2 Venn diagram showing the number of patients recorded from each source.

We have found there is less uncoded clinical activity when coding is carried out in the clinical coding department than when the operating surgeon codes procedures directly in the theatre; however, input from surgeons can improve the accuracy of coded information. Uncoded clinical activity is not reimbursed and therefore carries large financial implications. For example, the elective tariff for a phacoemulsification cataract extraction and lens implant was £720 in 2006. In our audit, the estimated cost of the ten procedures missed by the surgeons would be £6898 for just this 2-week period.

For the patients who were coded, the surgeons provided more accurate and detailed codes. A possible explanation for this is the different methodology used for the two study groups. We purposefully did not inform the coders that the audit was taking place as we felt that this would not provide an accurate reflection of the coding practice in our institution. By contrast, the surgeons were aware that an audit was taking place. Despite the extra detail provided by the surgeons, in most cases this would not alter the reimbursement. The primary reason for this is that the tariffs used in Payment by Results do not always reflect the complexity of the procedures; however, detailed coding is likely to become more important as the tariffs become further individualized. The Department of Health has stated that 'the more detail that is captured about the patient's treatment the greater potential for Payment by Results to differentiate between routine and more complex cases and achieve fairer reimbursement'.[5]

The quality of clinical coding may be improved by increasing the awareness of clinical coding among medical staff. Simple steps such as ensuring that entries in the notes are legible and without abbreviation will make coding easier. Other measures might include increasing the collaboration between medical staff and coders to develop more comprehensive coding systems and by holding regular clinical coding audit. The Audit Commission has set out its intention to regularly audit clinical coding. A pilot audit of 17 organizations in 2006 showed high levels of coding errors. In one trust, over 25% of the primary procedure codes were incorrect. The Audit Commission has recommended that clinical coding be given a high priority within the NHS and

has called for more investment in training clinical coders.

In conclusion, clinical coding is a valuable tool, but to be so it needs to be reproducible and accurate. Although clinical coders usually carry out coding, all healthcare professionals have a responsibility to ensure that coding is as accurate as possible.

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We have no conflicting interests to declare.
This work has not been presented earlier.

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Sir,

Delayed, rapid visual field loss in a patient after ten years of vigabatrin therapy

Vigabatrin is associated with the development of visual field loss (VFL) in 25–50% of patients.[1] VFL is suggested to be stable with continued use of vigabatrin.[2,3]

Case report

A 36-year-old female receiving 3000 mg/day of vigabatrin since 1992 as add-on therapy for partial epilepsy was referred in 1998 for visual field (VF) monitoring. At the time of referral the patient had no visual complaints, visual acuity was 6/6 in both eyes, colour vision and discs were normal.

Serial assessment between 1998 and 2008 using Goldmann kinetic perimetry showed a rapid deterioration in VFs between assessments a year apart between 2002 and 2003, after 10 years of vigabatrin therapy and earlier stable VFs (Figure 1).

The best corrected visual acuity and colour vision have not changed over the 10-year assessment period. Visual evoked potentials and full field flash electroretinograms carried out in 2003, 2006, and 2007 were within normal limits, although a mild deficit in cone system function was suggested on all three occasions. Fundus photographs in 2006 showed disc pallor. Imaging of the retinal nerve fibre layer using optical coherence tomography, undertaken in 2007 and 2008, showed thinning with sparing of the temporal quadrant (Figure 2) and did not change over a 1-year period. Other potential ophthalmological or neurological causes for the VFL were excluded.

In 2007 the patient was registered as severely sight impaired. Multiple attempts to withdraw vigabatrin

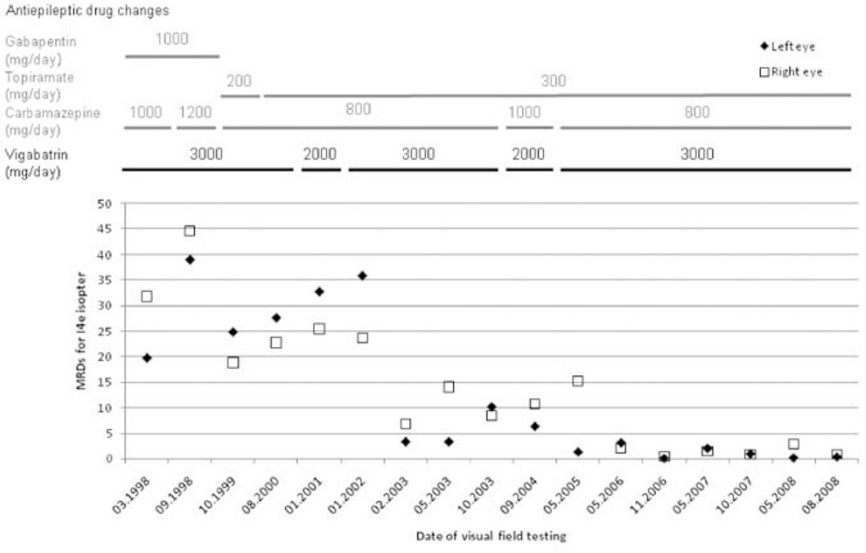

Figure 1 Graph showing change in mean radial degrees (MRDs)[2] using 14e isopter for the right and left eye over a 10-year period of continued vigabatrin use. Anti-epileptic drug changes over the same period are also shown. A deterioration is seen between test sessions in 2002 and 2003.