Number of adverse drug reactions and the number considered likely

	All drugs	Penicillin	Aspirin	Codeine	Co-trimoxazole
Elicited by questionnaire:					
Total	97	39	14	6	5
Likely	74	28	12	6	5
Recorded in medical notes:					
Total	53	24	5	4	3
Likely	42	20	4	4	3

reaction was disclosed the medical records were examined to see if it had been noted. There are spaces to record "drug allergy" and "contraindicated drugs" on prescription charts and inside the back cover of medical notes at our hospital. These too were examined. Reactions listed in standard texts[2,3] were regarded as likely and others as unlikely.

Seventy seven patients reported 97 adverse drug reactions on direct questioning (table). The current medical history recorded only 53 of these, and the prescription chart only 17 of the 53. None of the reactions was recorded inside the back cover of the clinical notes. Important reactions included facial swelling with penicillins (4), gastrointestinal bleeding with aspirin (3) or other non-steroidal anti-inflammatory drugs (1), and pulmonary embolism with oral contraceptives (1). The reactions elicited by questionnaire appeared likely in 74 cases, of which 42 were recorded in the current notes, though for likely penicillin reactions 20 out of 28 were recorded. The question "Have you ever needed treatment by a doctor or at a hospital for a reaction to a medicine or tablet?" did not add to information from the other questions.

Comment

The simple questions, Have any medicines or tablets ever disagreed with you or caused an allergy? and Are you able to take aspirin or penicillin? identified 97 reactions. Most (76%) of these were likely to have been related to the drug, so that the questionnaire was reasonably specific for adverse reactions, which are anyway difficult to diagnose.[4] Doctors recorded only half of the reactions elicited by the questionnaire, and they did not preferentially record well established reactions.

We have no evidence that any patient came to harm as a result of the imperfect recording of adverse drug reactions, but we believe that knowing a patient's history of such reactions is important to protect both the patient and the doctor. Doctors should be encouraged to ask the simple questions which we used when admitting patients, and to record the data they obtain. A hazard label for the front of the notes and the prescription chart might be helpful.

We thank Dr D K Scott for helping us to design the questionnaire.

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Homozygous deletion of gene for glutathione *S*-transferase M1 in bladder cancer

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The glutathione *S*-transferase enzyme GSTM1 has a polymorphic expression, with about half of people from various racial groups lacking enzyme activity.[1] The enzyme detoxicates several carcinogens including benzo[*a*]pyrene-4,5 oxide and it has been suggested that smokers who lack glutathione *S*-transferase activity are at increased risk of developing lung cancer, particularly adenocarcinoma.[2] Enzyme deficiency seems to be due to deletion of the coding gene GSTM1, and simple polymerase chain reaction assays to detect this deletion have been developed.[3]

The main risk factors for transitional cell carcinoma of the bladder are smoking and occupational exposure to carcinogens.[4] In view of the reported association between glutathione *S*-transferase and susceptibility to lung cancer, we examined whether lack of the enzyme was also associated with susceptibility to bladder cancer.

Subjects, methods, and results

We recruited 53 patients with transitional cell carcinoma of the bladder (34 men, 19 women; mean age 75) and 52 control patients (45 men, seven women; mean age 70) from Freeman Hospital Urology Department, Newcastle upon Tyne. The control patients were either having transurethral resection of the prostate for bladder outflow obstruction or were receiving treatment for stones, stress incontinence, unstable bladder, or neuropathic bladder, and all had had cystoscopy to exclude a bladder tumour. We also recruited 58 healthy volunteers from staff and students of Newcastle University (24 men, 34 women). The study was approved by the local ethics committee, and patients and volunteers gave informed consent.

We detected deletion of GSTM1 in leucocyte DNA by a polymerase chain reaction assay using the primers GCTTCACGTGTTATGGAGGTTC(fromintron6of GSTM1)andGAGATGAAGTCCTTCAGATTT(from exon 7), which gave rise to a 160 base pair product in subjects who were heterozygous or homozygous wild type (GSTM1 positive).[3] As a control, we also ran an assay for the non-polymorphic gene GSTM2 (for muscle specific glutathione *S*-transferase) in parallel using as primers CCAGAATACCTGCAGGCACTC (exon 6) and GTATGACAAATCTGTGGTGTCC (intron 6). Conditions for both assays were 40 cycles of 1 min at 95°C, 1·5 min at 47°C, and 2 min at 70°C. All assays were repeated at least twice.

The table summarises the results. Forty six per cent of the healthy controls and 40% of the patient controls had the GSTM1 gene compared with only 15% of patients with bladder tumour. There was a significant difference between the patients with cancer and the two control groups ($\chi^2=8{\cdot}41$, $p<0{\cdot}005$ for patient controls and $\chi^2=12{\cdot}67$, $p<0{\cdot}001$ for healthy controls). Compared with the patient control group the relative risk was 1·42 (95% confidence interval 1·12 to 1·79) and odds ratio 3·81 (1·53 to 9·34). This odds ratio is greater than the ratios calculated in the previous study

Presence of GSTM1 gene in patients and controls

Group	No of subjects	No (%) with gene	No (%) without the gene
Bladder tumour	53	8 (15)	45 (85)
Patient controls	52	21 (40)	31 (60)
Healthy controls	58	27 (47)	31 (53)

of patients with lung cancer both for adenocarcinoma and non-adenocarcinoma.[2] The percentage of patients who had the GSTM1 gene did not differ significantly with type or grade of tumour. Most of the patients with bladder cancer (67%) were smokers or former smokers, but there was no significant difference in GSTM1 genotype frequency between these subjects and the non-smokers in the group.

Comment

Previously reported risk factors for developing bladder cancer include high activity of the polymorphic cytochrome P450 enzyme CYP2D6 and lack of *N*-acetyltransferase activity.[5] The availability of genotyping assays for these polymorphisms as well as for GSTM1 may in future allow detection of people at high risk of bladder cancer because of occupation or smoking.

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Predicting driving performance after stroke

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Stroke causes physical and cognitive impairments that may influence driving ability. Predicting whether a patient will be a safe driver may be particularly difficult for patients who are also elderly.[1] The stroke drivers screening assessment was developed as a short screening measure of driving ability that can be administered by nurses or therapists. In the development stroke patients who wished to return to driving were given a detailed cognitive assessment and tested on the road by a professional driving instructor.[2,3] Discriminant function analysis was used to identify the cognitive tests which best predicted ability on the road. The present study aimed to compare the predictive value of the cognitive test battery with existing assessment procedures.

Method and results

Subjects were referred from three stroke units (Mansfield, Lincoln, and Nottingham) for advice on their fitness to drive. Those who had been driving in the three months before the stroke, a minimum of 10 weeks previously, and had a full driving licence were considered. Those who had any condition—for example, epilepsy—which legally precluded driving were excluded.

After a road test in a dual controlled, automatic vehicle on a set route around public roads subjects were graded by the instructor into pass or fail groups. Subjects were then randomly allocated into two groups, one of which (n=27) was tested on the stroke drivers screening assessment and scores from the three tasks were used to predict the likelihood of passing a road test. The subject's general practitioner was given the results of the cognitive tests with a recommendation about fitness to drive. The control group (n=25) was instructed to request the advice of their general practitioners regarding their fitness to drive. They did not undergo cognitive testing because it might have influenced their request to the general practitioner.

After six months subjects were contacted to ascertain the decisions on fitness to drive. The two types of assessment, cognitive and standard procedure, were compared to determine which assessment method agreed most closely with the performance on the road test.

There were no significant differences between the groups in age (mean 58·8 years in the assessment group *v* 60·2 years in the control group), sex (23 men *v* 23 men) or side of hemiplegia (13 right *v* 7 right) ($p > 0.05$). However, those in the cognitive assessment group were seen significantly later after their stroke (mean 44·4 weeks) than controls (mean 23·0 weeks).

For each group the decision method was compared with the grading of "on the road" performance (table). The stroke drivers screening assessment correctly predicted the road performance of 81% of patients, whereas the performance of only 56% was correctly predicted in the control group. The 95% confidence intervals indicate that the assessment predicted road performance significantly better than chance. The decision in the control group was made by either the general practitioner or the Driver and Vehicle Licensing Agency, but this was no better than chance. By six months 29 patients had resumed driving, 28 of whom had been advised they were fit to drive.

Road test performance compared with driving ability predicted by stroke drivers screening assessment (SDSA) or general practitioner. Values are numbers (percentages) unless otherwise specified

		Group given SDSA (n=27)				Control group (n=25)	
		Road test performance				Road test performance	
		Pass	Fail			Pass	Fail
Predicted by SDSA	Pass	6	3	Predicted by GP	Pass	10	10
	Fail	2	16		Fail	1	4
Actual pass rate		8	(30)			11	(44)
Predicted pass rate		9	(33)			20	(80)
Accuracy		22	(81)			14	(56)
Positive predictive value of predicting a pass		6/9	(67)			10/20	(50)
Positive predictive value of predicting a fail		16/18	(89)			4/5	(80)
Sensitivity for detecting passes		6/8	(75)			10/11	(91)
Specificity		16/18	(89)			4/14	(29)
Likelihood ratio (95% confidence interval)		6·0 (1·5 to 24·0)				2·0 (0·3 to 12·0)	
No who resumed driving at 6 months		9				20	

Comment

The road test by a driving instructor was used as the criterion of driving performance. Although not ideal, it is the closest approximation to daily driving.[4] The accuracy of either general practitioners or the cognitive assessment in predicting road test performance was not perfect, but both methods correctly identified most of those who failed the road test. Therefore a person judged by a general practitioner to be unfit should not be allowed to drive. If the patient is judged fit by a general practitioner then the stroke drivers screening assessment could be used as a further screening before patients are given a road test. Since the stroke drivers