Niuhuang Wan was found to contain 47 mg mercury and Zhusha Aushen 659 mg mercury (in the form of cinnabar). Arsenic and lead were also detected. When taken together as prescribed this would have resulted in a daily intake of 706 mg of cinnabar. We are concerned that the use of this amount of mercuric sulphide in long term treatment is potentially hazardous and could lead to mercury intoxication. Kew *et al* reported symptoms of mercury poisoning in a patient after daily exposure to 180-252 mg cinnabar for four weeks.²

Cinnabar has been used for a long time in traditional medicines. The toxic effects of inorganic mercury are well recognised, but because of its insolubility it has been assumed that this compound would not be significantly absorbed from the gastrointestinal tract. However, a study by Yeon *et al* of the oral absorption of cinnabar in mice found a significant increase in mercury concentrations in the liver and kidney. Concomitant use of cinnabar and drugs containing bromides, sulphates, sulphides, nitrates, and iodine may enhance its toxicity by increasing the gastrointestinal absorption.³

We wish to bring the availability and use of these preparations to the attention of medical professionals and to emphasise the importance of obtaining full information on all the medications used by their patients. We are carrying out a traditional remedies surveillance project and would be interested in receiving reports of adverse reactions to herbal remedies and food supplements.

This study is supported by the Ministry of Agriculture, Fisheries and Food.

DEBBIE SHAW Research scientist	IVAN HOUSE Trace elements analyst
STOYKO KOLEV Toxicologist	VIRGINIA MURRAY Consultant toxicologist

Traditional Remedies Surveillance,
Medical Toxicology Unit,
Guy's and St Thomas's Hospital Trust,
London SE14 5ER

- 1 De Smet PAGM. Should herbal medicine-like products be licensed as medicines? *BMJ* 1995;310:1023. (22 April.)
- 2 Kew J, Morris C, Alhie A, Fysh R, Jones S, Brooks D. Arsenic and mercury intoxication due to Indian ethnic remedies. *BMJ* 1993;306:507-8.
- 3 Pharmacopoeia of the People's Republic of China. English ed. Guangzhou: Guangdong Science and Technology Press, 1992: 21-2.
- 4 Yeon TS, Lee AS, Lee HS. Absorption of mercuric sulphide following oral administration in mice. *Toxicology* 1986;41: 107-11.
- 5 Kang-Yum E, Oransky SH. Chinese patent medicine as a potential source of poisoning. *Vet Hum Toxicol* 1992;34:235-8.

Monitoring during endoscopy

Attention to sedation techniques may reduce mortality

EDITOR,—J E Charlton draws attention to the estimated overall death rate of 1 in 2000 from upper gastrointestinal endoscopy, which is usually performed under sedation or local anaesthesia, or both.¹ When compared with the overall mortality solely attributable to anaesthesia, which is 1 in 185 000,² this mortality seems unacceptably high.

Recommendations for standards of sedation and for monitoring patients during gastrointestinal endoscopy were published by the British Society of Gastroenterology in 1991,³ and guidelines for sedation by non-anaesthetists were published by a working party of the Royal College of Surgeons in 1993.⁴ Despite this, practice across Britain seems to vary widely.

We were surprised to find that in some regions the preferred benzodiazepine for sedation during endoscopy is diazepam,⁵ which has an active principal metabolite (desmethyldiazepam) with a half life of 48-96 hours. Midazolam has been

recommended as the drug of choice for sedation on the basis of pharmacokinetic and pharmacodynamic properties⁶ and lends itself to a careful titration technique. Combinations of opioids and benzodiazepines are best avoided owing to the additive and synergistic effects on the cardiovascular and respiratory systems. It must be remembered that the antagonist drug flumazenil has a shorter half life than the benzodiazepines in common clinical use.

Local anaesthetic sprays have been implicated in the development of pneumonia after gastroscopy.⁷ Their use may be unnecessary in most diagnostic endoscopic procedures. Formal training of junior endoscopists in sedation techniques together with adequate supervision should ensure the rational use of the available drugs.

When single operator sedationists practise endoscopy the British Society of Gastroenterology recommends at a minimum that a nurse trained in endoscopy techniques and dedicated to patient care is present throughout. Supplemental oxygen and monitoring should ideally be continued throughout the period of recovery, and premature discharge to maximise turnover must be resisted. The employment of qualified staff who are able to monitor patients, interpret changes in the monitored variables, and start cardiopulmonary resuscitation when necessary may have implications for general practice endoscopy services, where it may prove difficult to ensure both safety and cost effectiveness.

We may be able to influence these worrying statistics by centralising services, ensuring proficiency of endoscopists, providing skilled help, and adopting the excellent guidelines already available.

IAN R APPADURAI Lecturer in anaesthetics	RAYMOND J DELICTA Research fellow in surgery
	P DECLAN CAREY Senior lecturer in surgery

University of Wales College of Medicine,
Cardiff CF4 4XN

- 1 Charlton JE. Monitoring and supplemental oxygen during endoscopy. *BMJ* 1995;310:886-7. (8 April.)
- 2 Buck N, Devlin HB, Lunn JN. *The report of a confidential enquiry into perioperative deaths*. London: Nuffield Provincial Hospitals Trust and King's Fund, 1987.
- 3 Bell GD, McCloy RF, Charlton JE, Campbell D, Dent NA, Gear MWL, *et al*. Recommendations for standards of sedation and patient monitoring during gastrointestinal endoscopy. *Gut* 1991;32:823-7.
- 4 Royal College of Surgeons of England Commission on the Provision of Surgical Services. *Report of the working party on guidelines for sedation by non-anaesthetists*. London: RCS, 1993.
- 5 Quine MA, Bell GD, McCloy RF, Charlton JE, Devlin HB, Hopkins A. Prospective audit of upper gastrointestinal endoscopy in two regions of England: safety, staffing, and sedation methods. *Gut* 1995;36:462-7.

Pulse oximetry has limitations

EDITOR,—Most anaesthetists are already aware of the dual problems of oxygenation and monitoring during endoscopy on sedated patients.¹ The solution, however, may not be as simple as introducing supplemental oxygen and using pulse oximetry for all patients. There are crucial differences between a sedated patient undergoing endoscopy and an anaesthetised patient undergoing surgery.

Firstly, for patients undergoing endoscopy there is usually only one operator, who performs the endoscopy as well as giving sedation and cannot therefore give the patient's oxygenation and monitoring full attention during the procedure. The revised recommendations for standards of monitoring during anaesthesia and recovery issued by the Association of Anaesthetists of Great Britain and Ireland state that the anaesthetist should be present throughout the general anaesthesia and that this consideration applies to any technique or sedation carrying a risk of unconsciousness.

Secondly, and most importantly, pulse oximetry is not an infallible monitoring device, though it is

valuable, and prior knowledge is needed to prevent misinterpretation. Many limitations of pulse oximetry have been described, including the fact that it is a "lag" monitor²; that it measures oxygenation, not ventilation³; and that the function of the oximeter is adversely affected by a variety of factors.⁴ Anaesthetists are required, as part of their training, to have detailed knowledge of all the monitoring devices they use on patients perioperatively, including pulse oximeters. A recent survey of junior doctors in specialties other than anaesthesia showed poor overall knowledge of the principles of pulse oximetry, its limitations, and its application to clinical practice.⁵ A failure to interpret oxygen saturation values correctly could be as dangerous as not having them available.

If monitoring techniques such as pulse oximetry are introduced widely this should be accompanied by an increase in training in the use of such devices for staff. Widening the remit of the national confidential inquiry into perioperative deaths to include endoscopy would certainly be a start in auditing the safety of current endoscopic practice, but perhaps the safest method of all would be to add endoscopy under sedation to the list of procedures that are monitored by anaesthetists.

MARK STONEHAM
Senior registrar

Department of Anaesthesia,
Stoke Mandeville Hospital,
Aylesbury HP21 8AL

- 1 Charlton JE. Monitoring and supplemental oxygen during endoscopy. *BMJ* 1995;310:886-7. (8 April.)
- 2 Verhoeff F, Sykes MK. Delayed detection of hypoxic events by pulse oximeters: computer simulations. *Anaesthesia* 1990;45: 103-9.
- 3 Davidson JAH, Hosie HE. Limitations of pulse oximetry: respiratory insufficiency—a failure of detection. *BMJ* 1993; 307:372-3.
- 4 Ralston AC, Webb RK, Runciman WB. Potential errors in pulse oximetry. III. Effects of interferences, dyes, dysaemoglobins and other pigments. *Anaesthesia* 1991;46:291-5.
- 5 Stoneham MD, Saville GM, Wilson IH. Knowledge about pulse oximetry among medical and nursing staff. *Lancet* 1994;334: 1339-42.

Gastric lavage poses risks to patient

EDITOR,—J E Charlton comments on the safety of diagnostic and therapeutic endoscopy.¹ Gastric lavage is a procedure akin to upper gastrointestinal endoscopy that is invariably performed on an already sedated patient. It is likewise associated with cardiovascular and respiratory compromise² and should perhaps be undertaken with a similar degree of care and monitoring.

JAMES B ROBINS

Senior registrar in obstetrics and gynaecology
Leeds General Infirmary,
Leeds LS2 9NS

- 1 Charlton JE. Monitoring and supplemental oxygen during endoscopy. *BMJ* 1995;310:886-7. (8 April.)
- 2 Thompson AM, Robins JB, Prescott LF. Changes in cardio-respiratory function during gastric lavage for drug overdose. *Hum Toxicol* 1987;6:215-8.

Paediatric endoscopy should be carried out under general anaesthesia

EDITOR,—J E Charlton highlights the hazards of gastrointestinal endoscopy carried out under sedation.¹ These dangers are not confined to adults.

In a prospective study of 32 children undergoing gastrointestinal endoscopy under sedation, desaturation (oxygen saturation of 90% or less) occurred in 37.5%; this desaturation was unpredictable and failed to correlate with the patient's weight, age, or tolerance of the procedure.² In another prospective analysis, of 57 small children, 10% of the examinations had to be interrupted by removal of the endoscope because the child developed stridor and a low oxygen saturation.³