Colour-coded syringe labels: a modification to enhance patient safety

Editor—Medication errors during anaesthesia are being reported in the literature from time to time. Misidentification of a drug because of look alike/sound alike drugs, syringe swap, confusing, inaccurate, or incomplete drug labels have been found responsible for these errors on many occasions.\(^\text{1}\) Up to 86–94% anaesthesiologists have agreed for the need of standardized drug labels to decrease the incidence of medication errors.\(^\text{2}\)

Simple labels made from white adhesive tape or paper often fail to distinguish the different group of drugs, especially in critical situations. To prevent incidences of drug errors as a result of syringe and ampoule swap, Institute for Safe Medication Practices (ISMP) and American Society for Testing and Materials (ASTM) have recommended the standardized colour code for different anaesthetic drugs used in the operating theatre.\(^\text{3}\) Wassef and colleagues\(^\text{4}\) in a publication emphasized high speed and accuracy of drug administration because of colour coding in simulated high stress situations.

On the other hand, there have been problems with the colour-coding system. Colour differentiation has not been proved to prevent medication error completely.\(^\text{5}\) The colour label identifies a drug category, but it does not necessarily identify a specific drug in that group. Mix-ups occur because of selection errors among products within a class of drugs having different strength and action.\(^\text{6}\) Availability of the limited number of absolute identifiable colours and to remember these multiple or complex colour-coding systems is another limitation to colour-coding of drugs.\(^\text{7}\) Further, between 5% and 8% of the general male population is colour blind, although no authentic study has been done on colour blindness among the medical and paramedical personnel in anaesthesiology. To minimize the impact of colour blindness among anaesthesiologists, ASTM has proposed specific guidelines for the maximum contrast between text and background as specified in section 6.3.1 of ASTM International standards D6398.\(^\text{8}\)

In a letter published in the Anesthesia Patient Safety Foundation (APSF) newsletter, the author mentioned that anaesthesia providers may not read the label in critical situations because they only have time to recognize the colour and shape/size of the intended drug/syringe.\(^\text{9}\) Webster and Merry\(^\text{10}\) have recommended that colour coding should be used as a supplement to reading the label rather than substitute as the use of more than one cognitive cue (colour and text) always prevents the errors before they could occur.

Anaesthesiologists in many countries such as the UK, Australia, New Zealand, the USA, South Africa, Canada, and Denmark have been using standardized colour-coded syringe labels. Different formats of texts including drug name, concentration, date, and time of preparation have been printed on these colour labels for differentiation and identification of drugs. In India, no specific guidelines are available for the use of colour-coded syringe labels but we are using labels provided by a pharmaceutical company (Neon Labs, India). We often find difficulty in the identification of a particular drug within a group, for example, morphine, meperidine, and fentanyl, because of common colour and font size. We made a few modifications in the present colour-coded syringe labels to overcome these problems and to enhance the safety as follows (Fig. 1):

(1) We divided the label into two sections in a ratio of 20% (white) and 80% (coloured).
(2) In the coloured section, the generic drug name is printed in 12 font size, bold, Arial black letters all in upper case.
(3) Below this, the concentration of the drug is printed in 12 font size, bold, Arial black letters all in lower case.
(4) In the white section, either two or three letters from each drug name is printed in 24 font size, bold, Cooper standard black letters all in upper case.

Addition of these two/three big, bold, and capital letters of each drug against a white background as a second cue helped us to quickly identify a specific drug in a particular drug group by avoiding any element of colour blindness, thus further reducing the chances of drug error during anaesthesia because of syringe swap. We hope that anaesthesiologists will use these labels and share their experience with their fraternity.

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4 Wassef F, Sinz EH, Prozesky J, Martin D, Dyer AM. Using improved visual technique to reduce drug administration errors in the operating room. Anaesthesiology 2008; 109: A758
### Colour-coded drug labels: a better option.

#### Reversal agents
- **NT**: NEOSTIGMINE —— mg/ml
- **NG**: NEOSTIGMINE GLYCOPRROLATE —— mg/ml

#### Induction agents
- **PT**: PENTOTHAL —— mg/ml
- **KM**: KETAMINE —— mg/ml
- **PF**: PROPOFOL —— mg/ml
- **MX**: METHOHEXITONE —— mg/ml
- **ED**: ETOMIDATE —— mg/ml

#### Local anesthetics
- **LC**: LIGNOCAINE —— %
- **LCA**: LIGNOCAINE (ADR) —— %
- **BC**: BUPIVACAINE —— %
- **RC**: ROPIVACAINE —— %

#### Muscle relaxants
- **AC**: ATRACURIUM —— mg/ml
- **PC**: PANCRURONIUM —— mg/ml
- **VC**: VECURONIUM —— mg/ml
- **MV**: MIVACURIUM —— mg/ml
- **RC**: ROCURONIUM —— mg/ml
- **CA**: CISATRACURIUM —— mg/ml
- **SC**: SUCCINYLCHOLINE —— mg/ml

#### Narcotic agents
- **FE**: FENTANYL —— mcg/ml
- **RF**: REMIFENTANYL —— mcg/ml
- **SF**: SUFENTANYL —— mcg/ml
- **AF**: ALFENTANYL —— mcg/ml
- **PD**: PETHIDINE —— mg/ml
- **MO**: MORPHINE —— mg/ml
- **BT**: BUTORPHANOL —— mg/ml
- **BP**: BUPRENORPHINE —— mg/ml
- **TD**: TRAMADOL —— mg/ml
- **PZ**: PENTAZOCINE —— mg/ml
- **NP**: NALBUPHINE —— mg/ml
- **NX**: NALOXONE —— mg/ml

#### Opioid antagonists
- **AD**: ADRENALINE —— mg/ml
- **NAD**: NORADRENALINE —— mg/ml

#### Vasopressors
- **MP**: MEPHENTERMINE —— mg/ml
- **DP**: DOPAMINE —— mcg/ml
- **DB**: DOBUTAMINE —— mcg/ml
- **EP**: EPHEDRINE —— mg/ml
- **PE**: PHENYLEPHRINE —— mg/ml
- **ADR**: ADRENALINE —— mg/ml

#### Benzodiazenepines
- **DZ**: DIAZEPAM —— mg/ml
- **MZ**: MIDAZOLAM —— mg/ml

#### Anticholinergics
- **AT**: ATROPINE —— mg/ml
- **GP**: GLYCOPRROLATE —— mg/ml

#### Benzodiazepine antagonists
- **FZ**: FLUMAZENIL —— mg/ml
Takotsubo cardiomyopathy: issues for the intensivist

Editor—We echo the caution advised by Dr Redmond and colleagues in using sympathomimetics to address hypotension secondary to Takotsubo cardiomyopathy and propose mechanical circulatory support as an alternative in this condition. This suggestion stems from our treatment of a 67-year-old woman with subarachnoid haemorrhage and hypotension refractory to catecholamines, who was referred to the National Advanced Heart Failure Service at our hospital. She too had no evidence of coronary artery disease at angiography despite a moderate troponin increase. Left ventriculography demonstrated apical ballooning in systole and hyperkinesis of the basal segments consistent with Takotsubo cardiomyopathy. The left ventricular ejection fraction was estimated at 20% and an intra-aortic balloon pump was inserted. This enabled catecholamine infusions to be steadily weaned and discontinued within 36 h. Myocardial function recovered sufficiently to allow the removal of the balloon pump after 5 days. While acknowledging the paucity of evidence at this time, we feel that such use of mechanical circulatory support is a sensible approach in Takotsubo cardiomyopathy given the putative pathogenic role of catecholamines in this condition.

We also wish to draw attention to the study by Park and colleagues assessing the incidence of Takotsubo cardiomyopathy in medical ICU patients. They performed serial echocardiography in 92 patients with a non-cardiac diagnosis and identified left ventricular apical ballooning in 26 (28%). Left ventricular function normalized in 20 of these 26 patients but still the presence of apical ballooning predicted lower 2-month survival. It is possible, therefore, that Takotsubo cardiomyopathy is neither uncommon nor unimportant amongst ‘stressed’ ICU patients. Moreover, as previously mentioned, standard treatment of hypotension may be counterproductive. Hence it would seem prudent to retain an index of suspicion and image the myocardium when hypotension proves relatively resistant to catecholamines. This provides further justification for the expansion of training in and use of echocardiography in ICU.

Declaration of interest
None declared.

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Use of recombinant human deoxyribonuclease for the treatment of acute asthma

Editor—We would like to thank Dr Sellers for the recently published asthma review. We would like to add to this comprehensive review by highlighting the potential use of recombinant human deoxyribonuclease (rhDNase) as an additional treatment for acute severe near-fatal asthma unresponsive to conventional therapy. It has been observed that patients who have died from severe asthma have marked widespread mucus plugging of the Airways. rhDNase is an enzyme that catalyses hydrolysis of extracellular deoxyribonucleic acid found in respiratory secretions, thereby reducing the viscosity of mucus plugs, improving expectoration, ciliary clearance, and overall airway obstruction. It is currently licensed for use in cystic fibrosis where it is administered by inhalation using a jet nebulizer. British guidelines on the management of asthma do not support the routine use of rhDNase or mucolytics for the treatment of severe acute asthma. There are however case reports, in paediatric and adult patients, suggesting its efficacy in mechanically ventilated patients with status asthmaticus unresponsive to conventional treatment. In each of these cases, there was an observed rapid improvement in oxygenation and reduced ventilatory pressures after rhDNase administration.

Administration by both direct instillation via bronchoscope and nebulizer therapy has been described and is well tolerated with minimal side-effects although blood streaking of sputum has been noted. Nebulizer therapy in non-intubated patients may have a role but requires further investigation. Two randomized studies including 171 patients showed no clinical improvement among moderate asthmatics refractory to standardized care; however, FEV1 measurements increased in the most severely affected.

In summary, we would suggest rhDNase should be considered as a potential therapy for refractory treatment of intubated patients with status asthmaticus in the near-fatal setting.

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