



Case reports

Accidental injection of patent blue dye during gynaecological surgery: Lack of knowledge constitutes a system error



Edita Laukaityte, Marie Bruyère, Amanda Bull, Dan Benhamou *

Department of Anaesthesia and Intensive Care Medicine, hôpitaux universitaires Paris-Sud, 78, rue du Général-Leclerc, 94275 Le Kremlin-Bicêtre cedex, France

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ABSTRACT

The authors report a case in which an intravenous injection of Patent Blue V dye instead of Indigo Carmine was given during routine gynaecological surgery. The patient presented with temporary arterial (spurious) desaturation and skin discoloration over a 48-hour period. Pharmacological differences between these dyes are described. Root cause analysis based on the ALARM (Association of Litigation and Risk Management) model is presented. The authors emphasise that use of this model should not be limited solely to describing and correcting well known systems errors such as working conditions or teamwork and communication. Furthermore, they conclude that insufficient knowledge must also be recognised as a systems error and as such should be sought out and corrected using similar strategies to those used to discover other contributory factors, without allocation of blame to any individual.

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1. Introduction

Drug errors during anaesthesia principally arise from the use of wrong syringes or drug ampoules, faulty medical equipment or the use of incorrect routes of administration [1]. Concerning anaesthesia, however, there are specific procedures that are an integral part of the job and thus carried out on a daily basis and that may be prone to error [2]. Such errors may occur during drug preparation, particularly concentration errors and those related to incorrect drug administration. There has been much emphasis placed on errors due to incorrect labelling or dilution, i.e. administrative errors [3]. Similarly, mistakes due to the confusion of similarly appearing drug ampoules (“looks alike, sounds alike...”) [4,5] are well documented in the literature. However, drug errors in the practice of anaesthesia also occur due to insufficient knowledge of a particular drug or agent. These are less often analysed, as there is an assumption that the professional commits a fault only because of unfavourable conditions or systems fault [6]. The case reported here demonstrates the repercussions of a lack of knowledge concerning a given product.

2. Clinical case

The patient, Mrs M., aged 85 years old, was admitted for routine gynaecological surgery (TVT and hysterectomy). Her past medical history of note included cardiovascular disease and renal impairment. Despite this, the patient had no significant functional impairments. Ten minutes after the initial incision, the surgeon asked for an injection of “blue” and furosemide to be given. The anaesthetic nurse (Infirmière Anesthésiste Diplômée d'État [IADE]) asked the theatre scrub nurse (Infirmière de Bloc Opératoire Diplômée d'État [IBODE]) if she had any “blue”, none being present on the anaesthetic trolley. An ampoule was given to the anaesthetic nurse who then diluted it into a 200 ml bag of normal saline and administered it to the patient. The anaesthetist was not present during this interaction as he was in the neighbouring theatre performing anaesthesia induction for another patient. Approximately 3–5 minutes after the infusion was started, the patient desaturated (SpO₂ 99% to 93%). Thinking that the patient was having an allergic reaction, the infusion of “blue” was immediately halted and the patient was ventilated on 100% oxygen. All other vital statistics were unchanged and stable and no abnormality was found on examination. The surgery continued and 30 minutes later oxygen saturations began to improve (97% – FiO₂ 0.6). The surgery lasted a total of 90 minutes and the patient was woken and extubated without further incident. In the recovery room, the patient was noted to have blue-grey skin discoloration

* Corresponding author at: Service d'anesthésie-réanimation, hôpital Bicêtre, 78, rue du Général-Leclerc, 94275 Le Kremlin-Bicêtre cedex, France.
Tel.: +33 01 45 21 34 47; fax: +33 01 45 21 28 75.

E-mail address: dan.benhamou@bct.aphp.fr (D. Benhamou).

Table 1
Analysis of the adverse event during a Mortality and Morbidity Meeting.

Factor types	Factors identified	Measures proposed
Patient factors General health (complexity, severity, emergency), anxiety, ability to communicate	Different surgeries use different products Breast surgery: Patent Blue V Uro-gynaecological surgery: Indigo Carmine	Knowing surgeries that require use of Indigo Carmine: blue urine
Individual (staff) factors Knowledge and skills, fatigue, mental and physical health	Lack of product knowledge by all theatre staff	Training of staff: nurses (IADES, IBODEs) anaesthetists, surgeons
Task and technology factors Procedures: existence, validity Decision-making aids	No defined protocol (for prescription or administration)	Ensure double check performed Establish a protocol
Team factors Verbal and written communication, anaesthetic charting, supervision and seeking help, team structure	Imprecise wording “Can you give the blue...?” Too many people involved nurse/surgeon/anaesthetist	Specific and clear instruction regarding dose and route “Can you give Indigo Carmine intravenously?” Use of WHO/HAS (Haute Autorité de santé) theatre check-list
Work environmental factors Adequate staffing levels and material resources Design, availability and maintenance of equipment	Improper storage of products found on the same trolley in the same place	Theatre nurse (IBODE) tray: blue patent V (local injection by the surgeon) Anaesthesia trolley: Indigo Carmine (intravenous injection)
Organisational and management factors General organisational structure, policy, standards and goals, safety culture and priorities	None	None
Institutional context factors Health and social policy Links with external organisations	None	None

According to Vincent et al., 2002 [6].

and thus the error was discovered; she had been given Patent Blue V, used primarily in lymphangiography, rather than Indigo Carmine. The patient was informed of the mistake. The discoloration disappeared over the next 48 hours and her postoperative recovery was otherwise uneventful.

Following this event, a survey was carried out amongst the medical (surgeons and anaesthetists) and nursing staffs (theatre and anaesthetics) and this revealed a lack of knowledge regarding the two different products (indications, contra-indications, unwanted effects, route of administration). A tutorial was subsequently organised for nursing staff and the case was discussed in both anaesthetic and obstetric and gynaecology departmental mortality and morbidity (M&M) meetings. The M&M meetings not only provided the opportunity to train and inform staff but also to investigate the factors contributing to the occurrence of this adverse event. This was done using the following means: chart examination, data collection, and analysis using the ALARM model [6]. Subsequently, a series of steps were identified in order to prevent such an error occurring again in the future (Table 1).

3. Discussion

Although the use of different dyes in the operating theatre is not uncommon, it should be remembered that they have differing indications, contra-indications and require different methods of administration (Table 1) [7–11]. Knowledge of these characteristics is essential in order to avoid error. It was clear from discussion at the M&M meetings that knowledge of the differing characteristics of these dyes was both superficial and incomplete; there was also confusion relating to the existence of the different dyes available for clinical use. A single M&M meeting for all disciplines concerned would have been preferable to two separate meetings to aid and improve the quality of discussion; however, this proved impossible to arrange due to conflicting schedules.

The lack of knowledge in this case is most likely due to the fact that these products are used relatively infrequently, except in gynaecological and urological surgery, when both Indigo Carmine and Patent Blue V are most commonly used, albeit without specific teaching concerning them. The absence of a written protocol is likely to have contributed to the occurrence of such an event. The fact that this lack of knowledge was widespread across the whole team (IADEs, IBODEs, doctors) resulted in a delay in discovering the error until the patient reached the recovery room. The possibility of pseudo-desaturation was not considered, as evidenced by the manoeuvres made in an attempt to re-oxygenate the patient [12]; an arterial blood gas sample would have quickly established the underlying problem. This clinical case illustrates the need to establish and analyse the relevant facts in order both to search for system factors likely to have a negative impact on the working conditions of healthcare professionals, and also to preserve and improve skills and training of staff, including their knowledge of established medicines, without regard to financial costs. This case demonstrates that there are certain drugs/agents belonging to no particular specialty and thus no one team is better trained. The area of diagnostic medicine and those medicines with diagnostic uses are not formally taught as part of the training for any of the disciplines, medical or nursing, involved in this case [13]. This lack of “ownership” contributed to a less rigorous verbal and visual check between nursing staff. Although a double check of drugs is considered to be effective, there remains potential for error at each step of the process [2,14]; this is why a multimodal approach is necessary. We must remember that individual factors, such as lack of knowledge, are considered to be contributory in the ALARM model [6]. We should not limit our analysis of critical incidents just to the identification of systems error, but equally search for individual factors such as lack of knowledge. The main difficulty in identification of lack of knowledge as a contributory factor is that it identifies an individual failing, less easily accepted by the professional than an overall fault of the system. Thus, it is important that lack of knowledge is treated in a similar fashion to a

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