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An Observational Study of Feasibility of a Novel Drug Storage Tray In Anaesthesia Practice

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Summary

Drug errors in the anaesthetic domain remains a serious cause of iatrogenic harm. To help reduce this issue, we aimed to explore the potential impact of a simple colour-coded tray to drug preparation and storage on safe drug administration during anaesthesia. Over a six-month period, a total of 30 cases were observed. The observations were conducted at three NHS Trusts by three different trained researchers. Ten observations involved the standard drug trays in 'normal' practice and 20 observations, before and after, were conducted where the new "Rainbow trays" were used. A total of 20 semi-structured interviews were conducted immediately upon completing the second observation with the involved anaesthetists. All discussions and detailed notes taken were transcribed and qualitatively analysed using line-by-line coding. These codes were then synthesized into themes. Current practice using uni-compartmental trays is quick, cheap, and portable but linked to potential or actual harmful errors such as syringe swaps. The Rainbow trays, seem to aid drug identification, allow for drug separation and act as a prompt to guard against drug errors. Limitations to the feasibility of use were around design and placement. The Rainbow trays were perceived as likely to reduce drug errors and improve patient safety. Additionally, there was an overall preference for this novel system at all three sites, as they were perceived to be easy to use and effective.

Keywords: drug preparation; drug-checking; drug errors; patient safety

Introduction

Drug preparation and administration in the operating theatre is a particular challenge, distinct from other hospital settings [1]. Anaesthetists routinely choose, prepare, administer, and record several potent intravenous drugs in a relatively short period, on their own, sometimes while stressed or fatigued [2]. Most developed countries have attempted to improve the prescription, preparation, and administration of medications to help reduce the inherent difficulty of this process [3], but it remains a serious cause of iatrogenic harm [2, 4]. A recent prospective observational study examined the rate of medication errors and adverse drug events [1], finding that approximately 1 out of every 20 preoperative drug administrations and every second operation resulted in drug errors or adverse drug events. More than one third of these incidents led to observed patient harm; the other two thirds had the possibility of patient harm. This is markedly higher than the rates observed in past literature, wherein the incidence of drug errors ranged from 1:131 to 1:5475 'pre-operative anaesthetic administrations' [5-8]. The lower incidence observed in the past is perhaps because of operators' unwillingness to self-report errors or the lack of awareness that an error has occurred [1].

There are several practices employed within anaesthesia that help mitigate the risk of drug error; international colour coding of drug labels ensures that drug labels used by anaesthetists follow a standard colour design reducing the risk of selecting the wrong class of drug; restriction on the contents of the anaesthetic room drug cupboard to only those drugs that are frequently used or must be administered on an urgent basis; prefilled syringes to reduce the risk of the wrong drug being drawn up and within some hospitals drug preparation is supported by using a double-checking system (either two-person double check or machine-checking) [9, 10]. Nevertheless, several researchers have argued that the types of medication errors made, the most common drug errors, and the main factors contributing to drug errors in

anaesthesia have remained relatively unchanged for more than 20 years [1, 5, 11, 12]. However, novel solutions do not always work in practice. This may be due to a combination of lack of efficacy, unintended negative consequences or barriers to implementation. It is therefore appropriate to determine whether even apparently small or simple alterations in practice serve to reduce the risk of errors.

The present study aimed to explore the potential impact of a simple adjunct to drug preparation and storage on safe drug administration during anaesthesia. The study aimed to investigate both the praxis of the novel drug tray, and the perceived barriers and drivers to its use in daily practice.

Methods

Study design and participants

This was a multi-centre qualitative study, adopting an interpretive paradigm, utilising observation and semi-structured interviews. A pragmatic approach of convenience sampling within three NHS Trusts in England was used. Approval for this study was obtained from the NHS Research Ethics Committee and local research governance approval, Reference number O14072015 15057 SoM AIC CN, 23rd July 2015, and local research governance approval was gained at all sites. Twenty different anaesthetists participated in the study. Each participant was sent a letter of invitation and information sheet and signed a consent form prior to taking part.

Observations

The observations were conducted at three NHS Trusts by three different trained researchers to permit comparisons and ensure the validity of the data collection.
Over a six-month period, the three investigators observed 30 cases, ten of which involved the standard trays in ‘normal’ practice and 20 cases wherein new Rainbow trays were used. Standard practice at all three institutions is for anaesthetists to collect and transport their

prepared drugs in one or more disposable uni-compartment paper trays. The novel Rainbow trays comprises three separate trays: one for non-emergency drugs, one for emergency drugs, and another for local anaesthetic drugs **Figure 1**. Each one has a specific disposable insert with rounded edges to aid syringe retrieval and has a colour-coded base, matching ISO 26825:2008 [13] that can help in drug separation.

We introduced the Rainbow trays after completing an initial observation (with the standard trays) with each anaesthetist; then, at least two weeks later, a second observation was carried out where the Rainbow trays were used.

Data were collected utilising a bespoke, pre-tested observation schedule across all three sites to promote reliability. We recorded any additional comments provided by anaesthetists, trainees, or operating department practitioners (ODPs). We observed and recorded our observations in real time, focusing on the drug preparation, administration, and use of the trays from throughout the case. All observations and detailed notes taken during the observation period were typed up immediately afterwards.

The key themes of the observation are summarised in **Figure 2**.

Interviews

A total of 20 semi-structured interviews were conducted immediately upon completing the second observation with the involved anaesthetists. Interview times were prearranged and lasted for 20–30 minutes. All discussions were digitally recorded and transcribed within one day of the interview by one of the researchers. We used an interview guide as a prompt for each interview to ensure key questions were asked to all participants. The questions included in the interview guide are shown in **Appendix 1**.

During the interviews, discussions were supplemented using the observation notes to help elaborate topics that arose. Before beginning the interviews, a brief outline of the format of the questions was given to ensure that all questions were understandable to participants

and to mitigate any possible anxiety. The final transcripts were independently read through by DA and double-checked alongside the original records by the investigators (DA, RE, IM) for reliability and integrity; any additional comments were included at this phase.

Analysis

Data from both the observations and interviews were analysed using thematic analysis to identify themes and subthemes. The interview and observation data were sufficiently in-depth to be coded line by line as described by Charmaz [14]. Early line-by-line coding of the observations enabled the researchers to focus the subsequent interviews. Throughout the analysis, the transcripts were repeatedly revisited to compare categories and to look for 'negative' or contradictory themes, these themes could then be explored further during the study period both within the observations and the interviews. The organisation and management of the data was assisted by the software package NVivo-11 (QSR International Pty Ltd.; Melbourne, Australia) [15]. Initial analysis and coding was carried out by DA and RE separately. DA and RE then met to discuss the coding and to agree or revise the thematic categories before discussing the results with the IM. Open coding generated 98 codes; these codes were then synthesised using focused coding into three theoretical categories; two of these categories were then further broken down into three subcategories.

Results

The two main thematic categories that emerged from the data were 1) standard practice (with subcategories of preparation, benefits and risks) and 2) Rainbow trays (with subcategories of preparation, benefits and disadvantages). A third category that emerged was syringe labelling.

Standard Practice

Preparation

Anaesthetic induction was routinely carried out in an anaesthetic room at all three Trusts, we observed no cases of induction within the operating room. In Trust A and C we found that drugs were prepared sequentially prior to the patient arriving in the anaesthetic room whereas at Trust B drugs were prepared in advance for the whole operation list. Standard practice in all three sites was to keep prepared syringes on a grey, disposable, compressed paper tray.

In all three NHS Trusts, the drugs were prepared before the patient entered the anaesthetic room by the anaesthetist, several reasons were given for this practice, one reason was as a way of mitigating distractions or mistakes (**Table 1**). Other reasons given were to ease patient anxiety and reduce the time spent in the anaesthetic room.

In all three Trusts some anaesthetists read aloud the drug label, including the name of the drug, its concentration, and the expiry date, before the drug was drawn up. Once the drug was drawn up we found all anaesthetists labelled the syringe, however we did not observe any occasions where the anaesthetist reconfirmed the drug in the syringe corresponded to the drug in the ampoule.

We observed that when drugs were checked by another individual after preparation, this was always by an anaesthetist, not an ODP or nurse. At Trust C we did not observe any second person double-check being performed, including when emergency drugs were prepared.

At Trust C emergency drugs were prepared on an individual patient basis, whereas at Trusts A and B controlled drugs were prepared in advance for the whole theatre list. In Trusts A and C empty ampoules were kept until the end of the operation; in Trust B they were discarded immediately after drawing up.

Across all three trusts, during induction, multiple drugs were held in the hand by the anaesthetist at the same time and we did not observe any two-person double check prior to

administration. It was not possible by observation to determine how deeply the anaesthetist checked the syringe prior to administration; for instance, whether only colour was checked, or whether the label was read and checked internally and explicitly against the mental model of the correct drug.

Prepared drug syringes were placed in grey trays at all three Trusts. We did observe that anaesthetists sometimes used more than one tray to separate the syringes containing 'emergency drugs' (typically metaraminol and / or ephedrine), from induction drugs. We found that the trays containing the induction drugs were routinely placed on the anaesthetic machine during induction; the trays containing the emergency drugs were left where they had been prepared.

On transfer to the operating room the emergency drug tray, if used, was generally placed on top of the anaesthetic machine, while the induction drug tray was again placed on the main part of the anaesthetic machine. At Trust B, both drug trays were routinely placed on top of the anaesthetic machine and the anaesthetic drug trolley was moved to the operating room and placed behind the patient.

Benefits

A frequent perceived benefit of the grey trays was ease of use, size and cost **(Table 1)**. Another benefit was the ability to separate the multiple drugs used during the anaesthetic pathway. Trays were used to collect the empty ampoules. A reason given for retaining ampoules was to mitigate distraction and prevent wrong drug administration.

Risks

The main perceived risk of the grey trays was size **(Table 1)**. Our observations found that when only one tray was used the tray was full of syringes and it was difficult to read the labels. Within our interviews this theme emerged on more than one occasion. There was a uniform acknowledgement that the crowded tray could lead to error.

Summary

There is no 'standard' practice with considerable variation in timing of drug preparation, the process of drug/syringe checking and separation of emergency drugs. There are perceived benefits of current practice – cheap and simple, and risks – insufficient size, intermingling of syringes.

Rainbow Trays

Preparation

The introduction of the Rainbow trays **Figure 1** did not appear to change the way drugs were prepared for the anaesthetic pathway. However, consistent with its intended purpose, it did impact on the storage of the syringes while in use. We observed that all anaesthetists cleaned the main body of the rainbow tray with sanitising wipes prior to use even though the tray includes a disposable insert as part of its design.

Once the drug was drawn up into the syringe and labelled they were placed into the individual compartment that corresponded to the appropriate drug class within the Rainbow tray. This was observed for both the induction drugs and the emergency drugs.

We observed no difference where the Rainbow trays were placed during use compared to the grey trays, however we did observe a change in practice during induction. Anaesthetists no longer held multiple syringes at the same time, instead each syringe was individually removed from the tray and the label rechecked prior to administration. The syringes were subsequently returned to their specific sections in the tray.

Placement of the rainbow tray within the operating theatre was comparable to standard practice with the grey tray. At the end of the operation, the Rainbow trays were taken from the operating theatre back to the anaesthetic room; inserts were discarded and the trays cleaned and prepared for the next case.

Benefits

From both our observations and interviews the Rainbow trays were found to be easy to use **(Table 2)**. The Rainbow trays appeared to aid drug identification through the use of separate compartments for different drug classes, the trays reinforced the labels on syringes and made it easy to identify what was available to anaesthetists. Another frequently cited benefit was the sequential ordering of syringes in line with anaesthetic practice.

Additionally, participants liked the way that different classes of drugs were clearly separated. In an emergency situation, the coloured sections within the Rainbow tray were seen as particularly advantageous, the majority of anaesthetists interviewed felt it would aid quick identification of the correct drug.

Finally, we found that the introduction of the Rainbow trays appeared to increase awareness of the potential for drug errors within anaesthesia.

Disadvantages

The main disadvantages we found were around the size of the tray and the compartments **(Table 2)**. There were several comments on the size of the individual compartments being too small. However, we observed that the overall size of the tray could be problematic when placed on the anaesthetic machine as it took up a reasonable amount of space. Tray size was also mentioned by several of the participants.

An identified barrier of the Rainbow tray was the latent risk of syringe swap. If the syringe is initially placed in the wrong compartment there is the potential to rely on the tray placement over the syringe label and administer the wrong drug. This risk was acknowledged by several anaesthetists.

Finally, most of the participants were concerns about the cost effectiveness of the Rainbow trays on NHS finances.

Summary

Rainbow trays did not change the way drugs were prepared for anaesthesia. However, consistent with its intended purpose, it did impact on the storage of the syringes while in use. There are perceived benefits of ease of use and increased awareness of the potential of drug errors. Limitations to the feasibility of use were around design and placement.

Syringe labelling

As part of this study we observed syringe labelling. More than half of the participants preferred to label syringes around the barrel at the neck of the syringe, the reasons given were predominantly around the ease of reading syringe markings **(Table 3)**. Another perceived benefit described was that the colour on the label was easy to see no matter how the syringe was placed in the tray. However, for some anaesthetists it was a more practical issue with the label that had influenced placement.

Discussion

The main finding of this study was that the current drug storage system was easy to use, low cost and portable, it did however have the latent potential for syringe swap errors. The novel Rainbow tray was readily accepted into clinical practice, was generally preferred to the standard tray by participants and was perceived to have the potential to reduce drug errors.

This study can be conceptualised as asking **how** the Rainbow trays might work (or not) as well as **whether** they could work. The study was not designed to demonstrate an impact on drug errors *per se*. Ergonomics is concerned with the interaction between humans and their (working) environment. Understanding how work is currently done, as opposed to work as imagined, and the impact of changes on behaviours and attitudes is key to successful change.

Our results suggest there is no clear ‘standard’ practice for drug preparation and handling, despite this being a fundamental component of safe anaesthetic practice. This is

perhaps more surprising to those outside anaesthesia than those within. Although there are legitimate debates about the balance between standardisation, clinical variation and professional autonomy, drug preparation and handling is a repeated, low-variability, high-risk task. The literature describes drug preparation as a potentially high risk activity and several factors should be mitigated to reduce the potential for error [2, 4, 16]. However, there is still no definitive consensus on the best method for preparing drugs.

The original drivers to development of the Rainbow trays was dissatisfaction with current practice by an anaesthetist (LS) and a pharmacist (SG). This was in the context of serious drug errors and increasing awareness of the consequences [17] and frequency of distraction [18]. Syringe swaps have consistently been cited as a major factor leading to medication errors with potential and actual serious adverse consequences. [7, 19].

The Rainbow trays are simple, designed in line with Reason's recommendation for reducing complexity and NAP5 recommendations for the formal organisation of the anaesthetic workplace and handling of drugs [20, 21]. Prototyping and informal user feedback improved various aspects of the design: compartments sizes; incorporation of a reusable base and recyclable, disposable insert; and separation of similar colours.

Study participants identified that local practice of a relatively small, single compartment tray may be a latent system design error, facilitating miss-selection. Conversely, the participants identified the colour-coding and compartmentalisation of the Rainbow tray as mitigating miss-selection.

The potential benefits of the Rainbow tray seem to go beyond the design itself. Participants identified an increased awareness of drug safety. Exhortations to vigilance in response to drug errors are a seemingly common practice within healthcare, with scant evidence of benefit. At least in this short-term study, the Rainbow tray appears to act as an 'in the moment' reminder. The tenet of 'making it easy to do the right thing' seems to have

worked. There is nothing stopping anaesthetists separating out their drugs now (cardboard trays are effectively unlimited) yet the explicit separation of routine, emergency and local anaesthetic drugs with the Rainbow tray system appears to have facilitated this behaviour. Similarly, the change of behaviour at time of induction from holding drugs in one hand, to selecting them individually, appears to be a response to the new tray – there is nothing preventing the anaesthetist doing this with current practice.

The unpredictability of human behaviour is demonstrated in this study. The inserts are designed, and clearly labelled, as disposable. Yet, anaesthetists changed their behaviours and consciously cleaned them after use.

As expected, not all perceptions were positive. There were concerns about size and workspace availability. The increased footprint of the tray is an unavoidable consequence of compartmentalisation. This does have practical issues, but these do not seem to outweigh perceived benefits.

There were also concerns about the size of the white (miscellaneous) section. Predominantly this contains antibiotics and (saline) flush syringes. On the one hand making this compartment bigger would facilitate syringe handling. Conversely, a larger compartment is moving back toward the single tray concept currently in use.

An unexpected finding was the failure of the tray to address a practice that is generally not recommended – 'capping' syringes with filler needles. The trays were deliberately designed not to accommodate a syringe capped with a needle, yet several anaesthetists carried on their practice of using needles as caps which makes the trays harder to use. This represents a mismatch between our work-as-imagined and real-world work-as-done [22].

Participants correctly identified that the trays themselves can do nothing about incorrectly prepared syringes. Of greater concern, are the comments about over-reliance on

correct placement of syringes in the correct compartment. These are legitimate concerns. We would hope that the trays are viewed and used as aids to correct selection, rather than as the sole means of identification. The same argument applies to the colour coding of anaesthetic drug labels. This is intended to reduce miss-selection, but is not intended to replace reading the labels.

Although it was not the primary purpose of the study, the process of drug preparation merits discussion. The new tray did not appear to change this somewhat variable practice. There is no consensus on whether to label first or draw up first [8, 23], and there are arguments for both. It is hard to justify the variation for such a basic task however, the variation was seen within and between the sites, suggesting this is widespread issue.

There were some interesting observations about the apparently trivial process of how to apply the drug label. There are standards requiring labelling parallel to the long axis of the barrel [24]. Anaesthetists currently largely seem to demur from this practice – for pragmatic reasons. Concerns about covering the gradations (which can be solved by the anaesthetist placing the label); inability to see the colour label if the syringe is 'upside down' (inevitable) and failure of label adhesive (outside of the immediate control of the anaesthetist). This would suggest a dissonance between work-as-imagined (by the standards writers) and work-as-done (by practicing anaesthetists).

Merry and colleagues designed an integrated drug administration system in which anaesthetic drug trolleys are arranged to complement the flow of the anaesthetic. The base of the drawers are divided in sections and colour coded to match the class of drug stored in each compartment [25]. This is one of the few approaches that has demonstrated beneficial effects on drug errors. However, it is not a panacea and a UK study identified workarounds and concerns that might limit its efficacy [9]. The Rainbow trays are a simple solution to

accommodate the nuances of UK practice where drugs are typically stored within cupboards rather than trolleys.

Anaesthesia has a proud history of pragmatic approaches, working with manufacturers and regulators, to reduce complexity and standardisation to help to improve safety [17, 18]: pin index systems on cylinders, colour coding, universal breathing system connectors to name a few. In parallel the specialty has always been cautious of the risks of creating new problems whilst solving another, most recently seen with the introduction of non-Luer equipment for intra-thecal injection.

We have demonstrated that it is feasible to introduce the Rainbow tray into clinical practice at three NHS Trusts in England. We found that the Rainbow trays were readily accepted and facilitated drug identification as intended. Use of the Rainbow trays also appeared to heighten awareness of the potential for drug error and the need to check the syringe prior to drug administration. Negatives appear to be few. Further research is now needed to determine the best strategies to ensure the continued use of the Rainbow trays and the potential overall effect on reducing drug error. Ultimately take up of this, or similar systems will be the product of drivers such as national recommendations [25] 'Syringe Labelling in Critical Care Areas' [26], regulations and hospital policies, education about drug safety at a local and national level [27], and barriers such as cost, resistance to change, and currently unforeseen unintended consequences.

Competing interests

Part funded by the AAGBI: "Evaluation of benefits, risks and barriers to implementation of an ISO 26825 colour coded anaesthetic drug tray", 2015.

DA is a PhD student funded by Libyan Ministry of Higher Education.

RE is the researcher and member of the technical team for the Royal College of Anaesthetists Guidelines for the Provision of Anaesthesia Services.

RG was vice-president of AAGBI during the study period

LS Conceived and co-designed the initial concept of the tray. No financial interest in the sale of the tray.

SG Conceived and co-designed the initial concept of the drug tray. No financial interest in the sale of the tray.

IM is a member of the NICE topic expert group for Quality Standards for hip fracture, Deputy Director of the National Institute of Academic Anaesthesia (NIAA) Research Council and holds grants from the National Institute for Health Research and the Association of Anaesthetists of Great Britain & Ireland and Royal College of Anaesthetists through the NIAA for clinical trials. Assisted with development of the drug tray.

The Rainbow tray is commercially available. None of the authors have any financial interest in the sales of the tray.

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Figure 1: Photos of Rainbow Trays

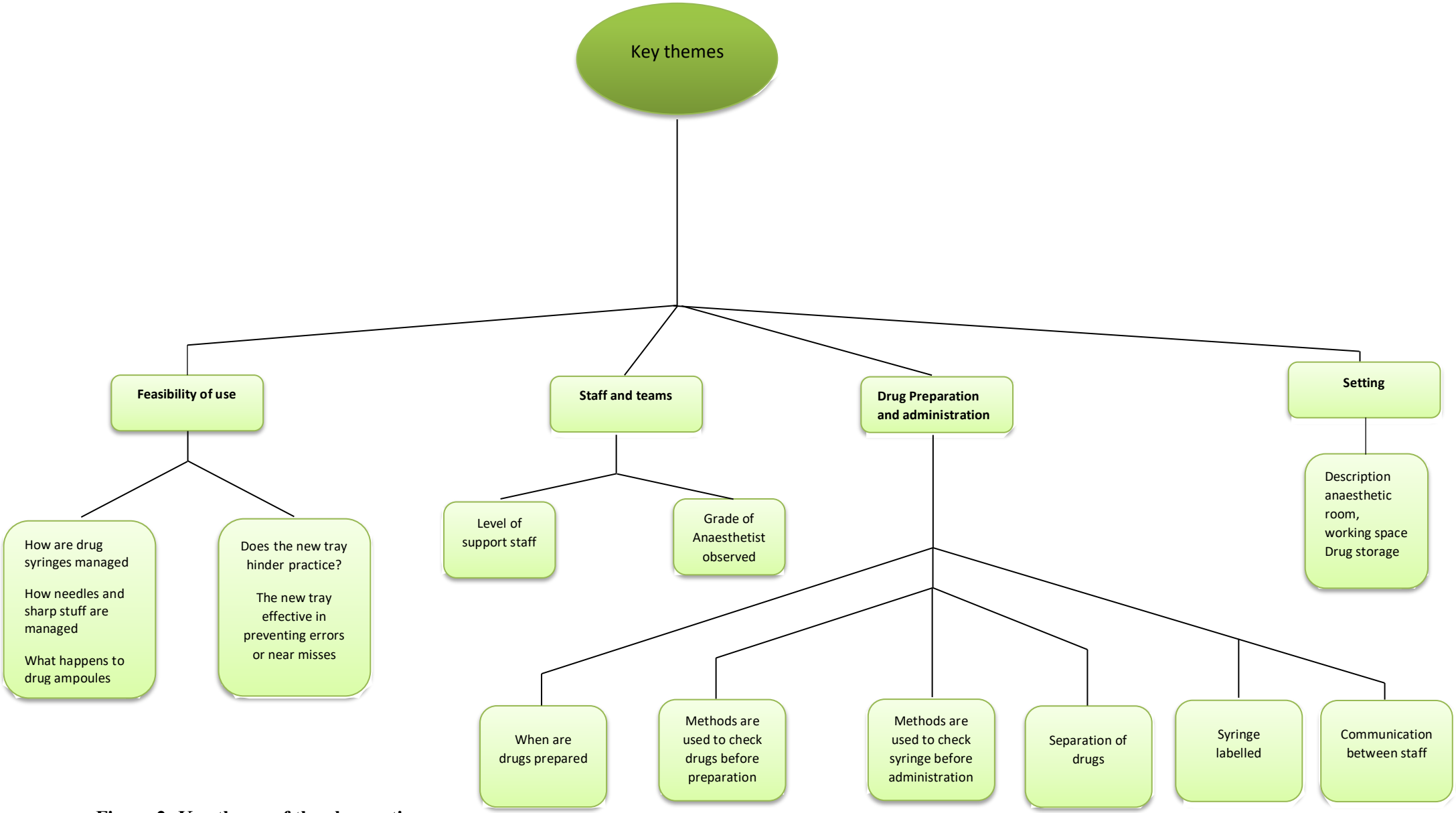

Figure 2: Key theme of the observation

Appendix 1

Interview Questions

1. Current practice for drug preparation and storage
2. Benefits of current practice
3. Risks of current practice
4. How do you feel about using a standardised / colour coded drug tray?
5. Benefits of a standardised / colour coded drug tray
6. Risks of a standardised / colour coded drug tray
7. What do you feel should be best practice?

Table 1 Subcategories, key emerging themes, and quotes for Standard Practice	
Subcategory	Quote(s)
Preparation	'*I like to draw up my drugs before the patient enters the anaesthetic room, so that I am not being distracted when I am doing it'* [Trust C, A1]. '*Normally I would like to prepare anticipate drugs before patient arrived because it takes reasons to avoid having wrong drug and to reduce risk of mistakes'* [Trust C, A4]. *'I can give my undivided attention to the patient, and not delay the time before induction to minimise the anxiety levels of the patient.'* [Trust B, A2]. *'I think once the patient is in the anaesthetic room, [making sure] the drugs [are] ready at that point means the patient is waiting for less time'* [Trust A, A9].
Benefit	*'A very cheap method of drug trays'* [Trust C: A1, Trust A: A5]. *'They are simple, cheap, and ecological, and are quick and easy to use'*[Trust B: A2]. *'It doesn't take up as much room on the anaesthetic machine work surface; the space is limited at the anaesthetic workstation'* [Trust B: A3]. *'I can use a number of trays my practice uses a lot of local anaesthetic drugs to separate the local drugs from the other drugs I use'* [Trust A: A7]. *'It is useful and just keeps drugs together, and if a couple of different types of drugs are used it is helpful, as I do not confuse my emergency drugs with other drugs'* [Trust A: A9]. *'We use the grey tray to collect some other discarded ampules'* [Trust A, A9].
Risks	'Drug error is a risk and is not big enough, and all drugs are mixed up' [Trust C: A1]. 'It is easy to fail and choose the wrong drugs' [Trust A: A4]. 'Drugs may still fall out if tilted' [Trust B: A3]. 'Drug error is a risk' [Trust B: A1]. 'Obviously, in terms of the syringes all going together in the tray, we do have to be careful to pick up the right drug before we give it' [Trust A: A7].

Table 2 Subcategories, key emerging themes, and quotes for Rainbow Tray	
Subcategory	Quote(s)
Benefit	*'I did like it; it does not come with a lot of problems' [Trust A: A4, Trust C: A5].* *'I like it, it is straightforward; I like the colour code and how it's organised, and it is easy to use'* [Trust A: A8], *'I like using rainbow trays. I find it a good way of storing drugs; I think they are safer than the cardboard trays if used properly'* [Trust B: A4]. *'I liked that they were tidy and they follow the normal order we use in the theatre'* [Trust A: A1]. *'It is easy to find drugs and follow the normal sequences'* [Trust A: A2]. *'I like the way that local anaesthetic drug are separate from the emergency drugs'* [Trust A: A1]. *'I can see there is a benefit for [them] in [an] emergency'* [Trust A: A7]. *'It is easy to identify syringes, especially in emergency situations'* [Trust B: A2]. *'I like the way they ensure that you think about which drugs you might need and the way of separating drugs very carefully, although syringes in colour coded trays does not mean that the right syringe will get to the patient. Still, it is good and does add additional safety'* [Trust A: A4]. *'It adds to the safety, as it is less likely to pick up the wrong syringe and the more likely to put the right drug in the syringe in the right compartment'* [Trust A: A8]. *'I would think that the risk of administering the wrong drug is reduced'* [Trust B: A3].
Risks	*'There are a number of drugs that go in the white compartment so I think that means you could potentially have a collection of drugs in that space that are potentially mixed up'* [Trust A: A9]. *'In terms of layout of the tray, some compartments needed to be slightly larger, such as the other agents' compartment coloured white, as the variety of different drugs that would be placed in it'* [Trust C: A5]. *'The size again was a drawback when regular drugs went to the patient, while the core trainee managed the airway'* [Trust B: A2]. *'Once you have used most of the drugs in the tray, it takes up a lot of room on the anaesthetic machine table and made it more awkward to complete the anaesthetic chart'* [Trust B: A2]. *'It is a very bulky container that does not fit on the anaesthetic machine if everything is in the tray'* [Trust B: A1]. *'There is potential for making the mistake of putting drugs in the wrong compartment'* [Trust A: A2]. *'You might suddenly put drugs in the wrong compartment and pick them up without reading the label'* [Trust A: A8].

Table 3 Subcategories, key emerging themes, and quotes for Syringe Labelling	
Subcategory	Quote(s)
Reasons	'*Around the barrel at the end does not cover any gradations'* [Trust A: A4]. *'I like be able to see the ml gradation and the labelling at the same time, and I think the advantage is that the colour is visible'* [Trust A: A8]. *'By labelling around the syringes, you can obviously see the label whichever way the syringe lays'* [Trust A: A7]. *'The biggest problem was that the labelling stickers did not stick very well along the barrel, so around it is the only way to make them stick'* [Trust A: A5].