Supplementary file: Example report back to hospital from Phase 1 study

N.B. This was delivered prior to the data being properly cleaned for the main analysis, so includes some numerical discrepancies

Section 5 (shaded in green) was added after the debriefs and focus groups to record important points from those meetings.

ECLIPSE

Exploring the Current Landscape of IV Infusion Practices & Errors

Point Prevalence Study

Preliminary Findings

Site P

Disclaimer: Please note, all results presented in this report are preliminary and may be subject to change. The data presented here are part of a wider multi-hospital study and the data will be reviewed and re-analysed when data collection is complete at all sites. These preliminary findings are shared with a view to engaging stakeholders and opening up discussions, with a view to developing recommendations for best practice that take into account broader contextual factors such as staffing levels and equipment usability (see section 5). Questions, comments, and other feedback are welcomed.

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26th January 2017

UCL

NHS National Institute for Health Research

1 Introduction and aims

The ECLIPSE study is a multi-phase project that seeks to explore the landscape of intravenous (IV) medication infusion practices in English hospitals and how these relate to the prevalence of medication administration errors. The first phase of the study comprises a point prevalence study of IV infusion administration and qualitative interviews with key hospital staff to determine how often and why errors occur. Subsequent phases will comprise more in-depth observational studies and synthesis of the findings to make recommendations for safer administration of IV medication.

The main objective of the point prevalence study is to document the prevalence, types, and clinical importance of errors and other discrepancies involving infusion of IV medication in a sample of English hospitals. The study also explores potential sources of variation in the rates, types and clinical importance of errors in relation to mode of infusion delivery and clinical area.

This report summarises preliminary findings from one hospital (Site P). An overview of the results from the other hospitals will be published and forwarded to each site later in our project.

2 Methods

2.1.1 Definitions

Medication infusions were taken to include any medication, fluids, blood products and nutrition administered via an IV infusion. This included patient-controlled analgesia. Bolus doses of IV medication were excluded, except where an intended bolus dose was identified being given as an infusion using a pump, or vice versa.

A medication administration error was defined as any deviation in the administration of an IV infusion from a doctor's written medication order, the hospital's IV policy and guidelines, or the manufacturer's instructions. This was taken to include the administration of medication to which the patient had a documented allergy or sensitivity; other aspects of the clinical appropriateness of the medication order and its administration was not assessed.

We also collected data on other procedural and documentation discrepancies that did not meet this definition of a medication administration error. These included patients not wearing

an identification wristband with the correct information, tubing not being been tagged and labelled in accordance with local policy, and failure to document the administration of the medication in line with hospital policy. Table 1 outlines the types of errors and discrepancies targeted for data collection.

Table 1 Definitions of errors and discrepancies

Discrepancy/error type	Definition
Medication administration errors	
Unauthorised medication/fluids (no documented order)	Fluids/medications are being administered but no medication order is present. This includes failure to document a verbal order if these are permitted as per hospital policy.
Wrong medication or fluid	A different fluid/medication/diluent as documented on the IV bag (or bottle/syringe/other container) is being infused compared with that specified on the medication order or in local guidance.
Concentration discrepancy	An amount of a medication in a unit of solution that is different from that prescribed.
Dose discrepancy	The same medication but the total dose is different from that prescribed.
Rate discrepancy	A different rate is being delivered from that prescribed. Also refers to weight-based rates calculated incorrectly including using a different patient weight from that recorded on the patient's chart.
Delay of dose or medication/fluid change	An order to change the medication or rate not carried out within 4 hours of the written medication order, or as per local policy.
Omitted medication or IV fluids	The medication prescribed was not administered.
Allergy oversight	Medication is prescribed / administered despite the patient having a documented allergy or sensitivity to the drug concerned.
Expired drug	The expiry date / time on either the manufacturer's or additive label has been exceeded.
Roller clamp discrepancy	The roller clamp is not positioned appropriately/ correctly.
Procedural and documentation discrepancies	
Patient identification error	Patient either has no identification (ID) band on wrist, or information on their ID band is incorrect.
Wrong or missing information on additive label	Any incorrect or missing information on the additive label, as required by hospital policy
Tubing not tagged according to policy	Tagging or labelling of tubing is different (either missing or incorrect) from requirements in hospital policy
Documentation error	Medication/fluids administered but not documented correctly on chart e.g. missing signature, start time, etc.

2.1.2 Context

This section seeks to outline some of the relevant local policies, procedures and technologies that shape IV administration at the trust.

1) Prescribing

There is electronic prescribing everywhere for inpatient drugs. Fluids and TPN are prescribed on paper because of the current limitations of the e-prescribing system, i.e. the electronic system does not reflect practice at the moment when consecutive bags are given and does not do a good job of continuous infusions either. So using the electronic system for these things at this time could cause more problems. Work is being done to improve the system to bring fluids and TPN within the e-prescribing system. This is a technology issue and should not be interpreted that fluids are less significant than drugs.

The trust's medicines policy says (p26): Medicines must not be given unless prescribed or covered by the appropriate PGD / Policy.

The site's research team thought that the trust's policy was that there should not be any verbal orders.

2) Guidelines used for preparation and administration of IV infusions e.g. are nurses expected to use Medusa guidelines, BNF, UCLH or similar?

There is a dedicated policy for the preparation and administration of intravenous drugs and infusions at the trust.

In terms of preparation and administration advice: some areas have access to BNF, some to UCLH guidance, and the trust is looking to roll out MEDUSA across the trust. In critical care the nurses have a drug delivery directory.

3) Labelling IV administration sets

The trust's IV preparation and administration policy says (page 15) that all IV administration sets must be labelled with the time and date they were connected. Continuous infusion sets should be changed every 72hrs, intermittent every 24hrs, parenteral nutrition every 24hrs and blood every 12hrs.

It should be noted that some areas, e.g. critical care, label the IV administration sets with the drug, but this is different to the policy mentioned above which focuses on the date.

4) Labelling of medication/fluids

The trust's IV preparation and administration policy says that additive labels should record (p.6): patient's name, drug name and dose (including solution added), route, date and time reconstituted, expiry date of reconstituted infusion, name of administering practitioner, name of checking practitioner and batch number.

5) Any other relevant policies

The trust's IV policy says that the access device should be flushed before and after infusions. 0.1-20ml is covered by a PGD. This is to flush the access device and not the line.

IVs should be double checked to check the pre-prepared drug/fluid or reconstituted drug/fluid is correct, in date, etc. plus correct patient and allergies need to be double checked, as well as two qualified staff to check the pump prior to it commencing.

6) Smart pumps

Infusion pumps (including volumetric, syringe and PCA pumps) use drug libraries with hard and/or soft limits. Drug libraries vary between departments, they are as extensive as the area wanted them to be originally, e.g. ICU drug library is more extensive than a general surgical ward. Hard and soft limits were programmed in, but they can be over ridden.

2.1.3 Data collection procedure

Two local clinicians, an experienced research nurse and a senior pharmacist, collected the data. Data were collected across five days in five clinical areas: general medicine, general surgery and critical care. On selected observation days, the data collectors moved systematically around each ward, aiming to gather data from every infusion that was being administered at that time.

The data collectors compared the medication being administered against the patient's prescribed medication and relevant medication administration records to identify any discrepancies. This included a comparison of the medication or fluid name, the concentration, dose and rate of infusion. Relevant data such as patient allergies to IV drugs, drug expiry

dates, pump type, and any procedural or documentation errors were also examined. The two observers worked together to check the data collected and agree whether or not any medication administration error or other discrepancy had been identified. All data were recorded via a tablet on a secure web-based data collection tool, called REDCap.

If an error was identified that had the potential to cause harm, the observers discretely informed the relevant nursing staff caring for the patient so that remedial action could be taken.

2.1.4 Assessment of likely harm

The potential harm associated with each discrepancy or error was discussed and agreed amongst the two observers. Each discrepancy was classified according to an adapted version of the US National Co-ordinating Council for Medication Error Reporting and Prevention (NCC MERP) index for categorising medication errors (Table 2). The adaptation allows for the assigned severity ratings to be based on the likelihood of the discrepancy or error to have resulted in patient harm if it had not been intercepted, rather than actual patient harm for which the NCC MERP index was originally designed. Minor procedural or documentation discrepancies that were assumed to be relatively straightforward or common, such as "missing patient identification band" and "no documented start time" were automatically assigned a rating by the research team.

Table 2 Adapted NCC MERP index for classifying the severity of a discrepancy or error

Harm	Category	Description
No Error	A1	Discrepancy but no error
	A2	Capacity to cause error
Error, no harm	B	An error occurred but is unlikely to reach the patient
	C	An error occurred but is unlikely to cause harm despite reaching the patient
	D	An error occurred that would be likely to have required increased monitoring and/or intervention to preclude harm
Error, harm	E	An error occurred that would be likely to have caused temporary harm
	F	An error occurred that would be likely to have caused temporary harm and prolonged hospitalization
	G	An error occurred that would be likely to have contributed to or resulted in permanent harm
	H	An error occurred that would be likely to have required intervention to sustain life
Error, death	I	An error occurred that would be likely to have contributed to or resulted in the patient's death

For the remainder of this report, observations rated as either A1 or A2 are considered as "discrepancies" that have the potential to cause an error, while those rated as B, C, D, E, F, G, H, or I are considered to be "errors".

3 Results

3.1 When and where were the data collected?

Data collection took place over five days in September and October 2016. This included 22 ward visits covering three clinical areas: general medicine, general surgery and critical care. Table 3 shows the specialties of the wards included.

Table 3 Specialties of wards included in the point prevalence study

Clinical area	Number of wards involved in study	Specialties	Infusions observed	Patients observed on infusions
General Medical	**6** (9 visits)	Admissions unit	26	22
		Gastroenterology	2	2
		General Medicine	1	1
		Intestinal failure	10	10
		Medical HDU	6	5
		Respiratory	3	3
		Subtotal	**48**	**43**
General Surgery	**4** (7 visits)	General surgery	28	18
		Neurosurgery	12	10
		Short stay surgery	4	3
		Spinal surgery	1	1
		Subtotal	**45**	**32**
Critical Care	**3** (4 visits)	Critical care / ICU / Intensive care	50	21
		Neurosurgical HDU	6	6
		Surgical HDU	12	7
		Subtotal	**68**	**34**
Total	**13 (22 visits)**		**161**	**109**

A total of 379 beds/chairs were occupied across all 22 ward visits. 361 (95%) of these were checked to determine whether the patient was receiving any infusions. Of these beds/chairs, 109 patients were included in the observations. Reasons for not including some patients included procedures being performed at the time of observation and infection control reasons. A total of 160 infusions were observed. An extra infusion is included in the report as a nurse had a 100ml bag of NaCl 0.9% hanging as a flush between medications, this was not infusing at the time of observation but the observers noted it as an interesting case (see Section 3.4.1).

3.2 Types of pumps in use

The most common method of delivery was using a volumetric infusion pump (58.8% of all infusions; table 4).

Table 4 Types of pump or delivery method in use in each clinical area

Pump type	Clinical area			Total
	General Medical	General Surgery	Critical Care	
Volumetric infusion pump Fresanius Kabi Volumatic Agilia	32	27	36	95 (58.8%)
Syringe driver Braun Perfusor Space	1	1	26	28 (17.5%)
Gravity feed	15	10	1	26 (16.3%)
PCA pump CME BodyGuard 575	0	7	5	12 (7.5%)
Total	**48**	**45**	**68**	**161 (100%)**

PCA: patient-controlled analgesia

3.2.1 Smart pump use

Of 160 infusions, 134 (83.8%) were administered using a smart pump (i.e. an infusion pump with a drug library and/or dose error reduction software). Only the 26 gravity infusions were not delivered by a smart pump. In 89 of the 134 infusions (66.4%) delivered via smart pump the drug was selected using the drug library. Of the 45 infusions that did not use the library, 24 had a drug library entry but it was not selected (53.3%), and 21 did not have an appropriate entry to select (46.7%). In 4 cases where there was not an appropriate selection Hartmanns was chosen rather than Drug X (3 infusions were for plasmalyte and one was for KCl 0.15% (20mmol K+), NaCl 0.18%, Glucose 4%). These fluids were not in the drug library because it was developed before their use a few years ago. All 24 infusions that did not use the drug library when they could have done and the 4 cases where Hartmanns was wrongly selected were classed as an A2 [Capacity to cause error].

The four cases of selecting Hartmanns rather than Drug X happened on general surgery (i.e. ward codes PS4 and PS5). The 24 Drug X's were spread: 9 in critical care (i.e. ward codes PC1 and PC6), 11 in general medicine (i.e. ward codes PM1, PM2, PM4 and PM7) and 4 in general surgery (i.e. ward codes PS4 and PS5). The 24 fluids and drugs being infused where Drug X was chosen were:

1. Sodium chloride 0.9%
2. Plasma Lyte 148
3. Plasma Lyte 148
4. Human Albumin
5. Plasma Lyte 148
6. Plasma Lyte 148
7. Plasma Lyte 148
13. Magnesium Sulphate 20mmols
14. Calcium Gluconate
15. Glucose 5%
16. Hartmanns solution
17. Insulin actrapid
18. Sodium chloride 0.9%

8. Plasma Lyte 148
9. Plasma Lyte 148
10. Sodium chloride 0.9%
11. Sodium chloride 0.9%
12. Potassium Chloride 0.3% in Sodium chloride 0.9%
19. Potassium Chloride 0.3% in Sodium chloride 0.9%
20. Peripheral Nutrition (PN)
21. TPN
22. TPN
23. Meropenem
24. Actrapid

3.3 Overview of errors and discrepancies

A total of 15 errors and 276 individual discrepancies were observed across 161 infusions. Multiple errors could be identified for a single infusion. Table 5 provides an overview of the number and proportion of infusions observed to have one or more errors and discrepancies. 14 patients (12.8%) were observed to have at least one error associated with their infusions. 106 patients (97.2%) had at least one discrepancy amongst their infusions.

Table 5 Number and proportion of infusions with at least one error or discrepancy

	At least one error per infusion	**At least one discrepancy per infusion**	**At least one error or discrepancy**
Medication administration	15 (9.3)	36 (22.5)	45 (28.1)
Procedure or documentation	0 (0.0)	161 (100.0)	161 (100.1)
Miscellaneous/other	0 (0.0)	1 (0.6)	1 (0.6)
Total	15 (9.3)	161 (00.0)	161 (100.1)

Data in brackets are percentage of all 161 infusions involving at least one error/discrepancy

3.4 Medication administration errors and discrepancies

A total of 15 medication administration errors were observed across 161 infusions. Fifteen infusions (9.3%) had at least one medication administration error. A total of 38 medication administration discrepancies were observed across 161 infusions. Thirty-six infusions (22.5%) had at least on medication administration discrepancy. Forty-five infusions (28.1%) had at least one medication administration error or discrepancy.

Table 6 indicates the types of medication administration errors and discrepancies observed. The most frequent types of errors were unauthorised drugs/fluids and deviations from the rate prescribed. The most frequent discrepancies were not using the smart pump library correctly.

Table 6 Number, frequency and potential severity of each type of medication administration error and discrepancy

Type of discrepancy/ error	Medication administration errors per infusion (n=160)	NCC MERP severity rating			Medication administration discrepancies per infusions (n=160)	NCC MERP severity rating	
		C	D	E		A1	A2
Unauthorised medication/fluids	7 (4.4)	7	-	-	1 (0.6)	-	1
Wrong drug/fluid*	2 (1.3)	2	-	-	-	-	-
Rate deviation*	5 (3.3)	5	-	-	6 (3.9)	5	1
Concentration discrepancy*	-	-	-	-	-	-	-
Dose discrepancy*	-	-	-	-	-	-	-
Administration start time discrepancy*	1 (0.7)	1	-	-	2 (1.3)	2	-
Omitted medications	-	-	-	-	1 (0.7)	1	-
Roller clamp issue	-	-	-	-	-	-	-
Expired drug	-	-	-	-	-	-	-
Allergy oversight	-	-	-	-	-	-	-
Drug library	-	-	-	-	28 (17.5)	-	28
Total	**15 (9.4)**	**15**	**-**	**-**	**38 (23.8)**	**8**	**30**

Percentages are in brackets.

*Seven unauthorised medication/fluids infusions are excluded (n=153)

3.4.1 Unauthorised medications / Medications without a written prescription

Eight of 160 infusions (5.0%) did not have corresponding medication orders. There were seven errors rated category C [An error occurred but is unlikely to cause harm despite reaching the patient], and one discrepancy rated A2 [Capacity to cause error]. Six errors were all for litre bags of Plasmalyte 148 in critical care wards. Three of them just note they had not been prescribed, three allude to previous bags being prescribed and nurses continuing the fluids before the doctors had time to document the order. These errors were observed between 11am-2pm.

One other error that was rated a C was noted because a nurse had prepared a 100ml bag of NaCl 0.9% to be used as a flush between Omeprazole and Furosemide doses. This was not prescribed and is outside of trust policy, which is up to 20ml flush on PGD. This was thought to be the practice of a single nurse that the ward manager was not aware of, the nurse rationalised that it was safer to spike a bag of flush for the whole line and then the next bag in terms of infection control rather than disconnecting and reconnecting another line on the cannula. The focus group talked about how this practice would actually give the patient the whole dose, whereas only flushing the cannula that is widely practiced leads to some of the

dose being thrown away with the line. Depending on the design of the giving set they can hold up to 25ml of fluid if full.

The discrepancy was because the observers could not locate the IV fluid chart to check the prescription.

3.4.2 Wrong drug/fluid

Two wrong drug/fluid errors were noted and rated C [An error occurred but is unlikely to cause harm despite reaching the patient. The first error observed a patient being given Sodium chloride 0.9% but they were prescribed Hartmanns and Plasmalyte. The second error was because 20mmol K+ in Glucose 5% had been prescribed but KCl 0.15% (20mmol K+), NaCl 0.18%, Glucose 4% was being infused.

3.4.3 Rate deviations

Five errors and 6 discrepancies were identified between the infusion rate observed and the rate prescribed. All errors were rated C and are described in Table 7. Of the 6 rate deviations categorised as discrepancies, one was an A2 and 5 were an A1 [Discrepancy but no error]. The A2 discrepancy was for Meropenem and says, “dose should be given every 8 hours. No rate specified on order but rate set at 9mL/hr. Examples of A1 rate discrepancies include: a 1ml/hr out when Noradrenaline was prescribed for 9ml/hr; a 1ml/hr out when Alfentanil was prescribed for 4ml/hr; and a litre of Sodium chloride 0.9% prescribed over 3hrs but infusing over 4hrs.

Table 7 Observed rate deviations

ID	Observed	Prescribed on drug chart and notes	Rating
PC1001	Atracurium, 50mls, at 10ml/hr	Prescribed 0-5ml/hr	C
PC1004	Plasmalyte 148, 1000mls, at 50ml/hr	Prescribed 125ml/hr	C
PC1008	Propofol, 50mls, at 25ml/hr	Prescribed 0-20ml/hr	C
PS4002	Plasmalyte 148, 1000mls, at 5ml/hr	Prescribed as 125ml/hr. The bag was almost empty at time of observation. Presume the nursing staff deliberately slowed down infusion rate to avoid interruption and maintain patency of line.	C
PS5007	TPN, 1900mls, at 78ml/hr	Prescribed as 52ml/hr over 24 hours (i.e. not intending to give full volume of bag).	C

3.4.4 Administration start time

One error and two discrepancies in administration start time were observed.

The C error was for an infusion of Paracetamol that finished about 8:30am, but the administration start time was signed to be started at 5:45am and should have only lasted 15mins. So it seems there is a mistake here.

The discrepancies included a Omeprazole dose prescribed at 8:00am but the additive label suggests it was given at 8:38am, and a Vancomycin dose due at 12noon that was signed for at 13:45 but observed running at 13:00.

3.4.5 Omitted fluids/medication (or not infusing at time of observation)

One discrepancy, rated A1, was noted as not being administered at the time of observation. The patient was due a dose of IV furosemide at the same time as the Omeprazole (8am). A bag containing the dose of furosemide was hanging but had not been connected. The observers questioned whether a Y connector could have been used to deliver both drugs at the same time. However, there was consensus at the focus group that it was standard practice to give these sequentially rather than at the same time in these circumstances.

3.4.6 Expired drug

No expired drugs were noted.

3.4.7 Allergy oversight

No allergy oversights were noted.

3.5 Procedural and documentation errors and discrepancies

There were 237 procedural and documentation discrepancies identified in the 160 observed infusions. All infusions (100.0%) had at least one procedural or documentation error or discrepancy.

Table 8 Number, frequency and severity of each type of procedural or documentation error or discrepancy

Type of discrepancy/ error	Procedural or documentation errors per infusion (n=160)	NCC MERP severity rating		Procedural or documentation discrepancies per infusion (n=160)	NCC MERP severity rating	
		C	D		A1	A2
Patient identification discrepancies*	-	-	-	8 (5.0)	-	8
Tubing not tagged/labelled correctly	-	-	-	160 (100.0)	-	160
Additive label missing or incorrect	-	-	-	15 (9.4)	-	15
Documentation discrepancies	-	-	-	54 (33.8)	-	54
Total	**-**	**-**	**-**	**237 (148.1)**	**-**	**237**

*Discrepancies are counted per infusion; there were 5 patient identification discrepancies, counting each once per patient.

3.5.1 Patient identification discrepancies

Five patients were not wearing an ID band, but the observers could perform a name verification check – this related to eight infusions in the data.

3.5.2 Tubing not tagged or labelled correctly

Of the 160 infusions that were observed 100.0% were not have a tagged according to the hospital's policy, which is to tag all IV lines with the date and time that it is setup. 32 infusions were tagged, 29 were in a critical care and 3 in general surgery, however these were tagged with the drug name and not the time and date the line was setup. All lines that were not labelled according to policy were rated an A2 [Capacity to cause error].

3.5.3 Additive label missing or incorrect

An additive label was required in 70 of the observed infusions. Of these 55 (78.6) were complete and correct, 14 (20.0) were incomplete or incorrect, and 1 (1.4) label was obscured, e.g. syringes were facing into the pump and could not be fully inspected. Some labels had more than one piece of information missing or incorrect. All labelling issues were rated A2 [Capacity to cause error].

Table 9 Missing or incorrect information on additive label

What information was missing or wrong?	Number of infusions
Time	6
Hung by	4
Expiry date	3
Date	2
Patient's name/ID	2
Patient's location	1
Dose	-
Volume	-
Drug name	-
Other (Batch number, double signature, diluent, wrong label used)	4 were missing diluent 1 was missing a 2nd signature check

3.5.4 Documentation of medication administration

Fifty-four of the 160 observed infusions (33.8%) had not been correctly documented on the patients' drug chart. Seven were missing the nurse's signature, 48 had a missing or incorrect start time documented, and four infusions had 'other' issues that included the total volume infused at last check not being recorded and no prescription or not being able to locate it. All discrepancies were rated A2 [Capacity to cause error].

3.6 Miscellaneous errors and discrepancies

One 'other' discrepancy was recorded as an A1, and the observers noted "Bag spiked time not recorded on drug bag, this is the time the bag was spiked with needle to be administered to the patient."

3.7 Errors and discrepancies by clinical area

Critical care had the highest proportion of infusions with at least one error, general medicine was the lowest. The large proportion of infusions not being tagged according to the trust's policy dominates the discrepancy frequencies and rates.

Table 10 Errors and discrepancies per infusions in each clinical area

	Number of infusions	At least one error per infusion n (%)	At least one discrepancy per infusion n (%)
General medicine	48	1 (2.1)	48 (100.0)
General surgery	45	4 (8.9)	45 (100.0)
Critical care	68	10 (14.7)	68 (100.0)
Total	160	15 (9.3)	145 (90.6)

3.8 Errors and discrepancies by method of delivery

Volumetric pumps had the highest proportion of errors with few errors for the other methods of delivery. Again the discrepancy data is dominated by the lack of correct tagging according to policy.

Table 11 Errors and discrepancies per infusion by method of delivery

	Number of infusions	At least one error per infusion n (%)	At least one discrepancy per infusion n (%)
Volumetric pump	95	14 (14.7)	95 (100.0)
Syringe driver	28	1 (3.6)	28 (100.0)
Gravity feed	26	0 (00.0)	26 (100.0)
PCA pump	12	0 (00.0)	12 (100.0)
Total	161	15 (9.3)	161 (100.0)

4 Summary

In total 160 infusions have been audited across three clinical areas. Fifteen errors and 276 individual discrepancies were noted. Importantly, no errors were rated higher than a C in severity [An error occurred but it is unlikely to cause harm despite reaching the patient]. The large discrepancy rate alludes to a gap between policy and practice.

Approximately 9% of infusions observed had at least one error, which relates to 15 errors. This included six cases of a litre of Plasmalyte being administered continued without a written prescription and five cases of the rate being different to that prescribed.

All infusions observed had at least one discrepancy. These usually relate to a break in the trust's policies or procedures. IV tubes not being tagged according to trust policy dominates the discrepancy data. 100% of IV tubes were not tagged according to policy. However, about 1 in 10 of observed infusions also had discrepancies with their additive label, and 1 in 3 had incomplete or incorrect documentation. Five out of 109 patients were not wearing an ID band.

Nearly all infusions were administered through some form of smart pump, i.e. a pump that had a drug library enabled, about 84% of infusions. The only exceptions were 26 gravity infusions. Of the 45 infusions that did not use the drug library on a smart pump about half did not have an appropriate entry to choose and the other half did not choose the appropriate entry. 28 infusions, 17% of infusions overall, did not use the available drug libraries correctly.

5 Focus Group meeting on 16th December 2016

When discussing these findings at a multi-disciplinary focus group meeting at the site a number of issues around IV practice were discussed, including:

- Reviewing what a second checker means, i.e. some thought it was only confirming what was in the bag or syringe and not the whole administration process at the pump and the bedside.
- Avoiding the word ‘check’ and ‘checker’ so the second administrator does not see their role as just to check.
- Creating a suitable process to record checks on the electronic prescribing system because signatures on additive labels are currently thrown away with no record of the check. Also signatures on additive labels imply you’re checking what’s in the bag.
- Reviewing whether some pre-made drugs could save nurses’ time, which would need to be balanced with cost.
- Reviewing whether too much of the IV dose is thrown away in the line if it is not all flushed through to complete the infusion. Also, how does flushing the whole line between drugs (as observed above) compare to detaching the line, throwing it away, and re-attaching a new line in terms of cost, time, infection control and fluid balance.
- To update the drug library so Plasmalyte is included.
- To carry out some form of education to improve compliance with using the drug library rather than using Drug X.
- To carry out some form of education to allow the nurses to bolus more effectively to save them time and reduce fluids patients receive, e.g. vitamin K does not need to be put in a bag. Many boluses can be done over a minute rather than 10 minutes as nurses commonly think.
- To review the policy on tube tagging.
- To review the practice of giving 3 bags of fluids to patients after surgery and the lack of documentation of this practice.

- To review policy and practice around verbal orders, as it is not currently supported by policy but it happens.
- Reviewing policy and practice around Keep Vein Open as nurses do this to keep lines patent but it does not appear to be covered by policy.
- Reviewing whether the lack of access to computers could cause nurses problems, e.g. when they are not available in clinical areas where nurses prepare drugs meaning they have to remember the prescription and it makes second checking more challenging.
- Thinking about whether the standard times of day for administering drugs could be adjusted to suit nurses better.
- To consider whether fluids should be included in the sepsis bundle being designed for EPR.
- To consider whether flushes should be automatically added to orders in EPR.

6 Limitations and future work

This analysis is based on Phase 1 of the ECLIPSE project which has a very specific focus: on measuring error and discrepancy rates related to differences between what is being administered and what has been prescribed and issues of non-compliance. It does not account for or measure other contextual factors that will be important for the likelihood of errors, e.g.: staffing levels, patient acuity, busyness of ward, staff competence and experience, safety culture, quality of documentation and equipment usability

Phase 1 provides a first step in exploring the landscape of intravenous infusion practices and errors in 16 English hospitals. As a project we want to go beyond issues of compliance versus non-compliance to understand the important contextual factors that contribute to system safety and to identify best practice that is sensitive to context. The purpose of this report is to raise questions about system safety, rather than to be used as a blunt instrument for compliance (which does not necessarily make the system safer). As the ECLIPSE project moves forward we will explore what system configurations and behaviours are important for safety.