VETERINARY EVIDENCE online

Can I Hang? Ideal Time to Replace Isotonic Crystalloid Intravenous Fluids and Sets to Prevent Fluid Contamination and Blood Stream Infection: a Knowledge Summary

A Knowledge Summary by

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KNOWLEDGE SUMMARY

Clinical bottom line

Based on very poor veterinary and human evidence, fluid bags and IV sets should be changed every 96 hours whether on one or multiple patients. Additionally, supportive evidence suggests that creating a routine of wiping ports with alcohol prior to injection or withdrawal may significantly decrease the likelihood of fluid contamination. This certainly seems to be an area that needs more research.

Question

In dogs and cats does the changing of IV fluids every 96 hours, compared to changing fluids when they are empty, reduce the risk of contamination in the bag and nosocomial infection to the patient?

Clinical scenario

In this particular shelter environment, IV fluids are used in surgery, and the bag is replaced when it is empty. While nosocomial infections have not been reported, the pets are discharged within four hours of surgery and follow up is based on reports from the shelter. Is it better to replace the bag more frequently to reduce bacterial contamination of the bag and risk infection to the patient?

The evidence

Results included two prospective studies, a prospective study abstract, and a Cochrane systematic review for human patients.

Summary of the evidence

Ullman (2013)	
Population:	Adult and neonatal human patients on central or peripheral IV and arterial lines with fluids being delivered over a period of time.
Sample size:	5001 (16 studies)
Intervention details:	Human adult and neonatal patients receiving fluid therapy had their fluid lines evaluated for contamination at varying frequencies.
Study design:	Meta-analysis
Outcome studied:	IV fluid colonisation and blood stream infections of patients on IV fluids.
Main findings: (relevant to PICO question):	• 1% of patients get a fluid IV bag-related infection at 3.6% colonisation of bacteria. • IV sets should be replaced every 96 hours (current CDC guidelines) unless containing blood products or parenteral nutrition. • Neonates may warrant special consideration and more frequent IV set changes.

Limitations:	All studies included were not blinded and had a high risk of bias; they all received low quality scores.

Guillaumin (2013)	
Population:	Fluid bags - Lactated Ringers Solution (LRS)
Sample size:	90 1-litre LRS bags
Intervention details:	LRS IV bags were placed in an emergency room and intensive care unit of an ICU. All bags were punctured three times daily and hung in the hospital's ICU and ER environment to simulate clinical usage. Fluid sampling and port swabbing occurred on days 0, 2, 4, 7, and 10.
Study design:	Prospective trial (non-randomised, non-blinded)
Outcome studied:	Fluids and ports were cultured for colonisation of bacteria
Main findings: (relevant to PICO question):	• No bags in the ICU had bacterial contamination of fluid but bags in the ER were at 1.1% colonisation by day 4 and reached a maximum fluid colonisation of 4.4% by day 7 and 10. • Port colonisation occurred on day 0 at 4.4%, day 4 had 17.8%, and bacterial colonisation reached 31.1% by day 7.
Limitations:	Conditions of the two environments (ICU and ER) are not discussed; the trial was not blinded or randomised. Only presented as an abstract.

Matthews (2011)	
Population:	Lactated Ringers Solution (LRS) bags used for subcutaneous delivery
Sample size:	29 LRS bags
Intervention details:	Bags maintained at room temperature with random allocation to a control group where bags were not used but removed from their plastic covering and 1 ml was collected immediately with fluid and interior bag wall cultured and only sampled at 30 and 60 days. The other group was the injection group where the bag was punctured by a 3 ml syringe and 22g needle on a daily basis. Culture of injection port was penetrated after being wiped with alcohol, and 1 ml was withdrawn with a 22 g needle (sterile) on 0, 7, 14, 21, 30, and 60 day intervals.
Study design:	Randomised controlled non-blinded trial
Outcome studied:	Bacterial culture from aseptic technique (wiping ports with alcohol before sampling and using sterile needle and syringe).
Main findings: (relevant to PICO question):	• Day 60 resulted in bacterial growth of *Acinetobacter lwoffi* and *Staphylococcus* spp in two bags. • No bags were contaminated before 60 days, and bags that were contaminated were in the injectable group, not the control group.

Limitations:	Methodology seems different from the previous two studies with alcohol prep of bag prior to culturing.

Appraisal, application and reflection

Fluid contamination that can lead to blood stream infections appear to be a fairly low risk to patients in human medicine (Ullman et al. 2013). In active and less clean environments, contamination of fluids seem to occur within four days of use (Guillaumin et al. 2013; Ullman et al. 2013). One well-designed study found that even with multiple patients, fluids were not contaminated in 60 days, but the sampling site was wiped with alcohol which may have affected the culture sensitivity, and since the environment was experimental, the facilities may have been much cleaner than a typical veterinary environment (Matthews & Taylor 2011). One consistent theme the evidence suggests is that fluid contamination is directly related to the cleanliness of the surrounding environment.

The bottom line is that most IV fluids can be safely changed every 96 hours without risk of blood stream infection, but the evidence-base to support it remains very poor. While contamination may occur within 72 hours according to Guillamin (2013), this is not based on a culture on day three, but on the contamination of fluids on day four. Pediatrics may need special consideration (perhaps because fluids may often have glucose content), and lipid emulsions should be changed daily. Percent contamination in Guillaumin's (2013) study in the veterinary clinical environment seems to be similar to the human meta-analysis (Ullman et al. 2013). Due to different study designs, it is hard to say where Matthews & Taylor's (2011) study fits in this spectrum since fluid contamination was not reached for 60 days; except that the laboratory environment can be much cleaner than the clinical environment or that the sample size is much smaller. Certainly, Matthews & Taylor's (2011) study suggests that bags for subcutaneous fluids can be kept for a minimum of 30 days.

Sabino and Weese (2006) examined factors for multi-dose vial contamination, and based on two prospective control studies published in the article, vial contamination is one of the largest factors for contaminated drugs. Swabbing the port or vial top resulted in a decline of 42% vial contamination to 0% vial contamination, much like Matthews & Taylor's (2011) study. One factor that probably contributes significantly to reducing fluid contamination besides changing fluid sets and IV bags every 96 hours is to make sure that any injection in the bag is done after wiping the ports in alcohol. Guillamin (2013) found a 17.8% bacterial contamination of ports by day four; a likely source to introduce fluid contamination.

Future research that examines the cleanliness of personnel handling fluids and contamination of the fluids might be a very interesting avenue of examination.

Methodology Section

Search Strategy	
Databases searched and dates covered:	Pubmed, Google Scholar, Vet Med Resource, Cab Abstracts (1973-2015)
Search terms:	Intravenous AND set AND replacement, intravenous AND fluid AND bag AND contamination, "fluid therapy" AND contamination
Dates searches performed:	October 2nd 2016

Exclusion / Inclusion Criteria	
Exclusion:	Relevance based on title and abstract, access. We only utilised human studies at the highest level of evidence (LOE) 1. If there were no human study of LOE 1 (systematic review), we would saturate with 10 most relevant human studies (LOE 2).
Inclusion:	Relevant articles we could access, English, French

Search Outcome

Database	Number of results	Number of duplicates	Excluded – not English language	Excluded – due to study design	Excluded – did not answer PICO question Total relevant papers
VetMed Resource	25	24	0	0	1
CAB Direct	23	23	0	0	0
Pubmed	85	64	1	20	1
Total relevant papers when duplicates removed					2 +1 outside source: Carr, Anthony P. 2015

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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