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National Infusion and Vascular Access Society

Complications of IV therapy: EXTRAVASASTION

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IV therapy and Vascular access

- 0ver 90% of patients will have some form of vascular access
- Vascular access is required in order to administer treatments including:
  - IV therapy such as antibiotic and intravenous fluids
  - Blood transfusions
  - Radiology contrast media
  - Chemotherapy
  - Parenteral nutrition
  - Critical care drugs
  - Anaesthetic

What is an Extravasation

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- Intravenous medication is administered into a vein via a vascular access device, most commonly a peripheral cannula
- When something goes wrong with the peripheral cannula the IV therapy can leak into the skin and tissue
- This is known as an infiltration. An extravasation occurs when the type of medicine or fluid that is leaked into the tissue is very irritating or corrosive also known as a vesicant
- An extravasation can be very serious because the medicine or solution involved can cause damage to skin and tissues for hours, days or weeks after the infiltration
- This damage can cause pain, tissue ulceration, tissue necrosis and in the most server cases, loss of limb or even death

Vesicant intravenous drugs

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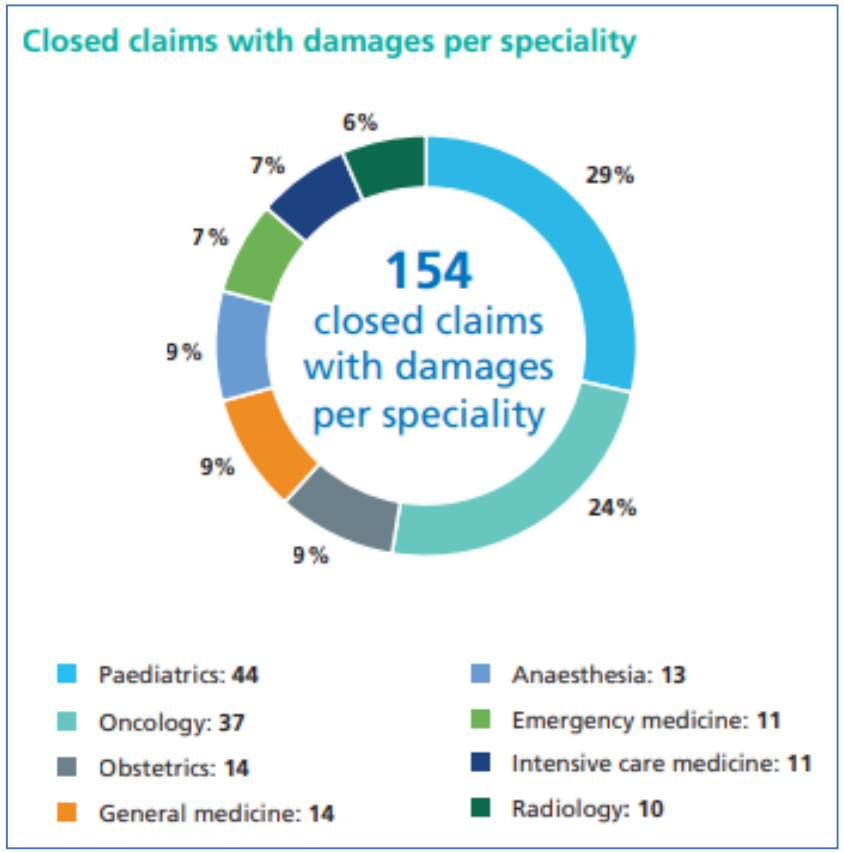
Stomach Acid	1.5 – 2.0	Glucagon pH: 2.5-3
Cola	2.5	Vancomycin pH 2.4 – 4.5
Vinegar	2.9	Gentamycin pH 3 – 5.5
Orange Juice	3.5	Glyceryl trinitrate pH: 3.5-6.5
Coffee	5.0	Metoclopramide pH: 3-5
Healthy Skin	5.0	Amiodarone pH: 3.5-4.5
Urine	6.0	Glucose 5% pH: 4-4.2
Pure Water	7.0	Chlorpheniramine pH: 4-5.2
Human Saliva	6.5 – 7.5	Potassium pH: 4
Blood	7.3-7.5	0.9% Saline solution pH: 7
Sea Water	7.7-8.5	Tazocin pH: 5-7
Baking Soda	8.4	Aminophylline pH: 8.8-10
Hand Soap	9.0-10.0	Frusemide pH: 8.7-9.3
Bleach	12.5	Acyclovir pH: 10-11
		Phenytoin pH: 12

NHS Resolution: Did you Know

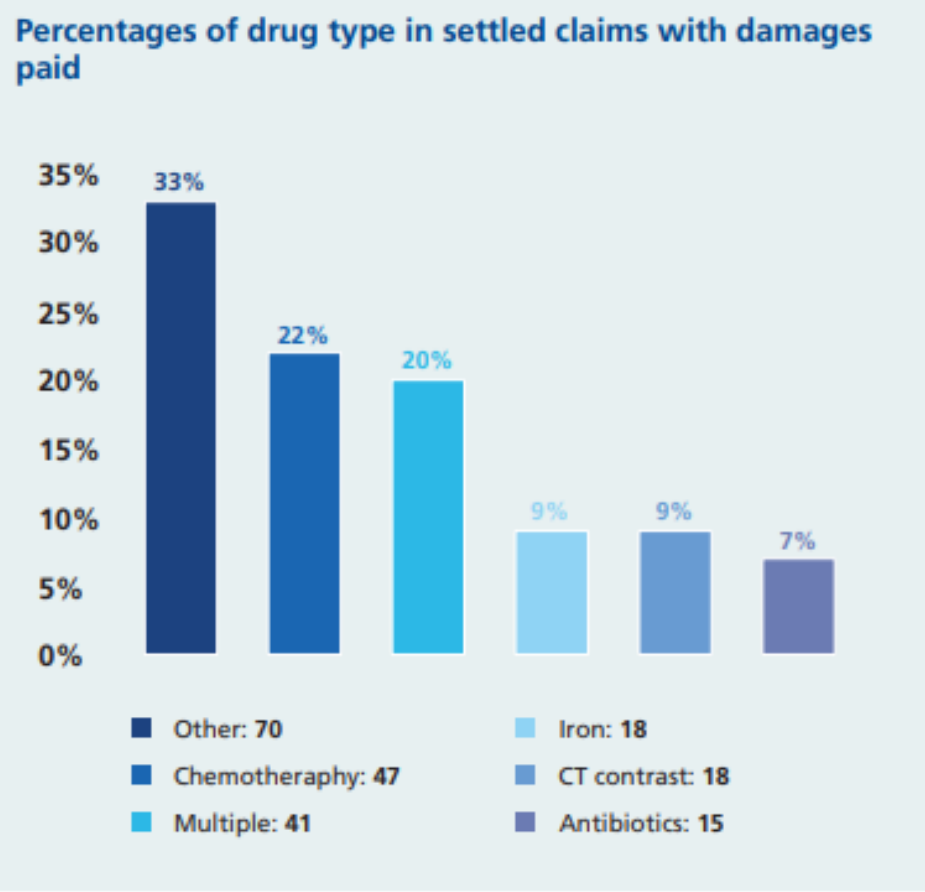
- Published in March 2022
- Chemotherapy is not the biggest cause of extravasation.
- There are no national standardised guidelines, especially for non-chemotherapy extravasation.
- There is no national reporting structure to capture harms cased by extravasation
- The true number of harms is unknown

Claims and damages



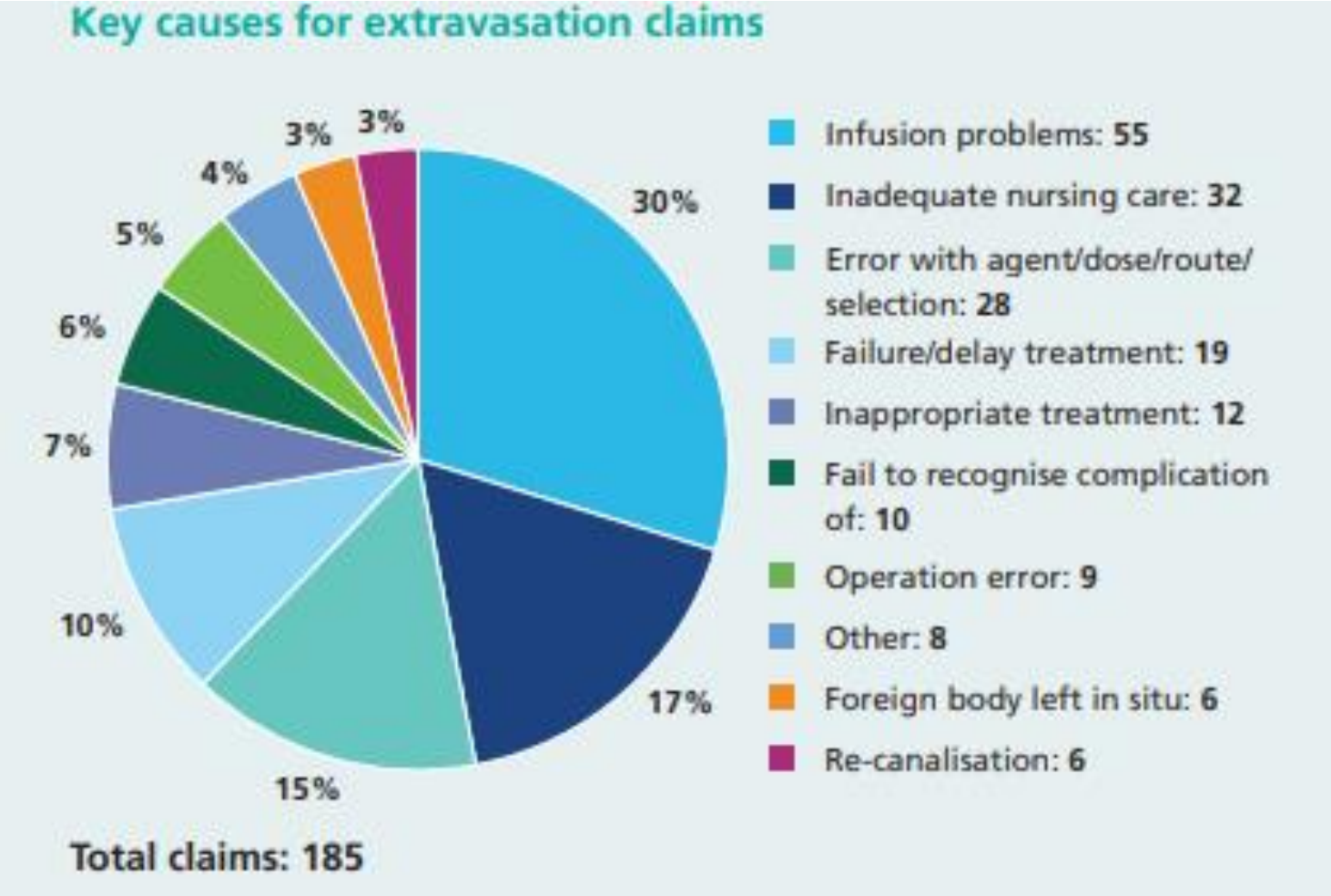
- From 1 April 2010 until 1 December 2021 NHS Resolution received 467 claims relating to extravasation injuries.
- Of those 467 claims, 214 have settled with damages and 112 have closed with nil damages.
- This has cost the National Health Service (NHS) 16 million pounds.
- This includes payment for claimant legal costs, NHS legal costs and damages.

Contributory factors

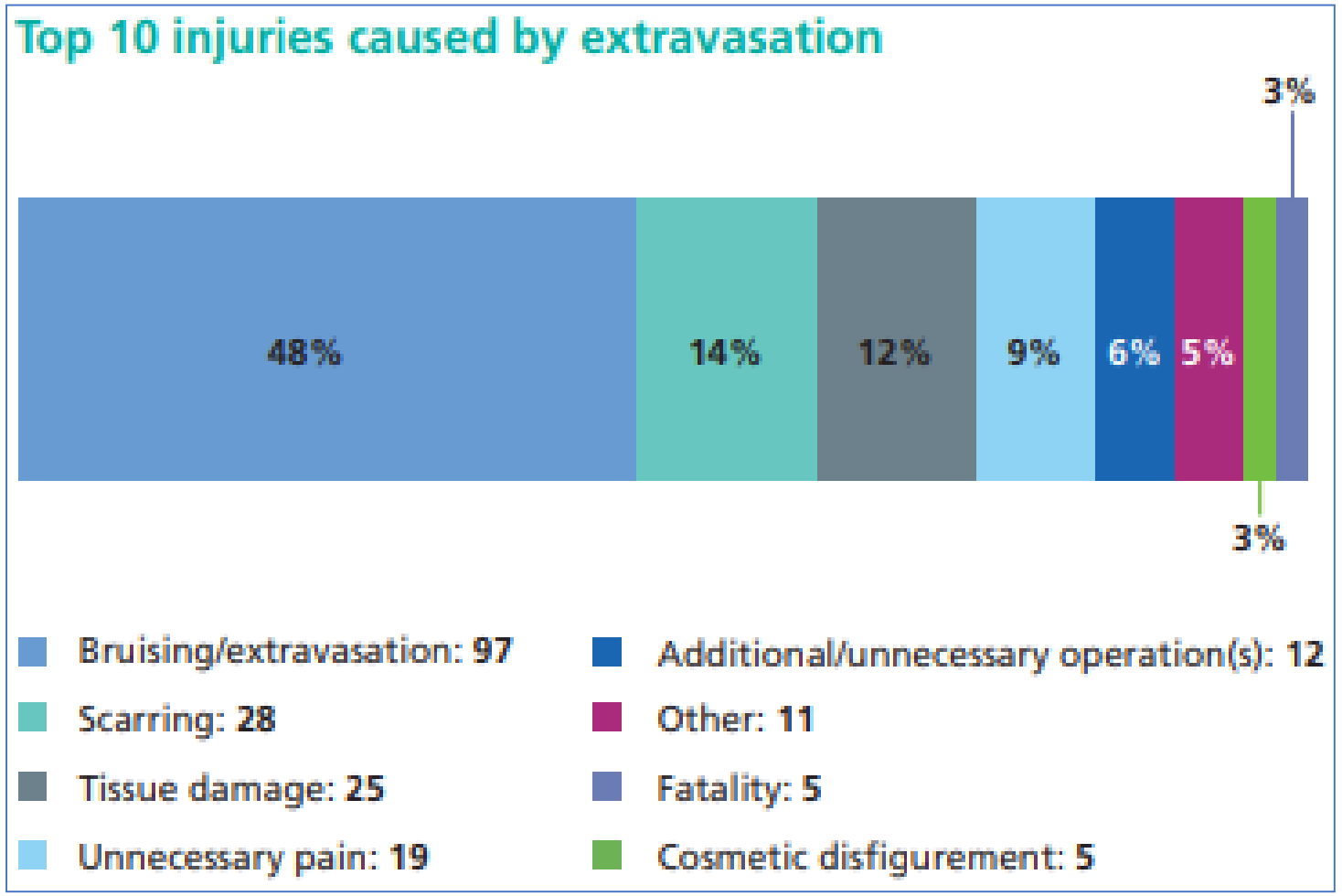


- Incorrect medication infusion pump pressures
- Bandaging the cannula in infants preventing lack of access and observations
- Wrong route of administration
- Failure to act on patient complaints of pain or discomfort Delay in identifying extravasation injury
- Staff not following manufacturers or local guidance on administration of intravenous drugs
- Cannula being placed in another depart and initially working

Contributing factors



Common injuries



Difficult IV access

- Patients with difficult vascular access are at high risk
- The most common site for extravasation injuries in children is the foot
- Patient movement, bandaging of the cannula and poor infusion surveillance are contributing factors.
- A dedicated vascular access team can reduce the risk

Informed consent

- Intravenous iron can cause anaphylaxis and if extravasation occurs, the iron can cause permanent staining of the patients skin?
- Informed consent before administration is essential but not always provided
- Written consent in IV therapy is rarely obtained, usually only for chemotherapy

Evolving injuries

- Extravasation injuries can take hours or days to evolve.
- Extravasation is not always apparent at an early stage.
- A high level of suspicion should be adopted with placements that have taken multiple attempts or if the incorrect vascular access device has been used.
- Sometimes extravasation injuries look like phlebitis or cellulitis, misdiagnosis is common

Contrast media

- Extravasation of radiological contrast is much more common for CT compared to MRI?
- Placement of the cannula outside of the radiology department and arm positioning during imaging are contributory factors to this.

Alfred's story

- Alfred was 84 and had advanced dementia and a left sided weakness following a stroke. Alfred lived in a nursing home and one day the carers in the home couldn’t wake him up.
- Alfred came into hospital and was found to be have abnormal blood chemistry
- Alfred needed intravenous infusions and could only have a cannula in the right arm due to his previous left sided stroke.
- He was difficult to cannulate, and as it was the weekend there were limited options for vascular Access.
- Over the weekend 6 bag of dextrose and potassium was infused. Patient sustained an extravasation which was misdiagnosed and he was discharged back to the nursing home with the wrong treatment plan for his injury.

What went wrong

- Alfred had multiple cannula in the right arm which failed frequently
- His admission as on a Friday and he had his IV therapy over the weekend
- An infusion pump was used but the pressure setting as set to 9
- The infusion was not checked regularly and as Alfred had dementia he couldn't raise the alarm
- The initial blistering was though to be an infection
- Alfred was discharged on the Monday, back to his nursing home with antibiotics and his arm bandaged
- A week later the arm was reviewed by the visiting doctor who escalated the injury to use for review
- Extravasation not recognised during admission

Simon's story

- 29yr old soldier
- Fall from motorbike and hit by car approx. 30mph
- Brought to the emergency department and seen by the trauma team
- Right shoulder pain
- Difficult vascular access
- Green cannula left forearm under US guidance by trauma team
- CT with contrast showed right collar bone fracture

Compartment syndrome

Simon's recovery

Cannula for CT was placed in ED Resus however the cannula was only partially placed in the vessel, the power injection forced the cannula to be dislodged and all the CT contrast was extravasated in the forearm.

Follow-up at 3 weeks after injury

- Altered sensation and strength in right arm and hand

Follow-up at 6 weeks

- Altered sensation and strength in right arm and hand

Permeant scaring, reduced right hand grip and altered sensation in forearm

Unable to follow preferred military carer pathway

Laura's story

- Laura is 41yr old and was 31weeks pregnant.
- Laura experienced some bleeding at home and called an ambulance.
- Laura was taken to ED and needed emergency and then surgery to deliver the baby and stop the bleeding, she lost 6lt of blood and nearly died
- Laura was transferred to critical care and her baby taken to the special care baby unit
- Laura had multiple life saving intravenous drugs via cannulas in her hands and arms
- Laura was discharged back to maternity after 3 days in ICU and discharged home the next day
- Laura sustained a serious extravasation injury to her left hand

What went wrong

- Laura had calcium chloride administered into a cannula in her left hand during her emergency treatment which extravasated
- Once Laura was awake in the ICU she complained of pain in her left hand
- Injury eventually misdiagnosed as a phlebitis
- Laura was discharged with a diagnosis of phlebitis and given antibiotics and a referral to tissue viability
- After 4 weeks of outpatient treatment for phlebitis Laura was referred to the vascular access team for review and an extravasation was confirmed
- Postnatal support was required for Laura to care for her baby at home
- Laura was unable to take pain relief due to breast feeding
- Laura was unable to hold her baby or feed him without help
- 8 months on and Laura is still having treatment

Preventative measures

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- Administer vesicants in the safest way
- Choose the correct vascular access device and ensure it is placed in an appropriate location and flushing well
- Use an infusion pump and check the rate and alarm parameters
- Monitor Administration of vesicants regularly
- Educate the patient to raise alarm
- Consider level of consent
- Have a protocol in-case of extravasation

Did you know recommendations

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- Ensure your local guidance for extravasation is circulated amongst staff
- Early recognition and standardisation of care
- Utilise infusion devices correctly
- Trust wide vascular access service team VAST
- Ongoing education to ensure front line clinicians are aware of the risk of extravasation and how to treat extravasation injuries Review your organisation's reporting procedure and claims for extravasation injuries and ensure learning is shared with all clinicians
- Review patient information resources to include manufacturer's guidance, evidence based practises and patient support organisations
- Review of consent for high risk IV therapy admiration including IV iron.

NIVAS Campaign

NIVAS is leading on a national project for Extravasation alongside NHS resolution to ensure all NHS providers know about extravasation and follow a standardised approach for:

Awareness, Prevention, Recognition, Reporting, Treatment, Follow up

NIVAS is also working in partnership with the National Chemotherapy Council and UKNONS to created a national standardised guideline for extravasation of chemo and non-chemotherapy drugs