NHS Improvement

Patient Safety Alert

Risk of severe harm and death from infusing total parenteral nutrition too rapidly in babies

27 September 2017

Alert reference number:	NHS/PSA/W/2017/005
	Warning Alert

Total parenteral nutrition (TPN, also known as PN) is a method of providing nutrition directly into the bloodstream to those unable to absorb nutrients from the food they eat.

TPN is used in all age groups, but in babies its use is often as part of a temporary planned programme of nutrition to supplement milk feeds in those too immature to suckle or too sick to receive milk feeds as a result of intestinal conditions. TPN consists of both aqueous and lipid components, which are infused separately into the baby via specific administration sets and infusion pumps.

The rate at which TPN is administered to a baby is crucial: if infused too fast there is a risk of fluid overload, potentially leading to coagulopathy, liver damage and impaired pulmonary function as a result of fat overload syndrome. In a recent three and a half year period 10 incidents were identified where infusion of the aqueous and/or lipid component of TPN at the incorrect rate resulted in severe harm to babies through pulmonary collapse, intraventricular haemorrhage or organ damage, and where intensive intervention and treatment were needed. Most of these incidents involved too rapid a rate of infusion. Review of samples of 'low harm' and 'no harm' reports (including 'near misses') in the same period suggested around 700 similar incidents were reported.

Three main types of error were identified:

- The administration set primed with lipid was threaded through the infusion pump intended for the aqueous component and vice versa. Lipids were therefore infused at the rate intended for the aqueous solution and the aqueous solution at the rate for the lipids. A key factor underlying this error appeared to be near identical protective outer covers on the two infusion bags as the contents for both need to be protected from ultraviolet light.

  A sample report reads: "Noted at 23.00 that lipid bag was empty. Pump rate had been set the opposite way round so lipids were running at 17.3ml/hour and aqueous at 2.5ml/hour."

- The incorrect infusion rate was entered into the administration pump.
- Miscalculation of volumes when fluid or pump related changes were made.

While a double-checking system at the cot side plays a vital role in reducing the risk of administration error, it cannot be relied upon in isolation. The use of visually distinct light covers, different syringe pumps and administration sets for the two components; use of safety software within administration pumps; training and competency assessments; double checking by pharmacists as part of an additional checking measure whilst on rounds; and regular checks of fluid volumes infused may all have a role in reducing the risk of similar incidents.

Actions

Who: All organisations providing NHS funded-care to neonates and children (especially those under 30 kg) and where TPN is administered.

When: To commence immediately and be completed no later than 8 November 2017.

1. Identify if TPN is used in your neonatal and paediatric departments
2. Bring this alert to the attention of all those with a leadership role in the prescribing and administration of TPN in neonatal and paediatric settings
3. Consider if immediate action is needed to be taken locally, and ensure that an action plan is underway to reduce the risk of harm to babies through TPN administration
4. Communicate the key messages in this alert, and your organisation's plan for managing those risks, to all relevant staff

Sharing resources and examples of work

If there are any resources or examples of work developed in relation to this alert you think would be useful to others, please share them with us by emailing patientsafety.enquiries@nhs.net

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Technical notes

Patient safety incident reporting

The National Reporting and Learning System (NRLS) was searched on 7 August 2017 for incidents reported as occurring between 1 January 2014 and 30 June 2017. NRLS reference number 3942.

Incident category lvl1 equal to medication and key words Vamin, TPN, Lipid, Parenteral nutrition, PN bag, PN feed, PN line.

Filters identifying neonatal incidents were applied and all identified incidents for which the reported degree of harm is moderate, severe or death were reviewed.

Filters identifying babies aged under one year were applied and all incidents where the reported degree of harm is moderate, severe or death were reviewed.

A sample of 150 out of 2,599 incidents from the 'neonatal dataset' where the degree of harm is 'no' or 'low harm' were reviewed. Of the 150 incidents reviewed, 32 were relevant, which suggests around 550 incidents would have been found if we had reviewed the whole sample of 2,599 incidents.

A sample of 150 out of 1,082 incidents from the 'young babies dataset' where the degree of harm is 'no' or 'low harm' were reviewed. Of the 150 incidents reviewed, 22 were relevant, which suggests around 160 incidents would have been found if we had reviewed the whole sample of 1,082 incidents.

The Strategic Executive Information System (StEIS) was searched on 5 September 2017 for Serious Incidents reported between 20 May 2015 and 30 June 2017 and containing the keywords Vamin, TPN, lipid, parenteral nutrition, PN bag, PN feed and PN line.

Stakeholder engagement

- National Patient Safety Response Advisory Panel (for a list of members and organisations represented on the panel, see improvement.nhs.uk/resources/patient-safety-alerts/)

Advice for Central Alerting System officers and risk managers

This alert is relevant to staff working on some paediatric wards and most neonatal units, and wider services that support the delivery of TPN, including pharmacy staff, dietitians and education leads. If you are unsure who to disseminate this alert to, or who will lead on developing the action plan required, the sister/charge nurse of a neonatal unit would be a good contact to signpost the most relevant roles within your organisation.