Non Injectable Arterial Connector (NIC)

Programmes

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The NIC is intended to improve the safety and care of patients with arterial lines in theatres and Intensive Care Units (ICUs) by preventing accidental injection of IV medication into arterial lines. If medication is administered to a patient via the wrong route, there is potential risk of damage to a patient's blood vessel and surrounding tissue, which in extreme circumstances can lead to necrosis requiring surgical amputation. Inappropriate injections into an artery are rare but can have life changing consequences. All incidents involving the accidental administration of intravenous medication must be reported to the National Reporting and Learning System.

In a joint comment, Drs Mariyaselvam and Young said: "Innovation should be at the heart of the NHS, as should mechanisms for spreading innovative solutions to patients quickly and effectively. We are delighted that our technologies have been selected for the NHS Innovation Accelerator (NIA) Programme and with the support of NHS England, we look forward to seeing them scaled and implemented nationally across the NHS." (https://www.cambridgenetwork.co.uk/news/kings-lynn-drs-nhs-england-fellowship-for-innovation/).

View the videos here: – https://youtu.be/4zZvTGlSn6Y

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> For the safety and best practice for our patients, I heartily recommend that this device should be used on all arterial lines in the NHS.
>
> **— PROFESSOR SIR BRUCE KEOGH, CARDIOTHORACIC SURGEON / MEDICAL DIRECTOR, NHS ENGLAND**

Challenge/Problem Identified

Medication should never be administered via the arterial line. If this error occurs, it can damage the blood supply to the hand, leading to ischaemia, tissue necrosis and sometimes amputation of the fingers or hand.

This serious harm suffered by the patient can lead to:

- increased length of stay in the ICU and hospital
- an increase in specialist care and operative procedures required
- long-term pain problems, affecting the patient's working and social lifestyle.

The 2008 National Patient Safety Agency (NPSA) Rapid Response Report alerted ICUs and operating theatres to common errors seen with arterial lines, and required NHS Trusts to introduce safety measures and appropriate training to all clinicians using arterial lines.

In addition, a national postal survey of all ICUs in the UK targeting Clinical Directors revealed that 28.5% had personally witnessed accidental injection into the arterial line (16 out of 56 ICUs that responded) (Mariyaselvam, Blunt & Young, 2015).

Overview of innovation

The Non Injectable Arterial Connector (NIC) has been designed to be used on the sampling luer port and the transducer luer port of the arterial transducer set, to prevent inappropriate injection of fluids or drugs intended for administration into a vein. An arterial line is a thin catheter inserted into an artery and it is used in intensive care medicine and anesthesia to monitor blood pressure directly and in real-time, as well as for obtaining samples for arterial blood gas analysis.

Outcome

During the NIA Programme, Maryanne has focussed upon raising awareness of and accountability for, wrong route drug administration including:

- Engaging with individual hospitals through infection control teams, ICU and theatre practice development nurses and operating department practitioners
- Publishing papers and presenting at major safety conferences
- Engaging national leaders as advocates for patient safety

- Collecting evidence to develop a compelling case for incorrect route drug administration to be included on the Never Events list.

Impact

In a laboratory study simulating arterial blood gas sampling, the NIC was compared with a standard arterial connector for bacterial contamination. Results showed that there was bacterial contamination in 100% (n=20) of standard luer connectors versus 0% (n=20) contamination of the NIC ($p < 0.0001$). Use of the NIC also prevents ingress of bacteria into the patient's circulatory system, where 85% (17/20) of the flushed samples were contaminated with bacteria, compared with 0% (n=20) of the samples using the NIC ($p<0.0001$). However, it was acknowledged that this research was conducted using a syringe that was more heavily contaminated than would be expected in routine clinical practice (Mariyaselvam, Heij et al, 2015).

A health economic study found that the NIC could save an estimated £285 per year for an average NHS Trust, resulting in better patient outcomes at lower cost. Further detailed information about costs savings can found in the paper (Mariyaselvam, Blunt & Young, 2015).

In an implementation pilot across 11 NHS Trusts in the East of England, results of a survey (n=258) showed that 81% wanted to continue using the NIC after the trial period and 96.5% of staff said the NIC made it easier to identify the arterial line. 78% reported experiencing no problems when using the NIC and the remaining 22% noted problems related to blood clots. However this was found to be due to inadequate flushing of the arterial set and connector, and was rectified with training (Mariyaselvam, Blunt & Young, 2015).

Which national clinical or policy priorities does this example address?

The NPSA (2008) Report described the need for clear labelling and colour coding, as well as the need for manufacturers to test and develop universal solutions to minimise errors.

Plans for the future / spread and adoption

At the time of writing (August 2017), the NIC is currently being supplied to over 40 hospitals nationally.

In the North East and North Cumbria region, The Newcastle upon Tyne Hospitals NHS Foundation Trust is planning the introduction of the NIC to one of their wards in the Royal Victoria Infirmary (RVI). Other NHS Trusts in the region are exploring the possibilities with their clinicians of introducing the NIC.

Related links, references and further resources

Websites: http://klipsuk.com (Kings Lynn Institute of Patient Safety)

YouTube: https://www.youtube.com/watch?v=MKALHOXN_3I

https://www.youtube.com/watch?v=f22LesgXi0o

https://www.youtube.com/watch?v=R-9Ue4qTU5A (training video)

Vimeo: https://vimeo.com/129784638

BBC Report: https://vimeo.com/110349865

Twitter: @KLIPSuk @mmariyaselvam

AHSN Atlas Case Study: http://atlas.ahsnnetwork.com/non-injectable-arterial-connector/

NHS England Toolkit: NHSE Technical Guidance – ITT

Oxford AHSN Implementation Toolkit: NIC Implementation Pack v2.0 (Oxford AHSN)

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