

# Treatment of extravasation injuries in infants and young children: a systematic scoping review and survey of NHS practice

Mark Corbett,<sup>1</sup> David Marshall,<sup>1</sup> Melissa Harden,<sup>1</sup> Sam Oddie,<sup>2</sup> Robert Phillips,<sup>1</sup> William McGuire<sup>1</sup>

<sup>1</sup>Centre for Reviews and Dissemination, University of York, <sup>2</sup>Bradford Teaching Hospitals NHS Foundation Trust

## Introduction

Extravasation injuries are caused by unintended leakages of fluids or medicines from intravenous lines, but there is no consensus on the best treatment approaches.

The objectives of this study were to begin the process of resolving the uncertainty surrounding which treatments are best for treating extravasation injuries in infants and young children. Results from a systematic scoping review determined which treatments appeared to be the most promising. Results from an NHS survey informed on which treatment approaches are currently used across the NHS, and elicited opinions regarding which interventions are most worthy of future research.

## Methods

A systematic scoping review and survey of NHS practice were undertaken.

For the review, twelve bibliographic databases were searched including MEDLINE and EMBASE. Studies of children with extravasation injuries receiving any treatment for extravasation injury were eligible, providing they reported one of the following outcomes: wound healing time, infection, pain, scarring, functional impairment, or requirement for surgery. Studies were screened in duplicate. Data were extracted by one researcher and checked by another. Studies were summarised narratively.

An online questionnaire was piloted then distributed to NHS staff at neonatal units, paediatric intensive care units and principal oncology/haematology units.

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## Results

26 group studies, six guidelines, three reviews and 106 case report studies were included in the scoping review.

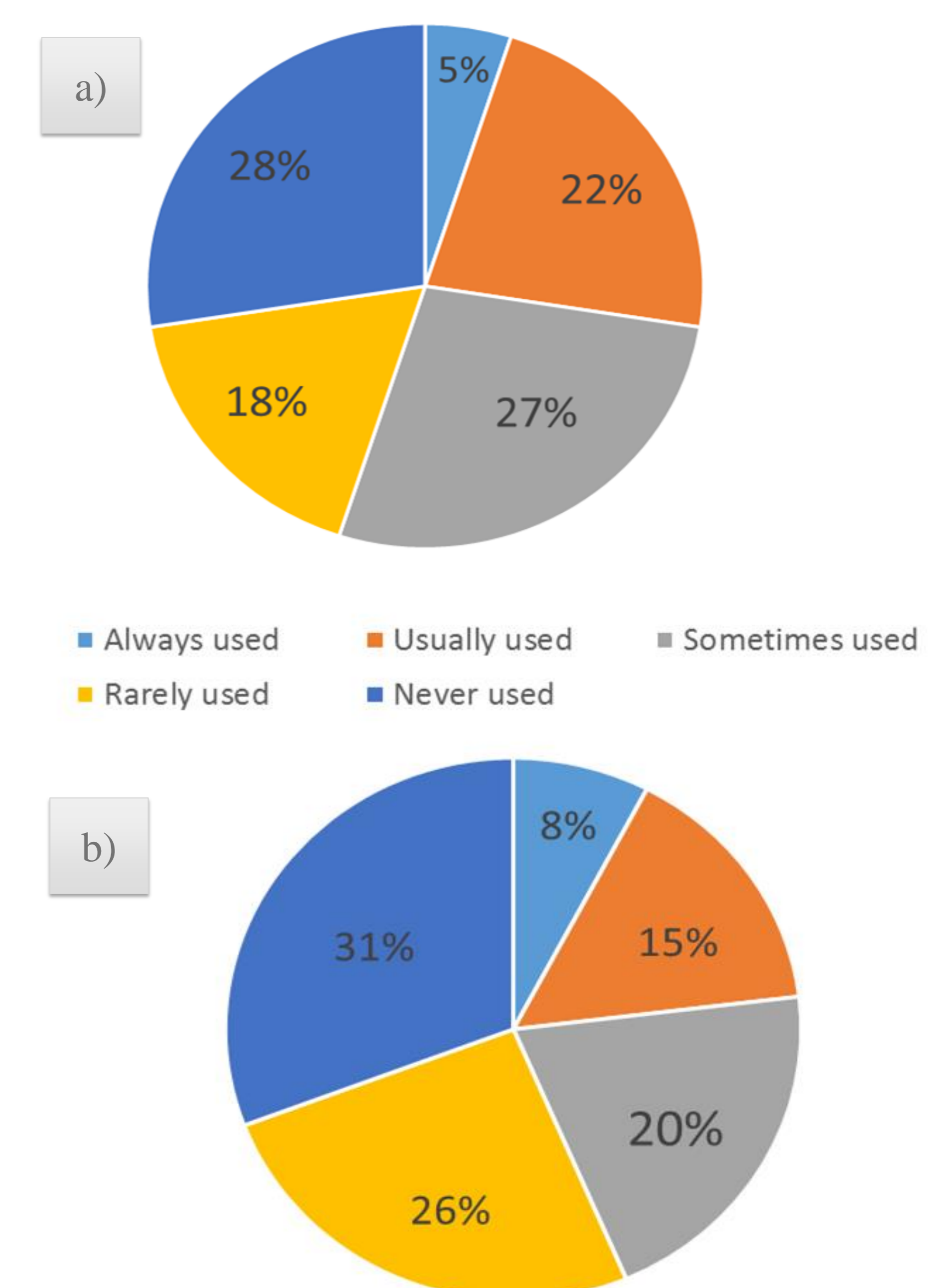
Many types of extravasation injury treatments have been studied in non-comparative studies, but most studies were small and retrospective. Seventeen of the 24 non-comparative studies had sample sizes of less than 20, and only three were reported as having a prospective design. The treatments studied were grouped into broad categories: conservative management approaches, saline flush-out techniques with or without prior hyaluronidase, hyaluronidase without flush-out, artificial skin treatments, debridement and plastic surgery. There was considerable heterogeneity across study populations in age, types of infusate, injury severity, location of injury, and the time gaps between injury identification and subsequent treatment. This, together with limitations inherent with small, non-comparative studies, made it difficult to compare results across treatments. Some results were likely to have been subject to chance effects or biases. Few studies reported data on the grading of injury severities and the results sections of most studies were minimal.

The NHS survey yielded 63 responses from hospital units across the UK; 71% of responses were from neonatal units. Results indicated that although most units had written documentation for treating extravasation

injuries, only one-third of documents included a staging system for grading injury severity.

The most frequently used interventions were elevation of the affected area and analgesics. Saline wash-out treatments, either with or without hyaluronidase, were regularly used in about half of all neonatal units. Most (71%) responders thought a randomised controlled trial (RCT) might be a viable future research design, though 21% did not think an RCT was viable.

Survey results: variation across NHS neonatal units in use of  
a) saline irrigation with hyaluronidase and  
b) occlusive dressings



## Conclusions

Although studies exist which, together, cover a wide range of treatments for extravasation injuries, the quality of evidence overall is very low. There is also important clinical and methodological heterogeneity across studies and treatments. Consequently, there is uncertainty about which treatments are most promising, particularly with respect to treating earlier-stage injuries.

Notwithstanding the evidence limitations, the results of studies of flush-out techniques suggest that these treatments may be worthy of further research. This finding was echoed in the NHS survey results, with flush-out techniques, hyaluronidase and conservative management approaches frequently suggested as being worthy of further study.

Some of the practicalities to overcome in a future conventionally-designed RCT are the recruitment of adequate numbers of participants, avoiding clinically unacceptable treatment delays and selection bias. An alternative to a conventional RCT design is the randomised registry trial, which incorporates many of the best aspects of both conventional RCTs and observational database studies. However, a key relevant database - the UK National Neonatal Research Database - does not currently record data on extravasation injuries.