Describing Intravenous Extravasation Injuries in Children (DIVE2)

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Background

- Extravasation is the erroneous delivery of medication into extravascular tissue caused by poor placement/ displacement of a cannula or leakage
- Children are at increased risk of extravasation injuries (EI) & complications
- Early identification and quick management with pharmacological antidotes are critical to minimize tissue damage
- The DIVE study[1] conducted in 2008 at BC Children's and Women's Hospitals (C&W) described:
  - EI incidence of 0.04% per patient day
  - Correct management for 50% of EI
- A protocol to improve the management of EI was developed and implemented
- This study examined how implementation of the extravasation management protocol has impacted the incidence, management and complications of EI at C&W.

Objectives

Primary: Describe the incidence of EI at C&W

Secondary:
- Identify agents most commonly involved with EI
- Describe the circumstance when EI occurred
- Describe the antidotes used in the management of EI
- Describe the incidence, types and severity of complications from EI
- Describe adverse drug effects (ADEs) from antidotes administered

Methods

Design: Retrospective cohort descriptive study

Inclusion:
- Pediatric patients (0 to 19 years inclusive)
- Admitted to C&W from September 2008 to August 2020
- Experienced an EI

Chart Identification: Pharmacy dispensing records for antidotes and Patient Safety & Learning System (PSLS) reports

Extravasation Injury Categorization Definitions:
- Mild: recovered without complication (no follow up required)
- Moderate: required plastics consult/ management, scar or superficial injury
- Severe: requiring long-term follow up for extravasation injury post discharge
- Critical: resulted in loss of limb or life due to extravasation injury
- Unknown: not reported in chart or patient transferred before outcome known

Extravasation Injury Incidence Calculation: Number of extravasation injuries divided by the number of patient days during study period multiplied by 100%

ADEs: Identified from chart review. If identified, Naranjo score was calculated to determine association between ADE and antidote

Statistics: Descriptive statistics

Sample Size: Convenience sample

Results

Table 1: Patient Characteristics	N=132
Median age, years (range)	0.15 (0.00 – 17.92)
Age group, n (%)	
• Premature neonate (<37 weeks GA)	26 (20)
• Neonate (37-44 weeks GA)	28 (21)
• Infant (1-12 months)	33 (25)
• Child (1-12 years)	34 (26)
• Adolescent (12-19 years)	11 (8)
Sex, male (%)	73 (55)
Median weight, kg (range)	4.60 (0.83 – 100)
Program area, n (%)	
• General Pediatrics	50 (38)
• NICU	37 (28)
• PICU	36 (27)
• Emergency Department	4 (3)
• Surgery	3 (2)
• Oncology	2 (2)
Type of line, n (%)	
• Peripheral IV (PIV)	127 (96)
• Vascular Access Device (VAD)	2 (2)
• Peripherally Inserted Central Catheter (PICC)	1 (1)
• Intraosseous access (IO)	1 (1)
• Central Venous Catheter (CVC)	1 (1)
Location of IV access, n (%)	
• Hand	53 (40)
• Foot	45 (34)
• Arm	23 (17)
• Scalp	8 (6)
• VAD	2 (2)
• Femoral Line	1 (1)

Table 2: Extravasation Incidence and Treatment Parameters	
Extravasation incidence (% per patient day)	0.04
Median time to extravasation after line in situ, hours, (range) [n=66]	27 (0.5 – 134)
Median time to treatment after extravasation, hours (range) [n=75]	1.4 (0.25 – 7.25)

Figure 1: Circumstance of Medication Extravasation

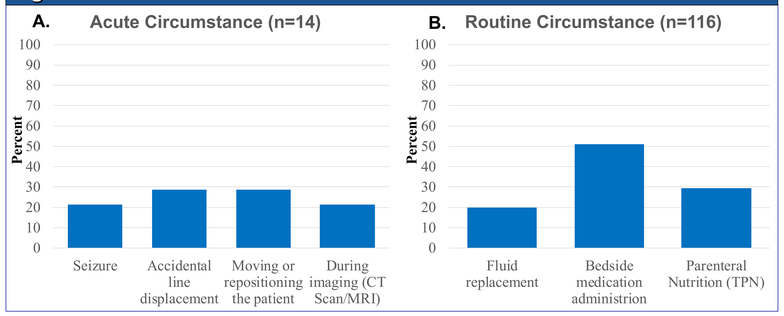


Figure 2: Medications Extravasated (n=149)

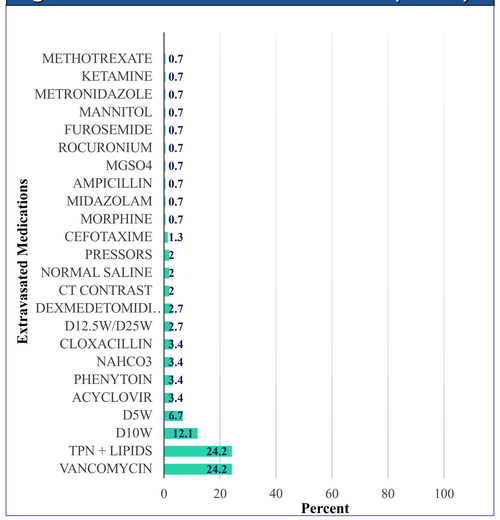


Figure 3: Antidotes (N=132)

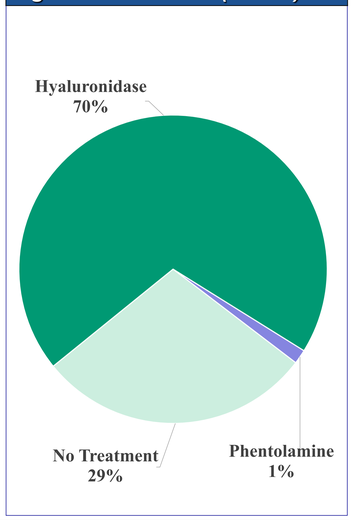
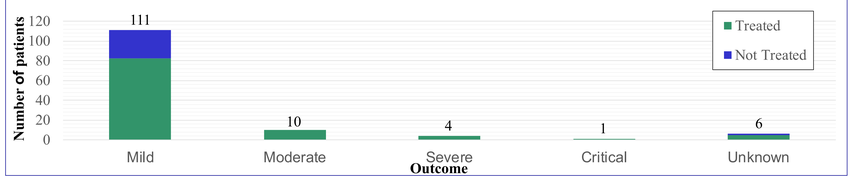


Figure 4: EI Outcomes (N=132)



EI Management & ADEs

- 78% of EI were managed as per institutional protocol
  - All moderate, severe and critical injuries received antidote
- Reasons protocol not followed included physician choice, recommendation against by the plastic surgery service and patient/family refusal
- All antidotes were correctly selected when used
- There were no ADEs to antidotes reported

Limitations

- Extravasation injuries that did not receive an antidote order or those that were not documented in PSLS were not captured
- Inconsistencies in documentation and standardized documentation times

Conclusions

- EI incidence remained unchanged from 2008 study
- Patient characteristics and circumstances were similar to that reported in the literature and the majority of injuries were mild recovering without complication
- Management of EI according to institutional protocol improved (from 50% to 78%)
- Additional studies needed to understand the impact of treatment of EI with antidotes on patient outcomes.

1. Paquette V, McGloin R, Northway T, DeZorzi P, Singh A, Carr R. Describing Intravenous Extravasation in Children (DIVE Study). Can J Hosp Pharm. 2011;64(5):340-345.