

# Preventing IntraVenous Extravasation Injuries

## Cincinnati Children's Vascular Access Team

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“No-one Has All The Answers”

CHA Webinar February 2013

# Objectives

- Describe Cincinnati's 4 Year I/V Extravasation Harm Reduction Initiative
- Describe Our 3 Phase Strategy
  - Reliable Hourly Bedside I/V Checks
  - Evidence Based 3 Tier Med Tissue Risk Stratification
  - “No Grade” 2 Component Assessment / Documentation Tool
- Discussion and Sharing

# Outline

- The Cincinnati Children's Safety Environment
- Definitions
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- 2 Component Extravasation Assessment Tool
- Goodbye Grading: Why We Divorced "Grading"

.....

# Outline cont'd

- Treatment, Feedback and Accountability
- Other Extravasation Assessment Systems
- Results
- Questions and Discussion

# CCHMC Safety Culture

Anderson Center

Patient Safety  
Patient Safety First

## Patient Safety First

At Cincinnati Children's, we believe that keeping our patients and employees safe is a precondition for everything we do. Safety is central to delivering the best-in-class outcomes we are committed to and is a fundamental right of the parents who bring their children to us for care. It is the reason we ask patients and families to sit on our boards, participate in our improvement work and help us design care delivery. We hope they will push us out of our comfort zone and eradicate a common belief in healthcare – that harm is an eventuality that comes with taking care of very sick kids. Stephen Muething, MD, vice president of safety, leads our efforts.



### Home

- [Safety- Home](#)

### What is a Serious Safety Event?

Serious safety events are adverse events that result when deviation in best-practice care cause significant harm to a patient.

- [Event Pyramid](#)
- [SSE Process](#)
- [Safety Reporting System](#)
- [Serious Safety Event Policy](#)
- [Checklist for Immediate Response to SSE](#)

### Manager's Safety Toolbox

- [2012 Culture Survey Results](#)
  - [2011 Culture Survey Results](#)
- [Think Safety, Talk Safety](#)
- [Aparent Cause Analysis \(ACA\)](#)
  - [Dr. Steve's Journal](#)
  - [Submit a Safety Story](#)
- [Manager SSE Post Event](#)
  - [Patient Safety Video Toolkit](#)

### Patient Safety Program Information

- [Daily Safety Brief \(secured\)](#)
- [ASSERT Project Overview](#)
- [Patient Safety Training ELM- login](#)

### National Patient Safety Goals

- [2011 National Patient Safety Goals](#)

### Safety Videos

- [Be a Soaper Hero. Clean Your Hands.](#)  
"How you too can be a Soaper Hero!"
- [Patient Safety Video](#)
- [Safety in Three Words Video](#)
- [Daily Safety Brief](#)
- [Reducing Serious Safety Events](#)  
"Learn what CCHMC plans to do!"

### Safety News

- [Tenets of Surgical Safety](#)
- [Surgical Safety Mission Statement](#)
- [Commitment to Patient Safety](#)  
"What does that look like?"
- [Count Policy](#)
- [AHA Pals Information](#)
- [PIV Extravasation Grading Scale](#)
- [Peripheral Venous Infusion Risk](#)

### Codes/MRT/CPR Committee

- [CPR/MRT Communications](#)
- [Monitor Oversight Under Development](#)

### Behavioral Observation Tool

- [e-BOT link](#)
- [e-BOT Tutorial](#)
- [Paper BOT](#)

### Resources and Tools

- [ISMP Medication Safety Alert Newsletter](#)
- [ISMP Nurse Advise-ERR Newsletter](#)

# <http://cincinnatichildrens.org>

## About Cincinnati Children's

HOME » ABOUT CINCINNATI CHILDREN'S » OUTCOMES AND QUALITY IMPROVEMENT » SYSTEM LEVEL MEASURES » SERIOUS SAFETY EVENTS

### About Cincinnati Children's

- ▶ Corporate Information
- ▶ University of Cincinnati Affiliation
- Mission and Vision
- ▶ Awards and Rankings
- Our History
- ▶ Community Outreach
- ▼ Outcomes and Quality Improvement
  - How We Measure Up
  - ▼ System Level Measures
    - Patient and Employee Safety
    - Clinical Excellence, Outcomes
    - Patient and Family Experience

## Serious Safety Events

A serious safety event (SSE) is a variation from expected practice followed by death, severe permanent harm, moderate permanent harm, or significant temporary harm.

### Why This Measure Is Important

Our goal is to eliminate all serious harm to our patients.

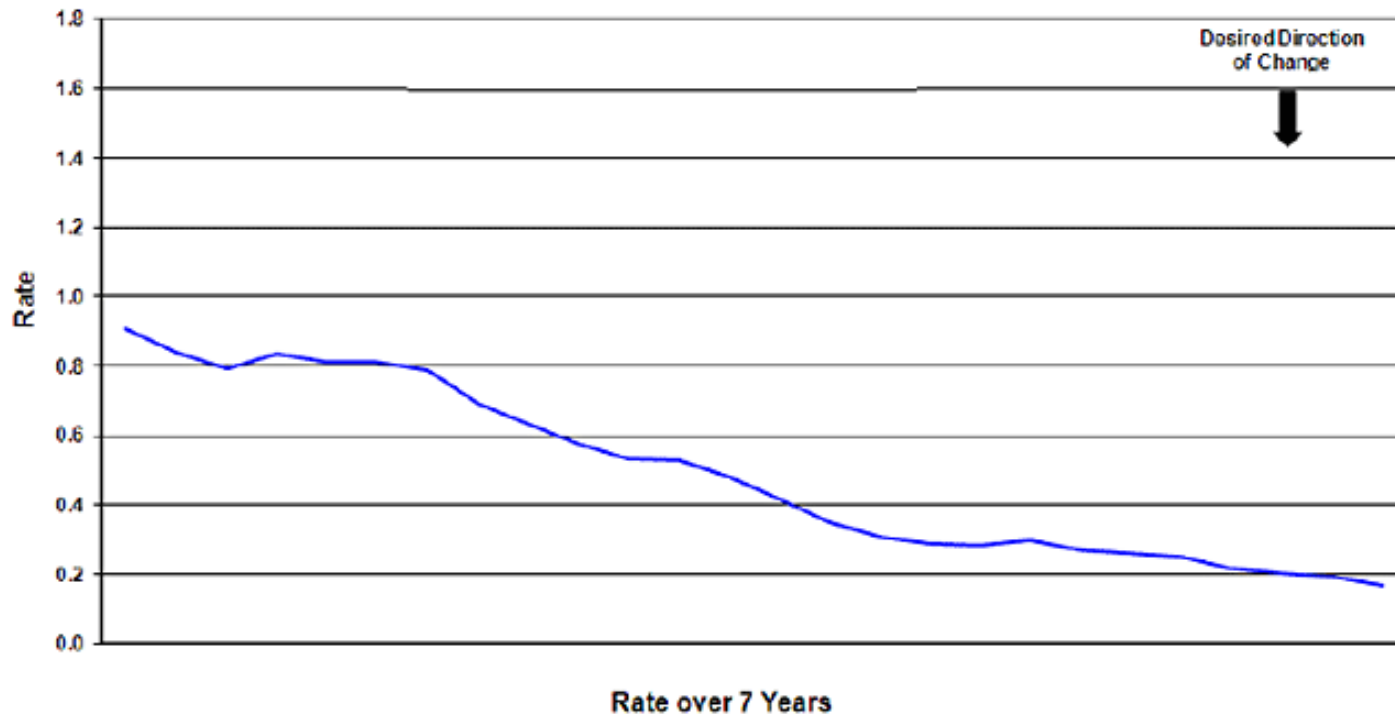
### How We Measure

To measure SSEs, we use a standard definition that has been adopted by the Ohio Children's Hospitals' Solutions for Patient Safety (SPS) collaborative. For a given period, the total number of SSEs identified is divided by the sum of the adjusted patient days (inpatient days plus "equivalent" outpatient days) and multiplied by 10,000. A rolling 12-month average of SSEs per 10,000 adjusted days is calculated monthly. The chart below displays a moving average of the quarterly rate to reflect the historical downward trend of the serious safety event rate.

<http://cincinnatichildrens.org>



### Serious Safety Event Rate

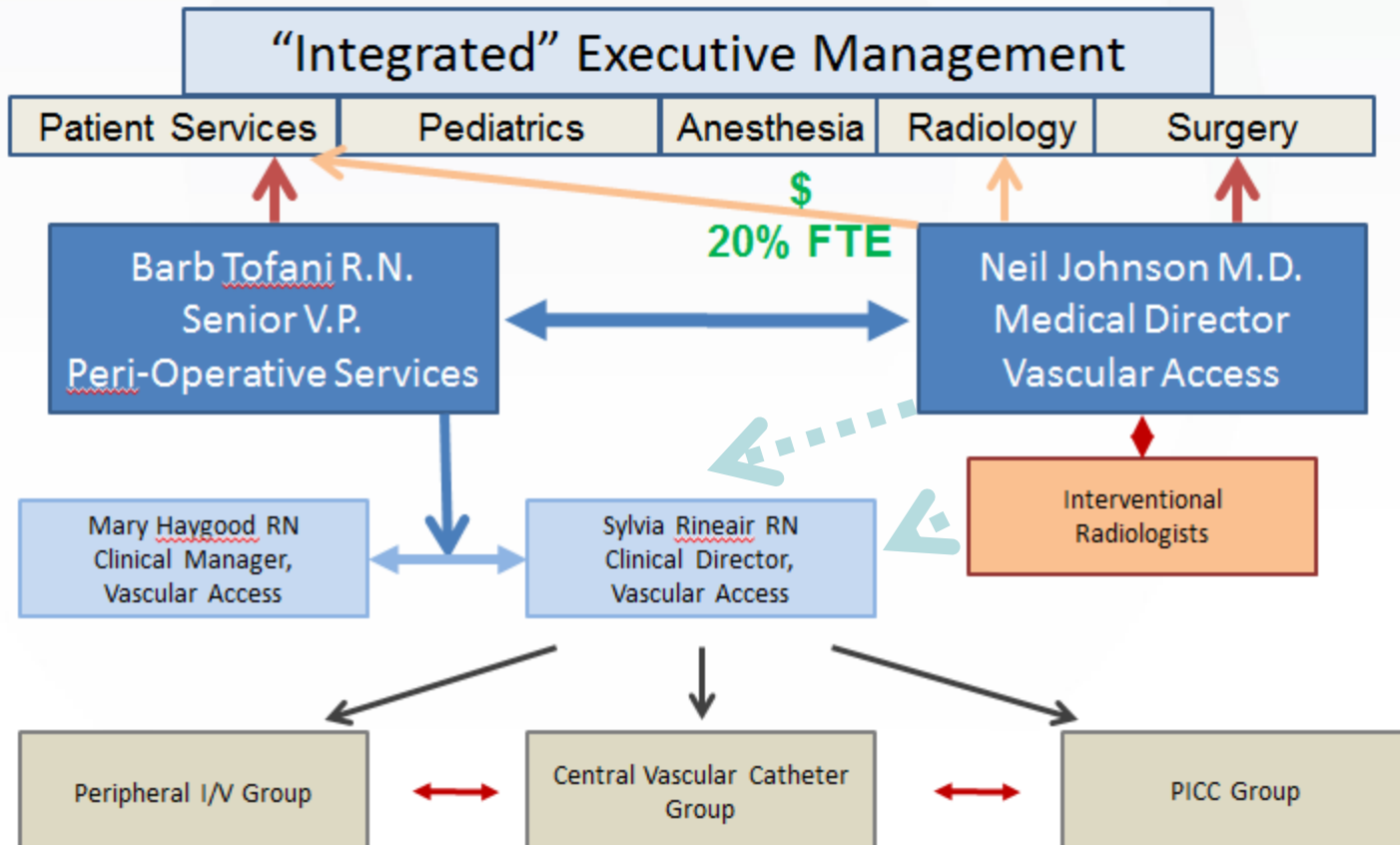


# CCHMC Safety

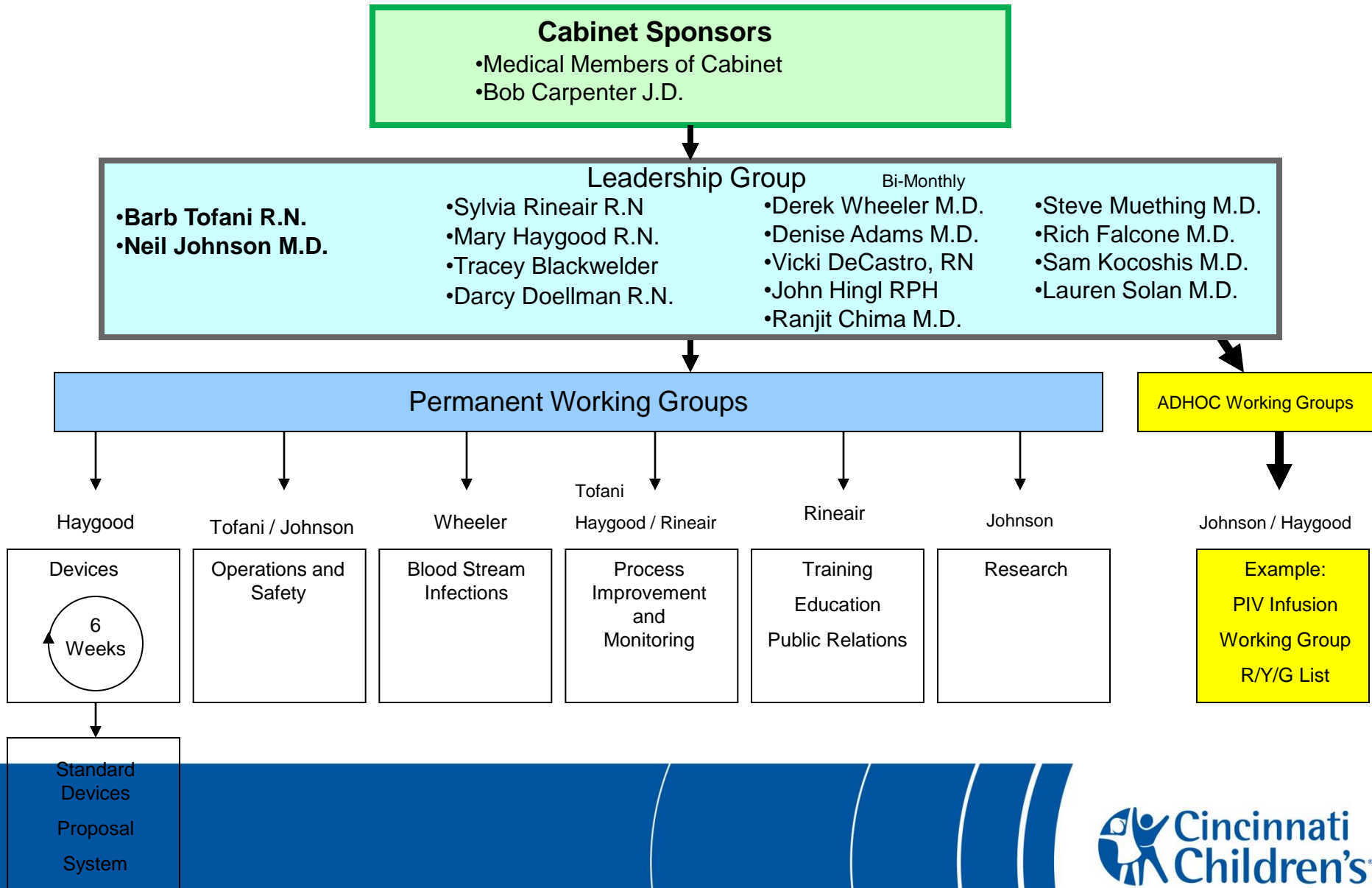
- CCHMC Board Takes Active Ownership
- Major Focus of Hospital
- Anderson Center
  - Academic and Operational Safety Center
- Serious Safety Events
  - Executive Cabinet Investigations
  - Prevention Plan
  - Multiple Issues Raised



# The Vascular Access Team at CCHMC



# CCHMC infusion and Vascular Access Governance (iVAG)



# Outline

- The Cincinnati Children's Safety Environment
- **Definitions**
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- 2 Component Extravasation Assessment Tool
- Goodbye Grading: Why We Divorced "Grading"

# Definition

- **HARM**

- Institute for Healthcare Improvement (IHI)

- “Unintended physical injury resulting from ....medical care...”

- **Canadian Disclosure Guidelines** (JAMA 2012 Vol307 #20)

- “an outcome that negatively affects a patient’s health / quality of life...”



# CCHMC I/V Extravasation HARM

## **MILD HARM**

*Any of the Following:*

- Discoloration at or near PIV Site
- Swelling < 60% (X/Y)
- Redness
- GREEN List Medication
- YELLOW List Medication

## **MODERATE HARM**

*Any of the Following:*

- Any number of Blisters
- Swelling > 60%
- Impaired Limb Function < 48 Hours
- RED List Medication

## **SEVERE HARM**

*Any of the Following:*

- Distal Arterial Compromise (No palpable distal pulse, Cap Return > 8 seconds, Skin Ischemia)
- Fasciotomy
- Skin Graft or Tissue Transfer at any time after Extravasation Event
- Impaired Limb Function > 48 Hours

Note: This harm assessment applies to harm caused:

- Up to 72 hours after PIV Extravasation for Mild – Moderate Category findings
- At ANY time after PIV Extravasation for SEVERE Harm Category findings.

OUTCOME  
or  
TREATMENT  
Based

# Definition

## • SAFETY



### Institute of Medicine (2000):

“....no commonly accepted definition of the safety net exists.....”

Institute of Medicine. 2000 America's Health Care Safety Net: Intact but Endangered. National Academy Press p3-4

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definition medical safety

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[safety - definition of safety in the Medical dictionary - by the Free ...](#)  
[medical-dictionary.thefreedictionary.com/safety](http://medical-dictionary.thefreedictionary.com/safety)

n the condition of possessing freedom from being exposed to risk, danger, or harm.  
**safety**. avoidance of occupational, iatrogenic or personal injury. drug **safety** ...

[Defining Patient Safety and Quality Care - National Center for ...](#)  
[www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov) > NCBI > Literature

by RG Hughes - 2008 - Cited by 75 - Related articles

Patient **safety** practices have been **defined** as “those that reduce the risk of adverse events related to exposure to **medical** care across a range of diagnoses or ...

[Safety - Definition and More from the Free Merriam-Webster Dictionary](#)  
[www.merriam-webster.com/dictionary/safety](http://www.merriam-webster.com/dictionary/safety)

**Definition** of **safety** from the Merriam-Webster Online Dictionary with audio pronunciations, thesaurus, Word of the Day, and word games.

[Safe - Definition and More from the Free Merriam-Webster Dictionary](#)  
[www.merriam-webster.com/dictionary/safe](http://www.merriam-webster.com/dictionary/safe)

**Medical Definition** of **SAFE**. : not causing harm or injury; especially : having a low incidence of adverse reactions and significant side effects when adequate ...

[PDF Institutes of Medicine Safety Net Provider Definition - Polk County](#)  
[www.polk-county.net/WorkArea/DownloadAsset.aspx?id=30134](http://www.polk-county.net/WorkArea/DownloadAsset.aspx?id=30134)

File Format: PDF/Adobe Acrobat - Quick View

Page 1. Institutes of **Medicine Safety Net Provider Definition**. Although no commonly accepted definition of the safety net exists, in mid-1990's the Institute of ...

# Definition

- **SAFETY:** CCHMC Vascular Access Team (VAT)
  - The Processes, Policies, People and Systems which seek to:
    - **AVOID** Unnecessary Risk
    - **MINIMIZE** Necessary Risk

“NOTHING in Life or Medical Practice is Risk Free”  
The ONLY way to achieve Zero Risk is to close the Hospital

# Definition

- **EXTRAVASATION** VS Infiltration
  - We Only Use The Word “**EXTRAVASATION**”
    - EXTRA = “Out Of or Outside”
    - VASCULAR = Vessel
- **EXTRAVASATION = “Out of the Vessel”**

“Infiltration” better used to refer to purposeful injection of fluids

Example:

“The skin was infiltrated with Xylocaine solution before incision”



# Definition

- **VESICANT**

- An agent that causes **Blistering**
- Originally a Chemical Warfare Term
  - e.g. Mustard Gas



Serious PIV Harm May NOT Involve BLISTERING

Therefore: The Word “VESICANT” not used at CCHMC

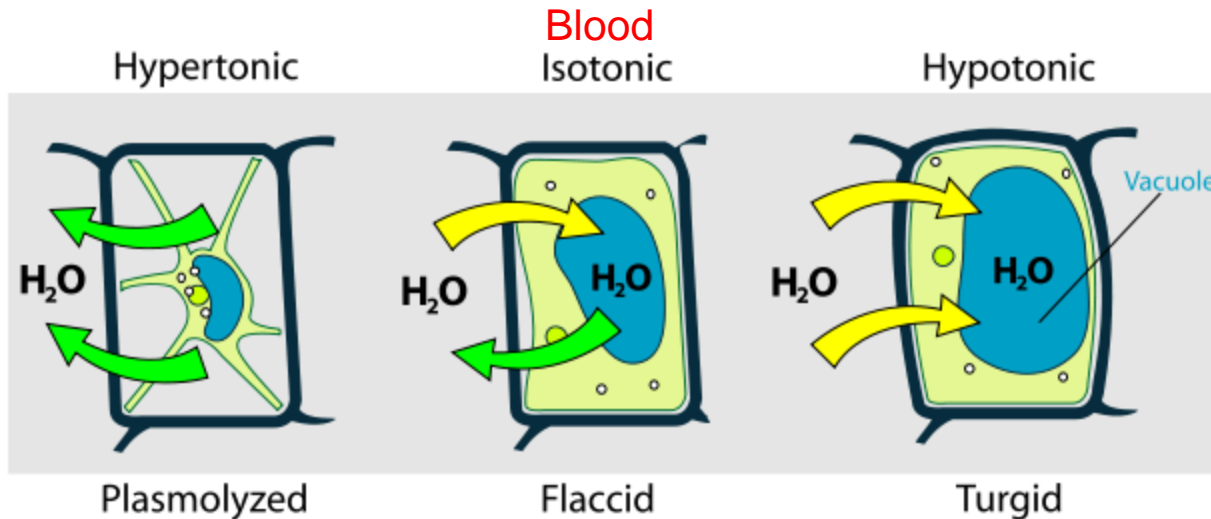
# Outline

- The Cincinnati Children's Safety Environment
- Definitions
- **Mechanisms of Extravasation Injury**
  - Reliable Hourly I/V Checks (Volume / Swelling)
  - Medication Risk Stratification (Tissue Toxicity)
  - 2 Component Extravasation Assessment Tool
  - Goodbye Grading: Why We Divorced "Grading"
  - **TOXICITY** (Local Tissue)
    - Osmolality
    - pH (Acid – Base)
    - Biological Activity
  - **VOLUME** (Pressure)

# Mechanisms of Extravasation Injury

- **OSMOLALITY**

- Non-Isotonic Solutions Destroy Cells / Tissue



Source: Wikipedia

EXAMPLES: TPN, 8.4% Na Bicarbonate, 20% Dextrose

- TOXICITY (Local Tissue)

- Osmolality
- pH (Acid – Base)
- Biological Activity

- VOLUME (Pressure)

# Mechanisms of Extravasation Injury

- **pH** (Acid – Base)

- Blood pH = 7.4

- High or Low pH

- Damages Proteins and Kills Cells

- $\text{pH} = -\log_{10} [\text{H}^+]$

- pH = 5 is 10 times more acidic than pH=6



pH = 2



pH = 12



pH = 11

- TOXICITY (Local Tissue)

- Osmolality
  - pH (Acid – Base)
  - Biological Activity

- VOLUME (Pressure)

# Mechanisms of Extravasation Injury

## • BIOLOGICAL ACTIVITY

– Vasopressors (Epinephrine / Dopamine)

- CONSTRICT vessels

– Chemotherapy Drugs

- KILL Cells (!)

– Other



Journal of Hand Surgery  
Vol 36, Issue 12, Dec 2011. pg: 2060-2065



• TOXICITY (Local Tissue)

- Osmolality
- pH (Acid – Base)
- Biological Activity

• VOLUME (Pressure)

# Mechanisms of Extravasation Injury

- **VOLUME**

- Massive Amounts of I/V Fluid in Tissues
- Compartment Syndrome
  - Fluid Pressure Occludes Veins
  - Venous Occlusion → More Swelling
  - Progressive Swelling → Arterial Compromise
  - **Dead Limb**



Our WORST Extravasation Injury was caused by Normal Saline

- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
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- VOLUME (Pressure)

# Outline

- The Cincinnati Children's Safety Environment
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- **Reliable Hourly I/V Checks (Volume)**
- Medication Risk Stratification (Tissue Toxicity)
- 2 Component Extravasation Assessment Tool
- Goodbye Grading: Why We Divorced "Grading"

**MINIMIZE** Necessary Risk

**AVOID** Unnecessary Risk

- **TOXICITY** (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity
- **VOLUME** (Pressure)



ELSEVIER

## Quality Improvement Project to Reduce Infiltration and Extravasation Events in a Pediatric Hospital<sup>1</sup>

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Craig H. Gosdin MD, MSHA<sup>c</sup>, Patricia M. Pilcher RN, MSN<sup>d</sup>,  
Susan McGee MSN, RN, CNP<sup>e</sup>, Kartik R. Varadarajan MPH<sup>f</sup>, Pamela J. Schoettker MS<sup>f</sup>

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### Key words:

Peripheral venous infusion  
injury;  
Infiltration;  
Extravasation;  
Quality improvement;  
Safety

A safety event response team at Cincinnati Children's Hospital Medical Center developed and tested improvement strategies to reduce peripheral intravenous (PIV) infiltration and extravasation injuries. Improvement activities included development of the touch-look-compare method for hourly PIV site assessment, staff education and mandatory demonstration of PIV site assessment, and performance monitoring and sharing of compliance results. We observed a significant reduction in the injury rate immediately following implementation of the interventions that corresponded with monitoring compliance in performing hourly assessments on patients with a PIV, but this was not sustained. The team is currently examining other strategies to reduce PIV injuries.

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# Strategies

- Peripheral I/V (PIV) Policy Revision
- Nursing Staff Education
  - Significant Institution-Wide Effort
  - TLC Methodology for Hourly Checks
- Nursing Unit Manual Hourly Checks AUDIT
  - >90% Compliance (after 3 months) → STOP Manual Audit
  - <90% Compliance → Continue Audit until >90% Achieved
- PROBLEMS:
  - Manual Data Collection
  - Variable Documentation
  - Two Electronic Data capture Systems



- **TOXICITY** (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity

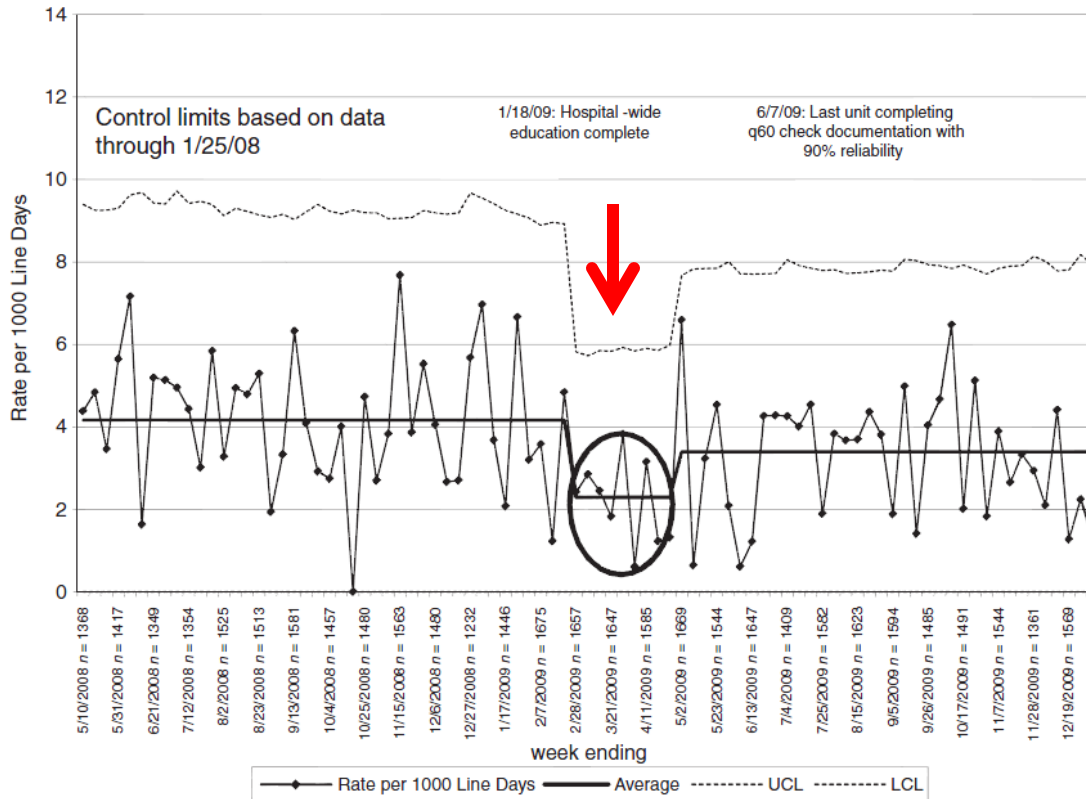
- **VOLUME** (Pressure) **Reliable Hourly Checks**



# Result: Good But Not Sustained

686


B.F. Tofani et al.

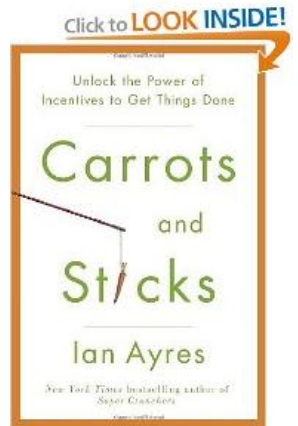


- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid - Base)
  - Biological Activity

- **VOLUME** (Pressure) **Reliable Hourly Checks**

# New Efforts: Reliable Hourly Checks

- **EPIC EMR Implemented**
  - All I/V Documentation now in ONE place
    - 18 month VAT – IT Project
- **>60% Extravasation = 1 Month Manual Audit**
  - Unpopular!
- Immediate **Feedback System** 
- “Personal **Interview**” (>60%)



- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity

- **VOLUME** (Pressure) **Reliable Hourly Checks**

# New Efforts: Immediate Feedback System

- Supports Reliable Hourly Checks (Volume)
- Supports "R" Medication Injury Prevention (Toxicity)

- Automated (EPIC) Digital Messaging to VAT leadership and PIV team

- Extravasations >30%
- Any Amount of "R" drugs



*Extravasation Alert: X / Y Ratio 65%*  
*Room: B4103*  
*Unit: B4N*



- VAT Nurse (24/7) Visits Unit

- Immediate **FEEDBACK TO THE PERSON(S) RESPONSIBLE**
- Early Treatment (If Appropriate)
- Educational Opportunity
- Intelligence Gathering for Analysis by VAT Improvement Team

- **TOXICITY** (Local Tissue)

- Osmolality
- pH (Acid – Base)
- Biological Activity

- **VOLUME** (Pressure)

# “Instant” Pager Notification



# New Efforts: Personal Interview

- ALL VOLUME Extravasations >60%
  - Detailed Report Required from Unit Manager
  - Personal Interview (Tofani-Johnson-Rinear)
    - Bedside Nurse(s) Involved
    - Unit Manager
- TREND:
  - Marked Decrease in >60% Fluid Extravasations
  - Most now “justifiable” or exceptional
  - Still Not Acceptable (O.R. Under Drapes etc.)

- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity

- VOLUME (Pressure) Reliable Hourly Checks

# Compare Is SO Important

Pager Feedback Strategy Identified “Compare” Not Done Reliably



# "Compare" Not Done Reliably

-Recent Change: Evidence Based

→ So.... TLC Poster Revised



## TLC

For IV Safety Touch, Look, and **COMPARE**  
*Vía intravenosa segura: Toque, mire y **COMPARE***

TOUCH (TOQUE)	LOOK (MIRE)	COMPARE (COMPARE)	
<p><b>Touch every 60 Minutes</b>                      IV should feel:                      Soft                      Warm                      Dry                      Pain Free</p>	<p><b>Look every 60 Minutes</b>                      IV site should be:                      Uncovered                      Dry                      Without Redness</p>	<p><b>Compare every 60 Minutes</b>                      IV site should be:                      Same size as other side                      Without Swelling</p>	<p>IV Checks must happen even when asleep  <i>Los controles deben hacerse mientras duerme</i></p>
<p><i>Toque cada 60 minutos</i>                      El lugar de la vía debe estar:                      Blando                      Tibio                      Seco                      Sin dolor</p>	<p><i>Mire cada 60 minutos</i>                      El lugar de la vía debe estar:                      Destapado                      Seco                      Sin enrojecimiento</p>	<p><i>Compare cada 60 minutos</i>                      El lugar de la vía intravenosa:                      Debe tener el mismo tamaño que el otro lado                      No debe estar hinchado</p>	<p><b>Call your nurse</b> if you notice anything wrong or if you have questions or concerns.  <b>Llame a la enfermera</b> si ve que algo no está bien o si tiene dudas o inquietudes</p>

- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity

• **VOLUME** (Pressure) **Reliable Hourly Checks**



# Outline

- Cincinnati Children's Safety Environment
- Definitions
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume)
- 3 Tier **Medication Risk** (Local Toxicity)
- 2 Component Extravasation Assessment Tool
- Why No Grading??

“**AVOID** Unnecessary Risk”

MINIMIZE necessary risk

- **TOXICITY** (Local Tissue)

- Osmolality
- pH (Acid – Base)
- Biological Activity

- **VOLUME** (Pressure)

# • Medication Risk Stratification

- 18 Month Project
- Multi-Disciplinary

- Pharmacy
- Nursing (VAT)
- Physicians
- Evidence Based Expert
- Nutrition Service
- NICU

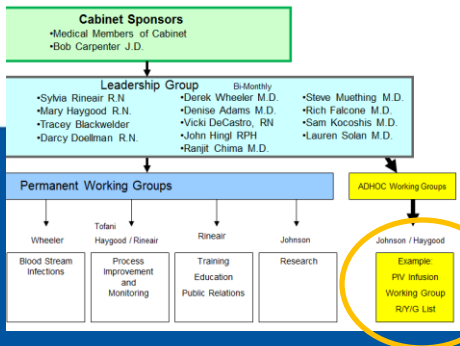
## Venous Infusion Extravasation Risk

This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device. Risk derived from available evidence, CCHMC data and CCHMC expert opinion, subject to review and change as further evidence becomes available.  
*For Treatment of Extravasation, Refer to CCHMC Policy P&T II-112*  
 This does not apply in situations of emergency medical treatment.  
 If a medication is not on this list, please refer to the CCHMC formulary or contact pharmacy (6-4291) for information

Red Higher Risk	Yellow Intermediate Risk	Green + Lower Risk
<b>Acyclovir</b> <b>Amiodarone</b> <b>Caffeine Citrate</b> <b>Calcium</b> (all salt forms) <b>Dextrose</b> > 12.5% <b>Doxycycline</b> <b>Esmolol</b> <b>Mannitol</b> 20% & 25% <b>Promethazine</b> <b>Potassium</b> >60 mEq/L <b>Sodium bicarbonate</b> <b>Sodium chloride</b> ≥ 3% <b>TPN</b> > 950 mOsm/L <b>Vasopressors such as Dopamine</b>  <b>Chemotherapy Drugs</b> <i>Extravasation treatment: Refer to policy P&amp;T II-113</i>	Acetazolamide Allopurinol Amikacin Amphotericin B (conventional) Arginine Ciprofloxacin Dextrose 10% to ≤12.5% Diazepam Erythromycin Ganciclovir Lorazepam Midazolam Morphine Ondansetron Nafcillin Non-Ionic Radiology Contrast Phenobarbital Phenytoin Potassium ≤ 60 mEq/L TPN ≤950 mOsm/L Vancomycin	Aminophylline Amphotericin B Liposomal Ampicillin Ampicillin/Sulbactam Cefazolin Cefotaxime Ceftriaxone Cefuroxime Clindamycin D5LR Dextrose < 10% Fentanyl Fosphenytoin Furosemide Gentamicin Heparin Imipenem IVIG Lactated Ringers Lipids Magnesium sulfate (bolus) Meropenem Methylprednisolone Normal saline Pentamidine Piperacillin  <div style="border: 1px solid black; padding: 5px; background-color: #e0ffe0;"> <b>* NOTE:</b>                      No intravenous infusate is "safe".                      Gross extravasation, even of normal saline, may result in serious harm including compartment syndrome, causing ischemia and loss of tissue or permanent loss of limb function.                 </div> Piperacillin/tazobactam Ticarcillin Ticarcillin/clavulanate Tobramycin



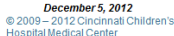
Peripherally Venous Access is defined as any Venous Access Device whose tip lies outside the Right Atrium, Superior / Inferior Vena Cava, or the Brachiocephalic Veins

**December 5, 2012**  
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# Medication Risk Stratification

- Literature Evidence Search
- MEASUREMENT
  - pH
  - Osmolarity
- Measurements of COMMON Pediatric Formulations
- Blood Products Excluded
  - Blood = Bruise
  - Not Tissue Toxic

Venous Infusion Extravasation Risk		
<p>This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device. Risk derived from available evidence, CCHMC data and CCHMC expert opinion, subject to review and change as further evidence becomes available. For Treatment of Extravasation, Refer to CCHMC Policy P&amp;T II-112. This does not apply in situations of emergency medical treatment. If a medication is not on this list, please refer to the CCHMC formulary or contact pharmacy (6-4291) for information.</p>		
<p><b>Red</b> Higher Risk</p> <p>Acyclovir Amiodarone Caffeine Citrate Calcium (all salt forms) Dextrose &gt; 12.5% Doxycycline Esmolol Mannitol 20% &amp; 25% Promethazine Potassium &gt; 60 mEq/L Sodium bicarbonate Sodium chloride ≥ 3% TPN &gt; 950 mOsm/L Vasopressors such as Dopamine</p> <p><b>Chemotherapy Drugs</b> Extravasation treatment: Refer to policy P&amp;T II-113</p>	<p><b>Yellow</b> Intermediate Risk</p> <p>Acetazolamide Allopurinol Amikacin Amphotericin B (conventional) Arginine Ciprofloxacin Dextrose 10% to ≤12.5% Diazepam Erythromycin Ganciclovir Lorazepam Midazolam Morphine Ondansetron Nafcillin Non-Ionic Radiology Contrast Phenobarbital Phenytoin Potassium ≤ 60 mEq/L TPN ≤ 950 mOsm/L Vancomycin</p>	<p><b>Green</b> + Lower Risk</p> <p>Aminophylline Amphotericin B Liposomal Ampicillin Ampicillin Sulbactam Cefazolin Cefotaxime Ceftazidime Ceftriaxone Cefuroxime Cindansynin DSL.R Dextrose &lt; 10% Fentanyl Fosphenytoin Furosemide Gentamicin Heparin Impipenem IVIG Lactated Ringers Lipids Magnesium sulfate (bolus) Mertropen Methylprednisolone Normal saline Pentamidine Piperacillin Piperacillin/tazobactam Ticarcillin Ticarcillin/clavulanate Tobramycin</p> <p><b>* NOTE:</b> No intravenous infusate is "safe". Gross extravasation, even of normal saline, may result in serious harm including compartment syndrome, causing ischemia and loss of tissue or permanent loss of limb function.</p>
<p>  </p> <p>December 5, 2012 © 2009 – 2012 Cincinnati Children's Hospital Medical Center</p> <p>Peripheral Venous Access is defined as any Venous Access Device whose tip lies outside the Right Atrium, Superior / Inferior Vena Cava, or the Brachiocephalic Veins</p>		

## RED Criteria

- pH <5 or >9
- Strong Published Evidence
- >950 Mili Osmoles

## TOXICITY (Local Tissue)

- Osmolality
- pH (Acid – Base)
- Biological Activity

## VOLUME (Pressure)

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## Reducing Risk of Harm From Extravasation

A 3-Tiered Evidence-Based List of Pediatric Peripheral Intravenous Infusates

### ABSTRACT

Extravasation of medications during peripheral intravenous (PIV) therapy can result in harm to pediatric patients. These medications have physical and/or biologic factors that cause tissue damage. To assist in clinical decisions when using these infusates, an evidence-based table of medications stratified by their relative risk of causing harm if extravasated was developed. Local data and experience, a systematic review of the pediatric literature, and measured pH and osmolality of common pediatric preparations of PIV infusates were used to create a 3-tiered table of PIV infusates categorized by relative risk of causing harm if extravasated.

**Key words:** adverse effects, children, extravasation, infants, intravenous infusions, peripheral catheterization

Peripheral intravenous (PIV) insertion is one of the most common procedures undertaken for pediatric patients requiring short-term infusion therapy. Serious but uncommon risks with PIV therapy may result in predictable patient injury, and the patient safety and medicolegal consequences are well known to most institutions. PIV device is defined as any venous access device whose tip lies outside the right atrium, superior or inferior vena cava, or brachiocephalic veins.

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**Darcy Doellman, BSN, RN, CRNI®, VA-BC,** is a vascular access nurse at Cincinnati Children's Hospital. She has several publications in the field of neonatal/pediatric vascular access. Darcy is certified in infusion nursing (2005) and board certified in vascular access (2011). Darcy was the 2007-2008 president of the Association for Vascular Access.

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**Neil Johnson, MD,** is a pediatric interventional radiologist practicing at Cincinnati Children's Hospital, where he is medical director of vascular access. He was formerly chief of interventional radiology, medical director of information systems, and immediate past president of the Society for Pediatric Radiology.

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Darcy Doellman is a consultant for Genentech and Teleflex Medical, Arrow International. All other authors disclose no potential, perceived, or real conflicts of interest or financial relationships relevant to this article.

The article was drafted and revised collaboratively, with substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data by all authors. Each author has seen and approved the submission of this version of the article and takes full responsibility for the article.

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**Eloise Clark, MPH, MBA,** works in the Anderson Center for Health Systems Excellence at Cincinnati Children's Hospital Medical Center as an evidence-based decision-making program administrator. Her expertise is in searching, appraising, and synthesizing published evidence so that clinicians may be able to apply it in practice to improve child health outcomes.

**Barbara K. Giambra, MS, RN, CPNP,** is an advanced practice nurse and evidence-based practice mentor at Cincinnati Children's Hospital. Ms Giambra has extensive experience in nursing care of chronically ill children and their families and the use of evidence at the point of care.

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TABLE 4 Continued

Medication <sup>a</sup>	Harm <sup>b</sup>	pH	OSM	CONC	DIL	Citations <sup>c</sup>
Potassium (unknown concentration)	C		—			1,16
Potassium >0.06 mEq/mL (>60 mEq/L)	F	5	763	0.3 mEq/mL (300 mEq/L)	NS	30
Promethazine	F	4.8	213	25 mg/mL	D5W	37
Sodium bicarbonate	C	7.8	932	0.5 mEq/mL	SW	1,10,33,38,39
Sodium chloride ≥3%	C	6.8	939	3%	SW	Concentrations not specified in the references <sup>1,16</sup>
TPN >950 mOsm/L	F, C	Varies	>950	NA	NA	• >950 mOsm/L in references (C harm) <sup>42,43</sup> • OSM in references unknown (F, C harm) <sup>1,12,14,18,30,31,33,43,47</sup>
Vasopressors such as dopamine (vasoactive)	F, C		—			Dobutamine in reference <sup>33</sup>
	F, C	2.9	997	80 mg/mL	D5W	27,43
Chemotherapy agents (cytotoxic)	F, C		Various			43,48,58
<b>Intermediate risk</b>						
Acetazolamide	N	9.5	548	25 mg/mL	D5W	Local consensus
Allopurinol	N	10.3	345	6 mg/mL	D5W	Local consensus
Amikacin	C	4.5	317	15 mg/mL	NS	27
Amphotericin B (conventional)	N	7.2	265	0.1 mg/mL	D5W	35,60,62
Arginine	C	5.6	950	10%	SW	65,67
Ciprofloxacin	N	4.2	279	2 mg/mL	D5W	Local consensus
Dextrose 10% to ≤12.5%	F, C	Varies	505 to 640	—	NA	1,12,16,30,32,33,47
Diazepam	N	6.6	>2000	5 mg/mL	NA	34,35,60,62,68
Erythromycin	N	7	287	5 mg/mL	NS	61
Ganciclovir	N	9.9	274	5 mg/mL	D5W	35,62
Lorazepam	N	7.4	>2000	2 mg/mL	NA	69
Midazolam	N	3.4	386	5 mg/mL	NA	Local consensus
Morphine	N	5	284	1 mg/mL	NS	60
Nafcillin	C	7	324	15 mg/mL	D5W	43,70,71
	C	7.1	363	30 mg/mL	D5W	
Nonionic radiology contrast	C	6.8 to 7.7	322 to 844	Varies	NA	72
Ondansetron	N	3.5	282	1 mg/mL	D5W	Local consensus
Phenobarbital	C	8.2	2159	10 mg/mL	SW	73
	N	10.0	>2000	5 mg/mL	NA	34,35,60,62,68,74,75

# Venous Infusion Extravasation Risk

This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device. Risk derived from available evidence, CCHMC data and CCHMC expert opinion, subject to review and change as further evidence becomes available. For Treatment of Extravasation, Refer to CCHMC Policy P&T II-112. This does not apply in situations of emergency medical treatment. If a medication is not on this list, please refer to the CCHMC formulary or contact pharmacy (6-4291) for information

## Red Higher Risk

- Acyclovir
- Amiodarone
- Caffeine Citrate
- Calcium (all salt forms)
- Dextrose >12.5%
- Doxycycline
- Esmolol
- Mannitol 20% & 25%
- Promethazine
- Potassium >60 mEq/L
- Sodium bicarbonate
- Sodium chloride  $\geq$  3%
- TPN > 950 mOsm/L
- Vasopressors such as Dopamine

**Chemotherapy Drugs**  
Extravasation treatment:  
Refer to policy P&T II-113

## Yellow Intermediate Risk

- Acetazolamide
- Allopurinol
- Amikacin
- Amphotericin B (conventional)
- Arginine
- Ciprofloxacin
- Dextrose 10% to  $\leq$ 12.5%
- Diazepam
- Erythromycin
- Ganciclovir
- Lorazepam
- Midazolam
- Morphine
- Ondansetron
- Nafcillin
- Non-Ionic Radiology Contrast
- Phenobarbital
- Phenytoin
- Potassium  $\leq$  60 mEq/L
- TPN  $\leq$ 950 mOsm/L
- Vancomycin

## Green + Lower Risk

- Aminophylline
- Amphotericin B Liposomal
- Ampicillin
- Ampicillin/Sulbactam
- Cefazolin
- Cefotaxime
- Ceftazidime
- Ceftriaxone
- Cefuroxime
- Clindamycin
- D5LR
- Dextrose < 10%
- Fentanyl
- Fosphenytoin
- Furosemide
- Gentamicin
- Heparin
- Imipenem
- IVIG
- Lactated Ringers
- Lipids
- Magnesium sulfate (bolus)
- Meropenem
- Methylprednisolone
- Normal saline
- Pentamidine
- Piperacillin

### + NOTE:

No intravenous infusate is "safe".  
Gross extravasation, even of normal saline, may result in serious harm including compartment syndrome, causing ischemia and loss of tissue or permanent loss of limb function.

- Piperacillin/tazobactam
- Ticarcillin
- Ticarcillin/clavulanate
- Tobramycin



Peripheral Venous Access is defined as any Venous Access Device whose tip lies outside the Right Atrium, Superior / Inferior Vena Cava, or the Brachiocephalic Veins

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Each Update has a Different Color Border



# Unexpected Positives

- Universal Availability **R/Y/G**

- Every Computer Workstation
- Every Pyxis etc.
- Hard To Avoid

Venous Infusion Extravasation Risk		
<small>This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device. Risk derived from available evidence, CCRMC data and CCRMC expert opinion, subject to review and change as further evidence becomes available. For Treatment of Extravasation, Refer to CCRMC Policy PA1 &amp; 12. This does not apply to scheduled emergency medical treatment. If a medication is not on this list, please refer to the CCRMC formulary or contact pharmacy (6.4291) for information.</small>		
<b>Red</b> Higher Risk	<b>Yellow</b> Intermediate Risk	<b>Green</b> *Lower Risk
Acyclovir Amiodarone Caffeine Citrate Calcium (all salt forms) Dextrose > 12.5% Doxycycline Esmolol Mannitol 20% & 25% Promethazine Potassium > 40 mEq/L Sodium bicarbonate Sodium chloride > 3% TPN > 950 mOsm/L Vasopressors such as Dopamine Chemotherapy Drugs <small>Extravasation treatment Refer to policy PA1 &amp; 12.12</small>	Acetazolamide Allopurinol Amikacin Amphotericin B (conventional) Arginine Cephalosporins Doxorubicin Dextrose 10% to 12.5% Digoxin Erythromycin Nicotinic Lorazepam Midazolam Morphine Oxidant Nafcillin Non-ionic Radiology Contrast Phenobarbital Phenytoin Potassium ≤ 40 mEq/L TPN ≤ 950 mOsm/L Vancomycin	Amphotericin B Liposomal Ampicillin Arginine-Isobutyrates Carbicarb Cefazolin Cefepime Ceftriaxone Cefuroxime Clindamycin DILP Dextrose < 10% Fentanyl Fingertone Gemtanebrin Gentamicin Heparin Insulin IVIG Liposomal Papatin Lipids Magnesium sulfate (Dobut) Mefenamic acid Midazolam Normal saline Penicillin G Piperacillin Propofol Propofol Isohexamer Dexamethasone Tobramycin Tetracycline Vancomycin
<small><b>NOTE:</b> If an intravenous infusion is "dry" Gross extravasation, even if normal saline, may result in serious harm including compartment syndrome, necrosis, ischemia and loss of tissue or permanent loss of limb function.</small>		
		<small>December 5, 2012 © 2009 - 2012 Cincinnati Children's Hospital Medical Center</small>

- Nurses Strongly Influence Doctor Behavior (!)

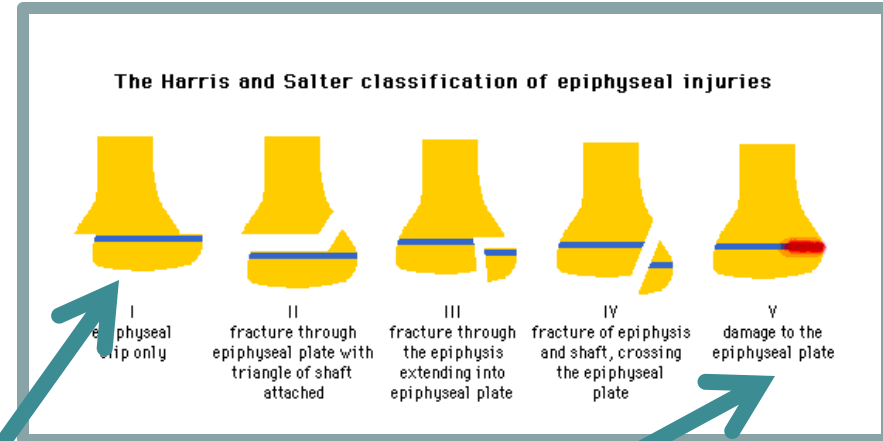
- Trend → Central Access for Red Drugs
- Increased Awareness of IV Risks of Red Drugs
- “Pseudo Policies” are *Sometimes* a Positive Phenomenon

# Outline

- The Cincinnati Children's Safety Environment
- Definitions
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- **Goodbye Grading: Why We Divorced "Grading"**
- 2 Component Extravasation Assessment Tool

# Medical Grading Systems: Fractures

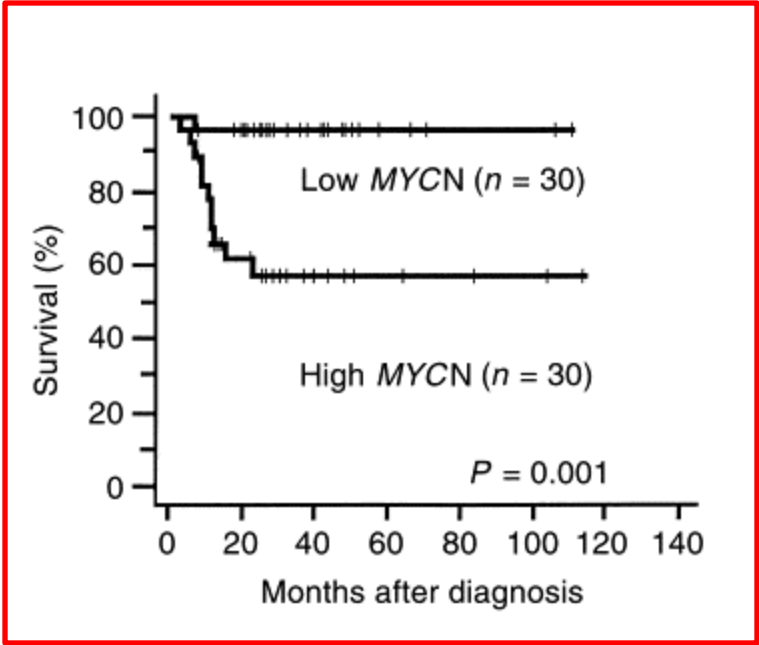
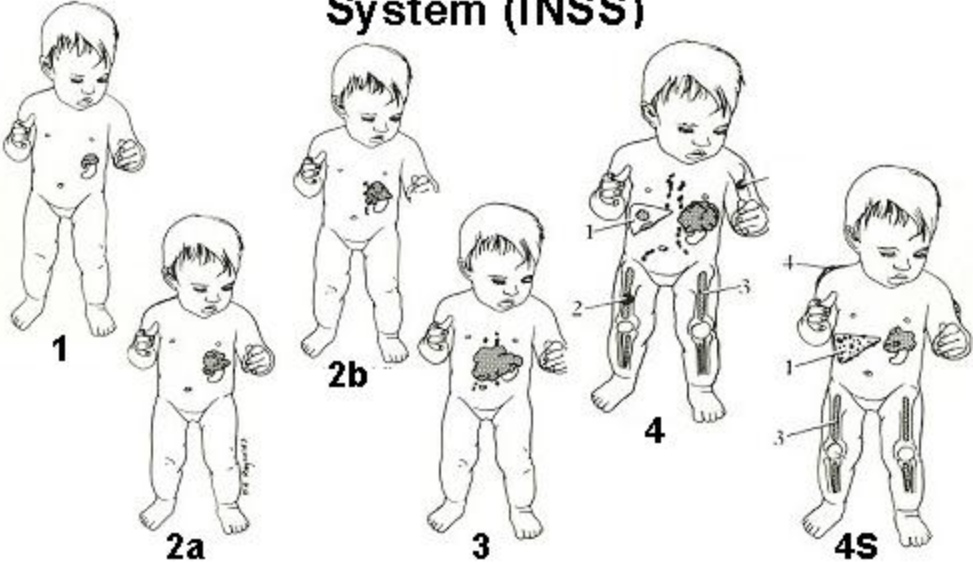
- Usually Based on
  - Severity
  - Treatment Pathways
  - Outcomes
- Type 1: Minor Injury
- Type 2: Almost Always Heals
- Type 3: Involves joint
- Type 4: High Risk
- Type 5: Disaster





# Medical Grading Systems: Neuroblastoma

## International Neuroblastoma Staging System (INSS)

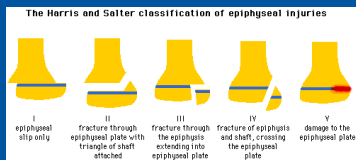


NANT Web Site

# The INS Grading System (Briefly)

- Grades 1-4
  - Mostly Descriptive
  - “Skin Blanched” is feature of ALL Grades
  - “Cool to Touch” is feature of THREE Grades
- Adult Based
  - Fixed Edema Measurements regardless of Ped. Patient Size
- Poor Outcome (Harm) Correlation for “Grades”
  - All Bad Outcomes are Grade 4 (Sensitive)
  - BUT....VERY Few Grade 4’s have Bad Outcome (NOT Specific)
    - (eg Small Amounts Vancomycin)
- Bundles TWO Separate Harm Components Into One “Grade”
  - Extravasated Fluid VOLUME (“Edema”)
  - MEDICATION (Local Tissue) TOXICITY (“Vesicant or Blood”)

Infusion Nurses Society Infiltration Scale of Intravenous Infiltrations <sup>a</sup>	
Grade: Clinical Criteria	
0:	No symptoms
1:	Skin blanched, edema less than 1 inch in any direction, cool to touch, with or without pain
2:	Skin blanched, edema 1-6 inches in any direction, cool to touch, with or without pain
3:	Skin blanched, translucent, gross edema greater than 6 inches in any direction, cool to touch, mild to moderate pain, possible numbness
4:	Skin blanched, translucent; skin tight, leaking; skin discolored, bruised, swollen; gross edema greater than 6 inches in any direction; deep pitting tissue edema; circulatory impairment; moderate to severe pain; infiltration of any amount of blood product, irritant, or vesicant



# The INS Grading System (Briefly)

- “Vesicant” Extravasation = Grade 4
  - 1ml or 100 ml -
    - Same Grade, Very Different Outcomes
- No “Official” Vesicant List
  - “We Know It When We See It....”



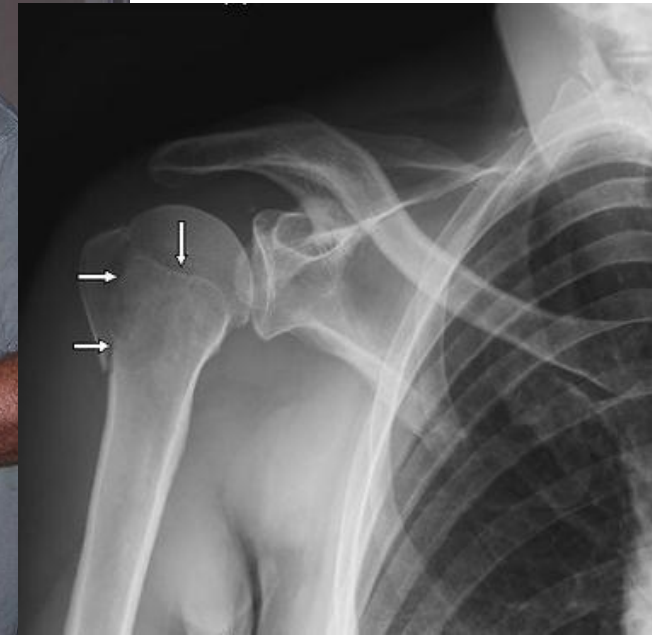
← Grade 4 →



# Blood Products Dangerous = Grade 4 ?

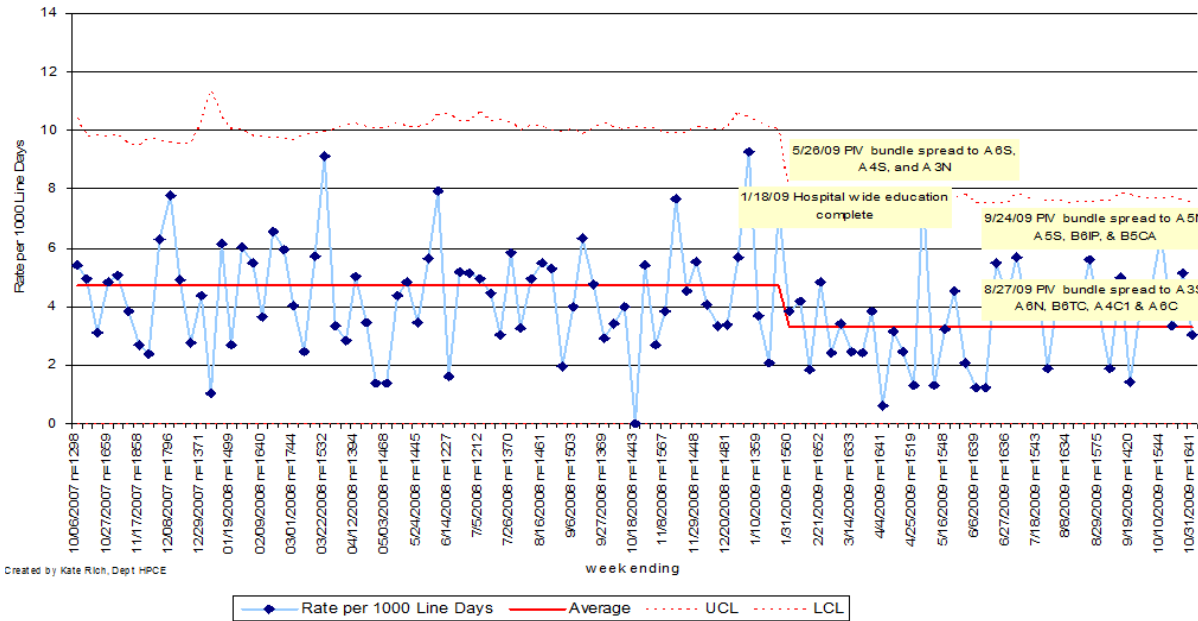


# Blood Products = Grade 4



# The INS Grade 4 Problem

Assumption: **Highest Grade = Highest Harm**



- CCHMC Safety Leaders Assumed "GRADE 4" = "Serious Harm"
  - "It's the HIGHEST Grade.. Why not??"
- Grade 4 PIV "Harm" was >40% of "Total Hospital Harm"
- Pressure on VAT to "Reduce Serious Harm" was Substantial

Extremely **HIGH** Sensitivity

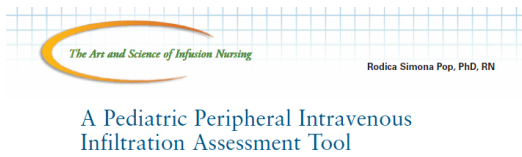
Every Serious Harm = Grade 4

Very **LOW** Specificity

Very Few Grade 4 = Serious Harm

# The INS Grading System

- No Longer Recommended by..... INS
- Grades Are Problematic for
  - Treatment Decisions
  - Institutional Harm Reduction Programs
- Grades Only Loosely Associated with OUTCOMES



**ABSTRACT**  
 Infiltration is a common complication of intravenous (IV) therapy. The use of adequate tools for IV assessment can identify infiltration in its early stages, thus reducing the potential for more serious complications. Assessment of IV devices in children needs to be performed using age- and size-appropriate tools that take into account children's smaller size and particular characteristics. It is also important to consider the size of an infiltration in relation to the affected extremity. This article discusses the development of a pediatric IV assessment tool as well as its psychometric properties.

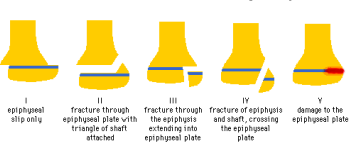
complication definition and reporting methodology.<sup>7,10</sup> Infants and young children are at an even higher risk for developing PIV-related complications because their veins are smaller and more fragile and because stabilization and protection of the PIV catheter are often difficult.<sup>8</sup> Although infiltration can be a minor complication of IV therapy, it can have serious consequences for some patients. Therefore, early identification and appropriate interventions are essential in reducing the potential for harm caused by PIV infiltration and extravasation.<sup>11</sup>

**BACKGROUND**  
 In 1998, the Intravenous Nurses Society, predecessor of the Infusion Nurses Society (INS), published an infiltration scale as part of their *Revised Intravenous Nursing Standards of Practice*.<sup>12</sup> This scale separated infiltrations into 4 categories based on signs and symptoms, size of the infiltrate, and type of IV solution infused. Although no clear evidence or psychometric tests to support the scale were presented, it was used extensively in clinical areas. The scale was eventually evaluated, and its psychometric properties were published by INS in 2010.<sup>13</sup> Infiltration scale testing showed moderate interrater reliability agree-

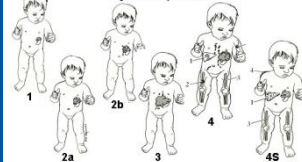
Intravenous (IV) catheters are routinely placed in hospitalized adults and children to administer medication or to deliver fluids and parental nutrition. Almost every hospitalized patient has a peripherally inserted IV (PIV) catheter.<sup>14</sup> Although considered a routine procedure, placement of a PIV catheter can be a stressful and painful experience for children and their par-

See Excellent Discussion in:  
 Rodica Pop, PhD, RN  
 J. Infusion Nursing, Vol. 35, Number 4,  
 July/August 2012  
 Children's Medical Center, Dallas

The Harris and Satter classification of epiphyseal injuries



International Neuroblastoma Staging System (INSS)



Infusion Nurses Society Infiltration Scale of Intravenous Infiltrations<sup>13</sup>

Grade	Clinical Criteria
1	No symptoms
2	Skin blanched, tender to touch, or to touch, with or without pain
3	Skin blanched, tender to touch, gross edema, greater than 6 inches in any direction, cool to touch, mild to moderate pain, possible discomfort
4	Skin blanched, translucent, skin tight, leaking, skin discolored, swollen, tender, gross edema greater than 6 inches in any direction, deep pulling tissue edema, or respiratory impairment, moderate to severe pain, infiltration of any amount of blood, pus, irritant, or vesicant

# Outline

- The Cincinnati Children's Safety Environment
- Definitions
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- Goodbye Grading: Why We Divorced "Grading"
- **CCHMC**
  - 2 Component
  - Extravasation Assessment / Coding Tool



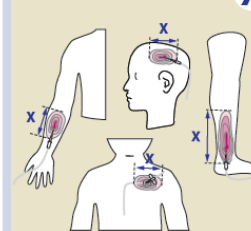
# CCHMC Extravasation Coding System

- Step 1 - **VOLUME** Measurement
  - Step 2 - **MEDICATION** (If Any)
- 
- Step 3 - **DOCUMENTATION**

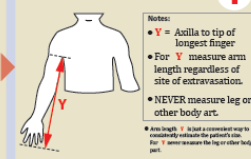
## Cincinnati Pediatric Intravenous Extravasation Assessment System

**STEP 1: Volume**

STEP 1a: Measure Swelling **X**



STEP 1b: Measure ARM Length **Y**



Notes:

- Y = Acilla to tip of longest finger
- For Y measure arm length regardless of site of extravasation.
- NEVER measure leg or other body part.
- Note: If a limb is amputated, use the contralateral limb to estimate the patient's size.
- For Y, measure across the leg or other body part.
- For patients with casts or limb deficiency, avoid standard measurement.

STEP 1c: Calculate

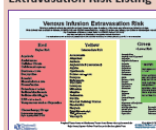
$$\left(\frac{X}{Y}\right) \cdot 100 = \boxed{\phantom{00}} \%$$

Notes:

- Define edges of swelling by palpation/visual observation.
- Measure largest dimension.

**STEP 2: Medication**

Use Current Version of Extravasation Risk Listing



**EXTRAVASATION MEDICATION CODING**

R = medication on RED list  
Y = medication on YELLOW list  
G = medication on GREEN list  
F = Fluids only (no medications or potassium)  
U = medication Unlisted  
N = medication not listed but causing harm similar to a RED drug (this category will rarely be needed)

Notes:

- "Extravasated Medication" means any drug administered through the IVIC during the previous 24 hours, or into the last segment of IVIC, whether to infuse.
- Refer to current Red/Yellow/Green listing (check new version for a different color listing, consult Pharm Services).

**STEP 3: Document** immediately in EPIC

Notify Vascular Access Team as soon as possible if:

- Volume ≥ 30%**
- and/or RED list Medication**

Vascular Access Team Pager: **736-0337**



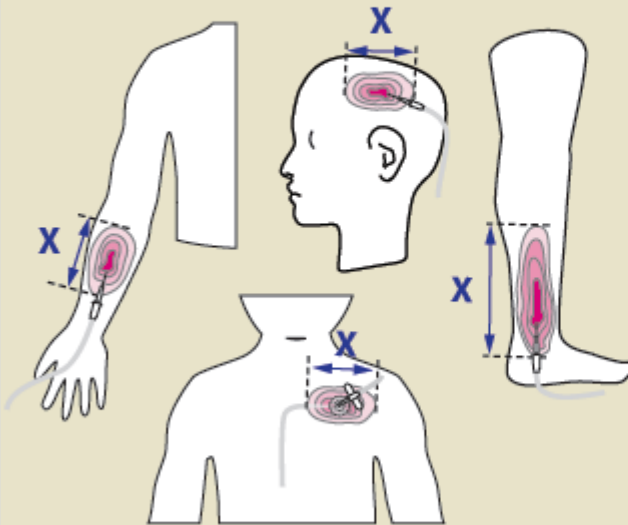
February 3, 2013  
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# Step 1: VOLUME

## STEP 1: *Volume*

### STEP 1a: Measure Swelling

**X**

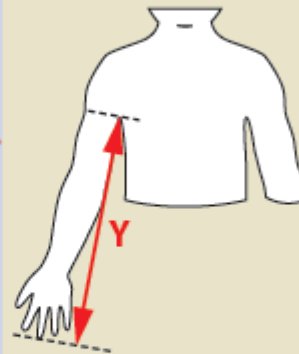


**Notes:**

- Define edges of swelling by palpation/visual observation.
- Measure longest dimension.

### STEP 1b: Measure ARM Length

**Y**



**Notes:**

- **Y** = Axilla to tip of longest finger
- For **Y** measure arm length regardless of site of extravasation.
- **NEVER** measure leg or other body part.
- Arm length **Y** is just a convenient way to consistently estimate the patient's size. For **Y** never measure the leg or other body part.
- For patients with casts or limb deficiency, consult vascular access team.

### STEP 1c: Calculate

$$\left( \frac{\mathbf{X}}{\mathbf{Y}} \right) \cdot 100 = \boxed{\phantom{000}} \%$$



# Step 1a:

- Measure Max Dimension
- Includes **ANY** Extravasation
  - PIV
  - PICC
  - CVC
  - PORT
  - Scalp / Chest

**STEP 1: Volume**

STEP 1a: Measure Swelling **X**

**Notes:**

- Define edges of swelling by palpation/visual observation.
- Measure longest dimension.

# Step 1b:

- Measure **ARM Length**
  - Surrogate for Body Size

**STEP 1: Volume**

**STEP 1a: Measure Swelling X**

**STEP 1b: Measure ARM Length Y**

**STEP 1c: Calculate**

$$\left(\frac{X}{Y}\right) \cdot 100 = \square \%$$

**Notes:**

- **Y** = Axilla to tip of longest finger
- For **Y** measure arm length regardless of site of extravasation.
- NEVER measure leg or other body art.
- Arm length **Y** is just a consistent way to consistently estimate the patient's size. For **Y** never measure the leg or other body part.
- For patients with casts or limb deficiency, consult vascular access team.

**Notes:**

- Define edges of swelling by palpation/visual observation.
- Measure longest dimension.

- “**Y**” is ARM length
  - Surrogate for Patient Body Size
  - Easy To Measure
  - Used for **ALL Extravasations**
  - Allows Consistent Quantification
    - Even If Extravasation is Scalp or Chest

If Patient has NO Arms:  
Refer to CCHMC Policy #1

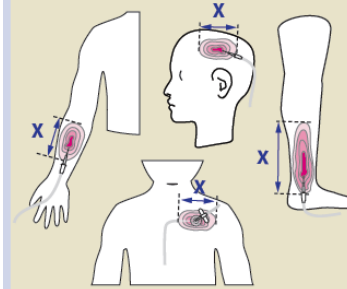
# Step 1c: Calculate

STEP 1c: Calculate

$$\left(\frac{X}{Y}\right) \cdot 100 = \boxed{\phantom{000}} \%$$

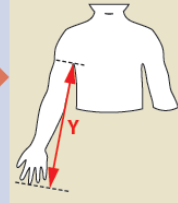
## STEP 1: Volume

STEP 1a: Measure Swelling **X**



• Define edges of swelling by palpation/visual observation.  
• Measure longest dimension.

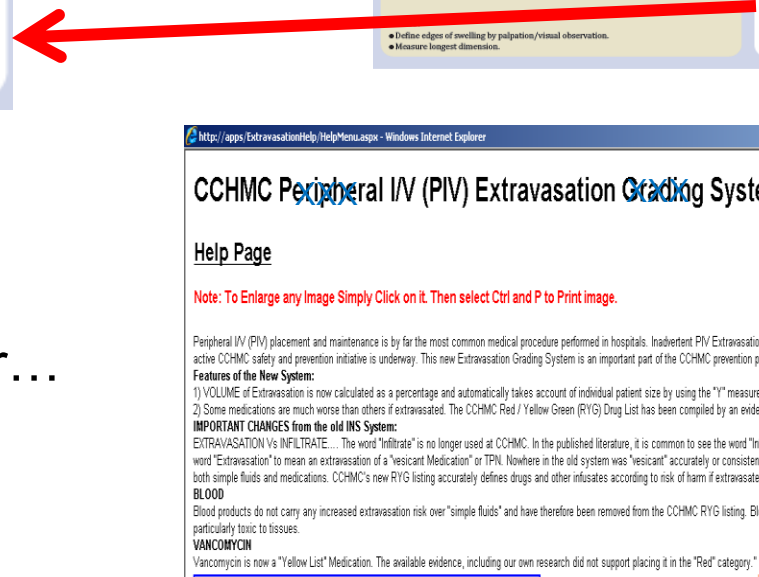
STEP 1b: Measure ARM Length **Y**



Notes:  
• **Y** = Axilla to tip of longest finger  
• For **Y** measure arm length regardless of site of extravasation.  
• NEVER measure leg or other body part.  
• Arm length **Y** is just a convenient way to consistently estimate the patient's size. For **Y** never measure the leg or other body part.  
• For patients with casts or limb deficiency, consult vascular access team.

STEP 1c: Calculate

$$\left(\frac{X}{Y}\right) \cdot 100 = \boxed{\phantom{000}} \%$$



Nurses USE Mobile Phone or...  
CCHMC Online Calculator  
(In EPIC)

https://apps.ExtravasationHelp/Help/Menu.aspx - Windows Internet Explorer

### CCHMC Peripheral I/V (PIV) Extravasation Grading System

Help Page

Note: To Enlarge any Image Simply Click on it. Then select Ctrl and P to Print image.

Peripheral I/V (PIV) placement and maintenance is by far the most common medical procedure performed in hospitals. Inadvertent PIV Extravasation is the number one cause of preventable harm to patients at CCHMC and an active CCHMC safety and prevention initiative is underway. This new Extravasation Grading System is an important part of the CCHMC prevention program.

**Features of the New System:**  
1) VOLUME of Extravasation is now calculated as a percentage and automatically takes account of individual patient size by using the "Y" measurement. There is no longer any need for "grades"... It is just a simple percentage.  
2) Some medications are much worse than others if extravasated. The CCHMC Red / Yellow Green (RYG) Drug List has been compiled by an evidence based multidisciplinary CCHMC team.

**IMPORTANT CHANGES from the old INS System:**  
EXTRAVASATION Vs INFILTRATE.... The word "infiltrate" is no longer used at CCHMC. In the published literature, it is common to see the word "infiltration" used to mean simple fluid (like Normal Saline) extravasation and the word "Extravasation" to mean an extravasation of a "vesicant Medication" or TPN. Nowhere in the old system was "vesicant" accurately or consistently defined. After July 1st, 2011 CCHMC will only use the word "Extravasation" for both simple fluids and medications. CCHMC's new RYG listing accurately defines drugs and other infusates according to risk of harm if extravasated.

**BLOOD**  
Blood products do not carry any increased extravasation risk over "simple fluids" and have therefore been removed from the CCHMC RYG listing. Blood extravasation is no more than a "bruise". It may look bad, but it is not particularly toxic to tissues.

**VANCOMYCIN**  
Vancomycin is now a "Yellow List" Medication. The available evidence, including our own research did not support placing it in the "Red" category."

**Volume Component**

STEP 1: Measure:

STEP 2: Calculate  $\left(\frac{X}{Y}\right) \cdot 100 = \boxed{\phantom{000}} \%$

Notes:  
• Define edges of swelling by palpation/visual observation.  
• For all extravasations, including scalp, leg, chest, abdomen use the same Y measurement. (Use either right or left arm)  
• NEVER measure leg or other body part.  
• X = measure the longest (depth or width) of swelling

This Calculator Will Help You Calculate Extravasation %

CALCULATOR

X:  Result:  %

Y:

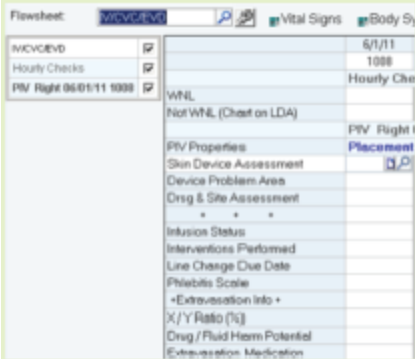
Local intranet 100% 12:36 PM 2/6/2012



# Step 3: DOCUMENT

- CCHMC Uses EPIC

## STEP 3: *Document* immediately in EPIC



The screenshot shows a flowchart titled 'Flowchart: [unclear] Vital Signs Body S'. It lists various assessment items with checkboxes and associated dates or times. The items include:

Item	Checkmark	Date/Time
IMCCEVD	<input checked="" type="checkbox"/>	6/1/11
Hourly Checks	<input checked="" type="checkbox"/>	1000
PW Right 060111 1000	<input checked="" type="checkbox"/>	Hourly Che
WNL		
Not WNL (Check on LDA)		
PW Properties		PW Right i
Skin Device Assessment		Placement
Device Problem Area		
Drug & Site Assessment		
Intusion Status		
Interventions Performed		
Line Change Due Date		
Phlebitis Scale		
+Extravasation Info +		
X/Y Ratio (%)		
Drug / Fluid Harm Potential		
Extravasation Medication		

Notify Vascular Access Team as soon as possible if:

**Volume  $\geq$  30%**  
**and/or RED list Medication**

Vascular Access Team Pager:

**736-0337**



February 5, 2013  
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Hospital Medical Center

# Step 3: DOCUMENT

- Other Institutions

<p><b>Category of Medication</b></p> <p>Insulin &amp; oral Doxycycline Ezetimib Mometasone nasal Pantoprazole Sildenafil Sildenafil oral TPN - intravenous Vaccines Chemotherapy Drugs Genetically modified APR-2463 Vaccines</p>	<p><b>Approved or Investigational</b></p> <p>Aspirin Cefazolin Cefepime Dexamethasone Ezetimib Fentanyl Gentamicin Levofloxacin Morphine Oxycodone Hydrocortisone Insulin Methylprednisolone Propofol Vancomycin</p>	<p><b>Unlisted</b></p> <p>Colchicine Cyclosporine Diazepam Etoposide Fentanyl Gentamicin Levofloxacin Morphine Oxycodone Hydrocortisone Insulin Methylprednisolone Propofol Vancomycin</p>
---	--	--

U = medication Unlisted  
N = medication not listed but causing harm similar to a RED drug (this category will rarely be needed)

Refer to current Red/Yellow/Green listing (each new version has a different color border, consult latest version)

## STEP 3: Document

For outside hospitals, use this space to attach your local Documentation requirements.

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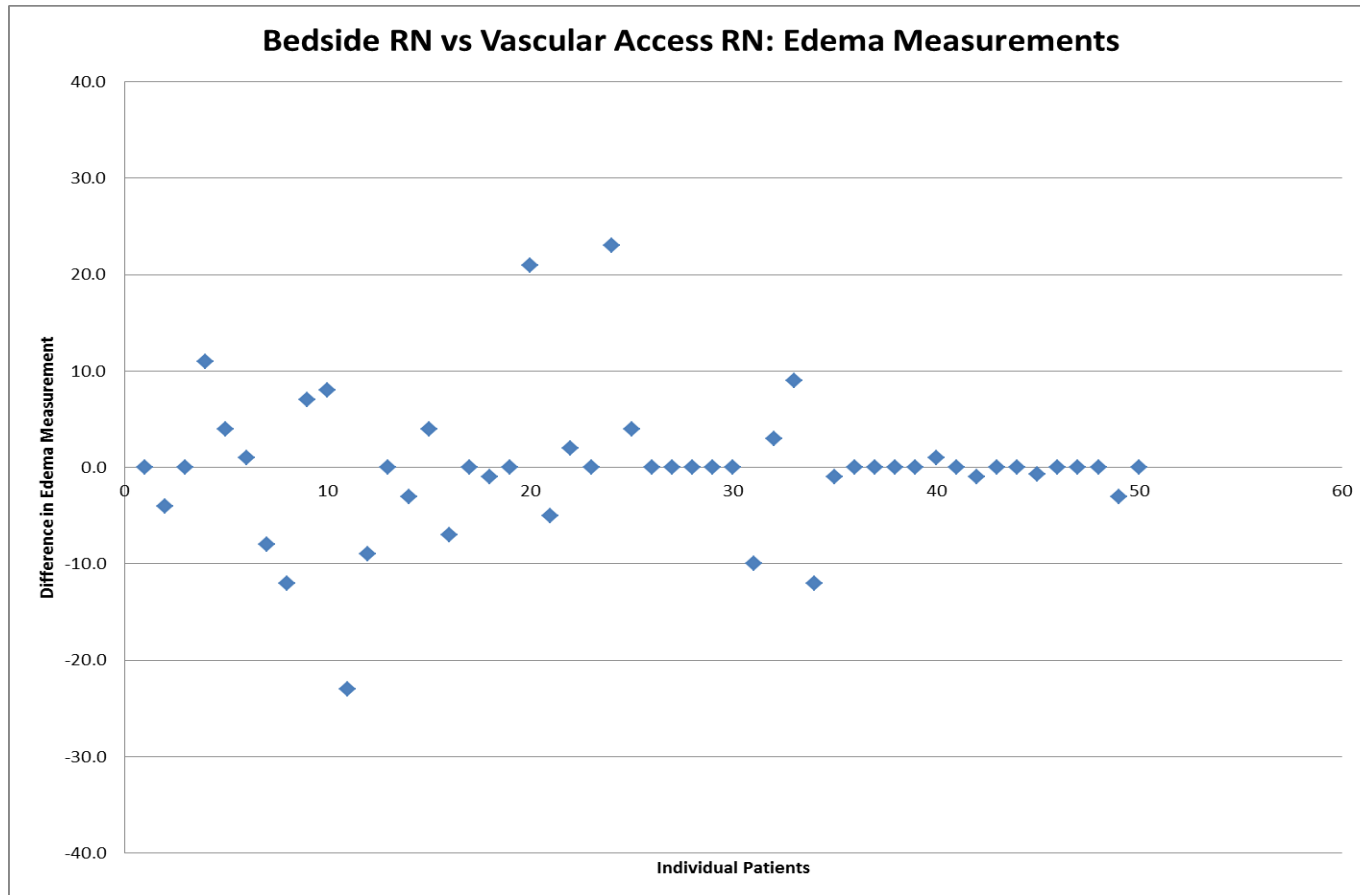
# Implementation

- **BIG Education Effort**
  - Julie Stalf, RN
  - Sylvia Rineair, RN
  - Mary Haygood, RN
  - Barb Tofani, RN
- CCHMC Education Team

# Initial Validity Testing

- **Validity and Repeatability**
  - 100 patients coded using 2 Vascular Access Team (VAT) RNs assessing PIV site separately
  - Next phase 100 patients coded using 2 RNs assessing PIV site separately (one VAT and one unit RN)

# Correlation: Bedside RN Versus VAT Team RN First 50 Patients



# CCHMC System: Driving Treatment

% Swelling and Infusate Component	Action
Extravasation $\geq$ 30%  AND  Red list infusate	Treat with Hyaluronidase per provider order.
Extravasation < 30%  AND  Red list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team or VAT Medical Director (or designee) to determine if <b>Hyaluronidase</b> is clinically indicated. Decision criteria include imminent skin loss, and / or peripheral circulation impairment (compartment syndrome).
Extravasation $\geq$ 30%  AND  Yellow or Green list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team, Medical Director or designee to determine if Hyaluronidase is clinically indicated, but <b>Hyaluronidase</b> treatment usually <b>NOT</b> indicated.
Extravasation < 30%  AND  Yellow or Green list infusate	No treatment indicated.
Extravasation of any % of a Red list Vasoactive medication (Dopamine, epinephrine and related medications)	<p><b>Consult and TREAT:</b>                      IMMEDIATE consult to fellow and/or attending physician. <b>Rx Phentolamine</b> if necessary. Medical Director may be consulted if necessary to determine treatment plan and use of Phentolamine.  <b>PICU / CICU / NICU Attending</b>  <b>Or Dr. Johnson</b></p>

In Plain English

**TREAT**  
 unless very good reason  
 not to

**Probably TREAT**  
 unless good reason  
 not to

**Probably NOT Treat**  
 unless good reason to do  
 so

**NO Treatment**

# Result: Hyaluronidase Rx

- \$350
- 4-5 Needle Sticks
- Previously Widely Recommended
  - E.R. Small Saline Extravasation Event
- 75% DECREASED Use (Last 12 months)
  - No Serious Harm Events

# CCHMC I/V Extravasation HARM

## **MILD HARM**

*Any of the Following:*

- Discoloration at or near PIV Site
- Swelling < 60% (X/Y)
- Redness
- GREEN List Medication
- YELLOW List Medication

## **MODERATE HARM**

*Any of the Following:*

- Any number of Blisters
- Swelling > 60%
- Impaired Limb Function < 48 Hours
- RED List Medication

## **SEVERE HARM**

*Any of the Following:*

- Distal Arterial Compromise (No palpable distal pulse, Cap Return > 8 seconds, Skin Ischemia)
- Fasciotomy
- Skin Graft or Tissue Transfer at any time after Extravasation Event
- Impaired Limb Function > 48 Hours

Note: This harm assessment applies to harm caused:

- Up to 72 hours after PIV Extravasation for Mild – Moderate Category findings
- At ANY time after PIV Extravasation for SEVERE Harm Category findings.

OUTCOME  
or  
TREATMENT  
Based

# Outline




- **Other Extravasation Assessment Systems**
  - Treatment, Feedback and Accountability
  - Results
  - Questions and Discussion

# Other “Grading” Systems

A New Approach to Management of Intravenous Infiltration in Pediatric Patients

Ibrahim Amjad M.D. et.al.

J. Infusion Nursing Vol 34 #4 July / August 2011


			
<b>Millam</b>	<b>Stage II</b>	<b>Stage III</b>	<b>Stage IV</b>
<b>Infusion Nurses Society</b>	<b>Grade 1</b>	<b>Grade 2</b>	<b>Grade 4</b>
<b>Thigpen</b>	<b>Stage 2</b>	<b>Stage 3</b>	<b>Stage 4</b>
<b>Proposed Scale</b>	<b>1<sup>st</sup> Degree</b>	<b>2<sup>nd</sup> Degree</b>	<b>3<sup>rd</sup> Degree</b>

- Focused on (Plastic Surgery) Treatment Decisions
- Determines TREATMENT Algorithm not PREVENTION



# CMC Dallas System

- Sensible Pediatric Modification of INS
- Introduces “% SWELLING” Concept
- Uses MEASUREMENT



The Art and Science of Infusion Nursing

Rodica Simona Pop, PhD, RN

## A Pediatric Peripheral Intravenous Infiltration Assessment Tool

**ABSTRACT**  
Infiltration is a common complication of intravenous (IV) therapy. The use of adequate tools for IV assessment can identify infiltration in its early stages, thus reducing the potential for more serious complications. Assessment of IV devices in children needs to be performed using age- and size-appropriate tools that take into account children's smaller size and particular characteristics. It is also important to consider the size of an infiltration in relation to the affected extremity. This article discusses the development of a pediatric IV assessment tool as well as its psychometric properties.

complication definition and reporting methodology.<sup>7,10</sup> Infants and young children are at an even higher risk for developing PIV-related complications because their veins are smaller and more fragile and because stabilization and protection of the PIV catheter are often difficult.<sup>6</sup> Although infiltration can be a minor complication of PIV therapy, it can have serious consequences for some patients. Therefore, early identification and appropriate interventions are essential in reducing the potential for harm caused by PIV infiltration and extravasation.<sup>11</sup>

**BACKGROUND**

In 1998, the Intravenous Nurses Society, predecessor of the

Pediatric PIV Infiltration Scale

Grade	Characteristics
0	No symptoms Flushes with ease
1	Localized swelling (1%-10%) Flushes with difficulty Pain at site
2	Slight swelling at site (up to ¼ of the extremity above or below site, or 10%-25% of the extremity above or below site) Presence of redness Pain at the site
3	Moderate swelling at site (¼ to ½ of the extremity above or below site, or 25%-50% of the extremity above or below site) Pain at site Skin cool to touch Blanching Diminished pulse below site
4	Severe swelling at site (more than ½ of extremity above or below site, or more than 50% of the extremity above or below site) Infiltration of blood products, irritants, and/or vesicants (any amount of swelling) Skin cool to touch Blanching Skin breakdown/necrosis Blistering Diminished or absent pulse Pain at site Capillary refill > 4 seconds

A Pediatric Peripheral Intravenous Infiltration Assessment Tool

**ABSTRACT**  
 Objective: To determine the relationship between IV therapy and the use of assessment tools for IV assessment. The study included 10 study sites. The results of the study are presented. Assessment of IV assessment tools needs to be performed using age- and site-appropriate tools that are used consistently across all IV assessment professionals. It is also important to consider the role of an evidence-based assessment of a patient's IV assessment tool as well as the assessment professional.

**BACKGROUND**  
 In 1998, the Infusion Nurses Society published the "Infusion Therapy Standards of Practice" which set the standard for IV therapy and the development of IV assessment tools. The study included 10 study sites. The results of the study are presented. Assessment of IV assessment tools needs to be performed using age- and site-appropriate tools that are used consistently across all IV assessment professionals. It is also important to consider the role of an evidence-based assessment of a patient's IV assessment tool as well as the assessment professional.

# CMC Dallas System

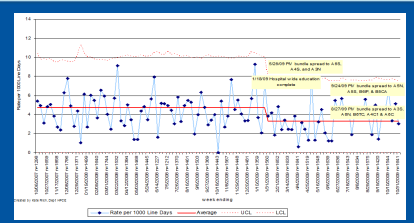
4

- Severe swelling at site (more than 1/2 of extremity above or below site, or more than 50% of the extremity above or below site)**
- Infiltration of blood products, irritants, and/or vesicants (any amount of swelling)**
- Skin cool to touch**
- Blanching**
- Skin breakdown/necrosis**
- Blistering**
- Diminished or absent pulse**
- Pain at site**
- Capillary refill > 4 seconds**

## Similar Issues to INS Grading:



- Mixes **VOLUME** and Medication local **TOXICITY** in one scale
- No "Vesicant" List
- Blood is NOT Dangerous Over and Above the Volume Issue
- ANY Amount of "Vesicant" → Immediate **GRADE 4**
- Makes it Difficult to Show **IMPROVEMENT** (e.g. Hourly Checks)
- Discourages Improvement Project Participants



### A Pediatric Peripheral Intravenous Infiltration Assessment Tool

**ABSTRACT**  
Infiltration is a common complication of intravenous (IV) therapy. The use of adequate tools for IV assessment can identify infiltration in its early stages, thus reducing the potential for more serious complications. Assessment of IV devices in children needs to be performed using age- and size-appropriate tools that take into account children's smaller size and particular characteristics. It is also important to consider the size of an infiltration in relation to the affected extremity. This article discusses the development of a pediatric IV assessment tool as well as its psychometric properties.

complication definition and reporting methodology.<sup>1,2</sup> Infants and young children are at an even higher risk for developing IV-related complications because their veins are smaller and more fragile and because stabilization and protection of the IV catheter are often difficult.<sup>3</sup> Although infiltration can be a minor complication of IV therapy, it can have serious consequences for some patients. Therefore, early identification and appropriate interventions are essential in reducing the potential for harm caused by IV infiltration and extravasation.<sup>4,5</sup>

**BACKGROUND**

In 1998, the Intravenous Nurses Society, predecessor of the

# CMC Dallas J. Inf. Nursing Paper

## DISCUSSION:

It is equally important to develop vesicant lists and to assess a vesicant's potential to cause harm when infiltration of these agents occurs.

VOLUME 35 | NUMBER 4 | JULY/AUGUST 2012

# We Agree

### Venous Infusion Extravasation Risk

This is an estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device. Risk derived from available evidence, CCMC data and CCMC expert opinion, subject to review and change as further evidence becomes available. For Treatment of Extravasation, Refer to CCMC Policy P&T II-112. This does not apply in situations of emergency medical treatment. If a medication is not on this list, please refer to the CCMC formulary or contact pharmacy (6-4291) for information.

Red Higher Risk	Yellow Intermediate Risk	Green Lower Risk
<p><b>Acyclovir</b> <b>Amiodarone</b> <b>Caffeine Citrate</b> <b>Calcium (all salt forms)</b> <b>Dextrose &gt; 12.5%</b> <b>Doxycycline</b> <b>Esmolol</b> <b>Mannitol 20% &amp; 25%</b> <b>Promethazine</b> <b>Potassium &gt;60 mEq/L</b> <b>Sodium bicarbonate</b> <b>Sodium chloride ≥ 3%</b> <b>TPN &gt; 950 mOsm/L</b> <b>Vasopressors such as Dopamine</b></p> <p><b>Chemotherapy Drugs</b> Extravasation treatment: Refer to policy P&amp;T II-113</p>	<p>Acetazolamide Allopurinol Amikacin Amphotericin B (conventional) Arginine Ciprofloxacin Dextrose 10% to ≤12.5% Diazepam Erythromycin Ganciclovir Lorazepam Midazolam Morphine Ondansetron Nafcillin Non-Ionic Radiology Contrast Phenobarbital Phenylephrine Potassium ≤ 60 mEq/L TPN ≤950 mOsm/L Vancomycin</p>	<p>Amphoteryline Amphotericin B Liposomal Ampicillin Ampicillin Sulbactam Cefazolin Cefotaxime Ceftazidime Ceftioxcid Cefuroxime Clindamycin D5LR Dextrose &lt; 10% Fentanyl Fosphenytoin Furosemide Gentamicin Heparin Imipenem IVIG Lactated Ringers Lipids Magnesium sulfate (bolus) Micropenem Morphine Methylprednisolone Normal saline Pentamidine Piperacillin Pipercillin/tazobactam Ticarcillin Ticarcillin/clavulanate Tobramycin</p> <div style="background-color: #90ee90; padding: 5px;"> <p><b>* NOTE:</b> No intravenous infusion is 'safe'. Gross extravasation, even of normal saline, may result in serious harm including compartment syndrome causing ischemia and loss of tissue or permanent loss of limb function.</p> </div>

Peripheral Venous Access is defined as any Venous Access Device whose tip lies outside the Right Atrium, Superior / Inferior Vena Cava, or the Brachiocephalic Veins

December 5, 2012  
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A Pediatric Peripheral Intravenous Infiltration Assessment Tool

**ABSTRACT**  
Infiltration is a common complication of intravenous (IV) therapy. The use of adequate tools for IV assessment can identify infiltration in its early stages, thus reducing the potential for more serious complications. Assessment of IV devices in children needs to be performed using age- and size-appropriate tools that take into account children's smaller size and particular characteristics. It is also important to consider the size of an infiltration in relation to the affected extremity. This article discusses the development of a pediatric IV assessment tool as well as its psychometric properties.

complication definition and reporting methodology.<sup>10</sup> Infants and young children are at an even higher risk for developing IV-related complications because their veins are smaller and more fragile and because stabilization and protection of the PIV catheter are often difficult.<sup>11</sup> Although infiltration can be a minor complication of PIV therapy, it can have serious consequences for some patients. Therefore, early identification and appropriate interventions are essential in reducing the potential for harm caused by PIV infiltration and extravasation.<sup>12</sup>

**BACKGROUND**

In 1998, the Infusion Nurses Society, predecessor of the

# CMC Dallas J. Inf. Nursing Paper

## DISCUSSION:

The development of interventions and treatment algorithms for PIV infiltration complications may be more important than assigning a grade. This discussion was particularly interesting in light of the new *Infusion Nursing Standards of Practice* published by INS.<sup>20</sup> Grading is no longer recommended as part of the PIV assessment, perhaps suggesting that the assignment of a grade may be of less significance than previously believed.

A combination of assessment and intervention tools tailored to pediatric patients may reduce pain and suffering associated with PIV infiltration, improve patient satisfaction and outcomes, and also have financial benefits.

# We Agree

Cincinnati Pediatric Intravenous Extravasation Assessment System

**STEP 1: Volume**

STEP 1a: Measure Swelling (X)

STEP 1b: Measure ARM Length (Y)

STEP 1c: Calculate  $(\frac{X}{Y}) \cdot 100 = \square \%$

**STEP 2: Medication**

Use Current Version of Extravasation Risk Listing

EXTRAVASATION MEDICATION CODING

% Swelling and Infusate Component	Action
Extravasation $\geq$ 30% <b>AND</b> Red list infusate	Treat with Hyaluronidase per provider order.
Extravasation < 30% <b>AND</b> Red list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team or VAT Medical Director (or designee) to determine if <b>Hyaluronidase</b> is clinically indicated. Decision criteria include imminent skin loss, and / or peripheral circulation impairment (compartment syndrome).
Extravasation $\geq$ 30% <b>AND</b> Yellow or Green list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team, Medical Director or designee to determine if <b>Hyaluronidase</b> is clinically indicated, but <b>Hyaluronidase</b> treatment usually <b>NOT</b> indicated.
Extravasation < 30% <b>AND</b> Yellow or Green list infusate	No treatment indicated.
Extravasation of any % of a Red list Vasoactive medication (Dopamine, epinephrine and related medications)	IMMEDIATE consult to fellow and/or attending physician. Vascular Access Team Medical Director may be consulted if necessary to determine treatment plan and use of <b>Phentolamine</b> .

# Results: Calendar 2012

- ZERO Severe Harm
- Moderate Harm = 0.55/1000 Line Days
- Red Drugs
  - Most PIV Red Drugs Now Only Given PIV in Code Situations → ? Early Intraosseous Rx
  - BUT:
    - New EPIC Data System (3 months)
    - Complete data but not yet analyzed

% Swelling and Infusate Component	Action
Extravasation $\geq$ 30% <b>AND</b> Red list infusate	Treat with Hyaluronidase per provider order.
Extravasation < 30% <b>AND</b> Red list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team or VAT Medical Director (or designee) to determine if Hyaluronidase is clinically indicated. Decision criteria include imminent skin loss, and / or peripheral circulation impairment (compartment syndrome).
Extravasation $\geq$ 30% <b>AND</b> Yellow or Green list infusate	Clinical evaluation of the extravasation site by attending physician and Vascular Access Team, Medical Director or designee to determine if Hyaluronidase is clinically indicated, but Hyaluronidase treatment usually NOT indicated.
Extravasation < 30% <b>AND</b> Yellow or Green list infusate	No treatment indicated.
Extravasation of any % of a Red list Vasoactive medication (Dopamine, epinephrine and related medications)	IMMEDIATE consult to fellow and/or attending physician. Vascular Access Team Medical Director may be consulted if necessary to determine treatment plan and use of Phentolamine.

## MILD HARM

Any of the Following:

- Discoloration at or near PIV Site
- Swelling < 60% (X/Y)
- Redness
- GREEN List Medication
- YELLOW List Medication

## MODERATE HARM

Any of the Following:

- Any number of Blisters
- Swelling > 60%
- Impaired Limb Function < 48 Hours
- RED List Medication

## SEVERE HARM

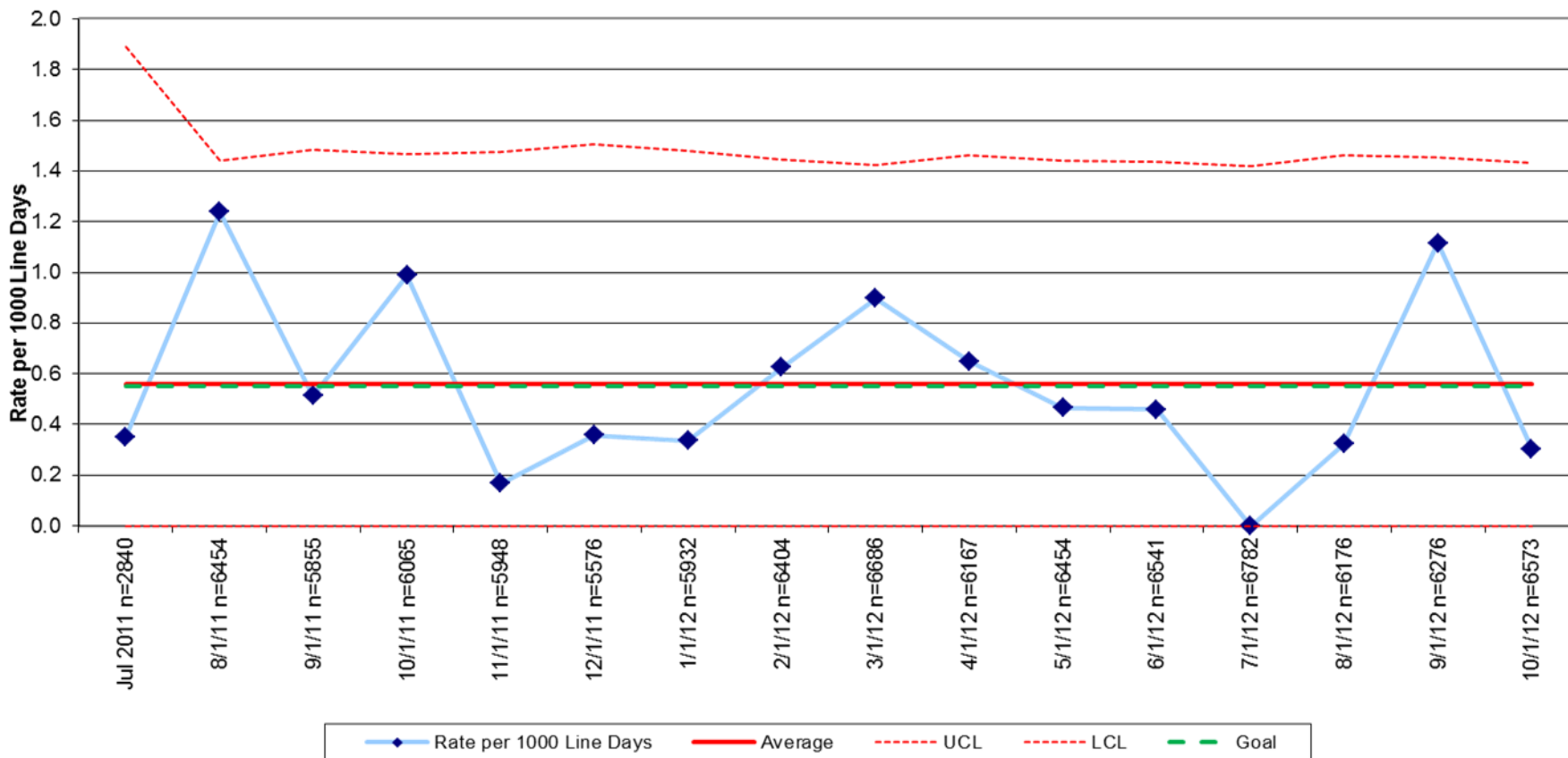
Any of the Following:

- Distal Arterial Compromise (No palpable distal)
- Fasciotomy
- Skin Graft or Tissue Transfer at any time after
- Impaired Limb Function > 48 Hours

“No one has all the answers.  
Severe Harm is only one slip up away”

**CCHMC PIV Extravasation Rate per 1000 Line Days (>60% Edema) - Inpatients**  
U-Chart

**Population:** All patients admitted to an inpatient unit who had a PIV during their stay  
**Line day calculation:** Each line is counted once for every day it is in place including the day of placement/admission and removal/discharge. A line counts as one line day regardless of the length of time the line is in place during that day  
**Infiltrate calculation:** Every infiltrate is counted that occurs from the time a patient arrives on an inpatient unit until discharged from the hospital




# Documents Available:

- <http://cincinnatichildrens.org/vascularaccess>

Vascular Access Team

HOME » SERVICES » V » VASCULAR ACCESS TEAM

Vascular Access Team  
Meet the Team



**Download Extravasation Materials**

**Ways to Help Your Patients**  
An interdisciplinary group at Cincinnati Children's has developed and implemented a new intravenous extravasation assessment and documentation tool to help improve the health of our children. We now want to share this information with other pediatric doctors and nurses so that they may also reduce extravasation risks for their patients.

**Contact Us**  
If you would like more information about the vascular access team at Cincinnati Children's, call us at

**Vascular Access Team**  
The vascular access team at Cincinnati Children's Hospital Medical Center consists of three subgroups:

- Central venous catheter (CVC) nurses
- Peripherally inserted central catheter (PICC) nurses
- Peripheral intravenous (PIV) nurses

**Our Responsibilities**

SHOW ALL

## Materials to Download

### Reducing Risk of Harm From Extravasation

Red	Yellow	Green
• 0.5% to 1.0% of patients with PICC lines develop extravasation.	• 1.0% to 2.0% of patients with PICC lines develop extravasation.	• 2.0% to 5.0% of patients with PICC lines develop extravasation.
• 1.0% to 2.0% of patients with PICC lines develop extravasation.	• 2.0% to 5.0% of patients with PICC lines develop extravasation.	• 5.0% to 10.0% of patients with PICC lines develop extravasation.
• 2.0% to 5.0% of patients with PICC lines develop extravasation.	• 5.0% to 10.0% of patients with PICC lines develop extravasation.	• 10.0% to 20.0% of patients with PICC lines develop extravasation.

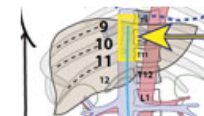
#### Venous Infusion Extravasation Risk

An estimate of risk for phlebitis or local tissue injury due to extravasation from any intravenous infusion device.



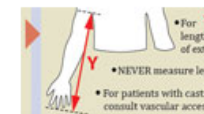
#### Upper Limb PICC Tip Target Position

How to construct the target triangle.



#### Lower Limb PICC Tip Target Position

How to access the desired landing zone.



#### Cincinnati Pediatric Intravenous Extravasation Assessment System

Measure swelling and arm length; chart results.

# Summary

- Primary CCHMC Institutional Safety Focus:
  - Serious Harm PREVENTION
  - CCHMC Data Centric Standardized Institutional Improvement Requirement
- INS 1-4 PIV Grading System Inhibited Improvement Success
- We Separated VOLUME and TOXICITY Harm Components
- New Assessment Tool Developed for ALL I/V Extravasations
  - No “Grading” Continuous Numerical Scale (% Swelling - Volume)
  - Eliminates Vague Descriptive Components
  - Automatically Accounts for Pediatric Body Size (Ratio X/Y)
  - Evidence Based Three Tier Stratification of Med Toxicity Risk (RYG)
- PRIMARY Focus is PREVENTION of I/V Injuries
  - “No Treatment Required if Injuries PREVENTED or Minimized”

- AVOID Unnecessary Risk
- MINIMIZE Necessary Risk



# Thanks

- iVAG (Our Governance Group)
- The Whole Extraordinary CCHMC VAT Team
- Dallas Children’s Vascular Access Team
- John Racadio MD
  - “Neil... Why Don’t You Just Abolish Grading ???”
- Glen Minano – Graphics
- Darcy Doellman RN – RYG list Initiative
- Marshall Ashby Quality Improvement Consultant
- Steve Muething MD
  - Vice President of Safety, CCHMC

## Cincinnati Pediatric Intravenous Extravasation Assessment System

**STEP 1: Volume**

**STEP 1a: Measure Swelling** **X**

**Notes:**

- Define edges of swelling by palpation/visual observation.
- Measure largest dimension.

**STEP 1b: Measure ARM Length** **Y**

**Notes:**

- **Y** = Acilla to tip of longest finger
- For **Y** measure arm length regardless of site of extravasation.
- **NEVER** measure leg or other body art.
- **Arm Length** is just a convenient way to consistently measure the patient's size. For **Y** never measure the leg or other body part.
- For patients with casts or limb deformity, extend nondominant access team.

**STEP 1c: Calculate**

$$\left(\frac{X}{Y}\right) \cdot 100 = \boxed{\phantom{000}} \%$$

**STEP 2: Medication**

Use Current Version of Extravasation Risk Listing

Venous Infusion Extravasation Risk	Yellow	Green
Acetaminophen		
Albuterol		
Amoxicillin		
Aspirin		
Atropine		
Benzocaine		
Benzocaine with Lidocaine		
Bupivacaine		
Bupivacaine with Lidocaine		
Calcium Chloride		
Calcium Gluconate		
Chlorhexidine		
Cloxacillin		
Diazepam		
Dexamethasone		
Dexamethasone with Lidocaine		
Diazepam		
Diazepam with Lidocaine		
Diazepam with Lidocaine and Propofol		
Diazepam with Lidocaine and Propofol and Fentanyl		
Diazepam with Lidocaine and Propofol and Fentanyl and Morphine		
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**EXTRAVASATION MEDICATION CODING**

R = medication on RED list  
 Y = medication on YELLOW list  
 G = medication on GREEN list  
 F = Fluids only (no medications or potassium)  
 U = medication Unlisted  
 N = medication not listed but causing harm similar to a RED drug (this category will rarely be needed)

**Notes:**

- “Extravasated Medication” means medication administered through the IV/EC during the previous 2 hours or since the last normal IV/EC site check, whichever is longer.
- Refer to current Med/Pharm/Toxicology.
- Don't use medication has a different color header, consult latest version!

**STEP 3: Document** *immediately in EPIC*

**Notify Vascular Access Team as soon as possible if:**

**Volume ≥ 30% and/or RED list Medication**

**Vascular Access Team Pager: 736-0337**

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# Questions????

