Preventing IntraVenous Extravasation Injuries

Cincinnati Children's Vascular Access Team

- Neil Johnson, MD
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"No-one Has All The Answers"

CHA Webinar February 2013

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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"

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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 Comittee
- CPR/MRT Communications
- Monitor Oversight
  Under Developement

Behavioral Observation Tool
- e-BOT link
- e-BOT Tutorial
- Paper BOT

Resources and Tools
- ISMP Medication Safety Alert Newsletter
- ISMP Nurse Advise-ERR Newsletter

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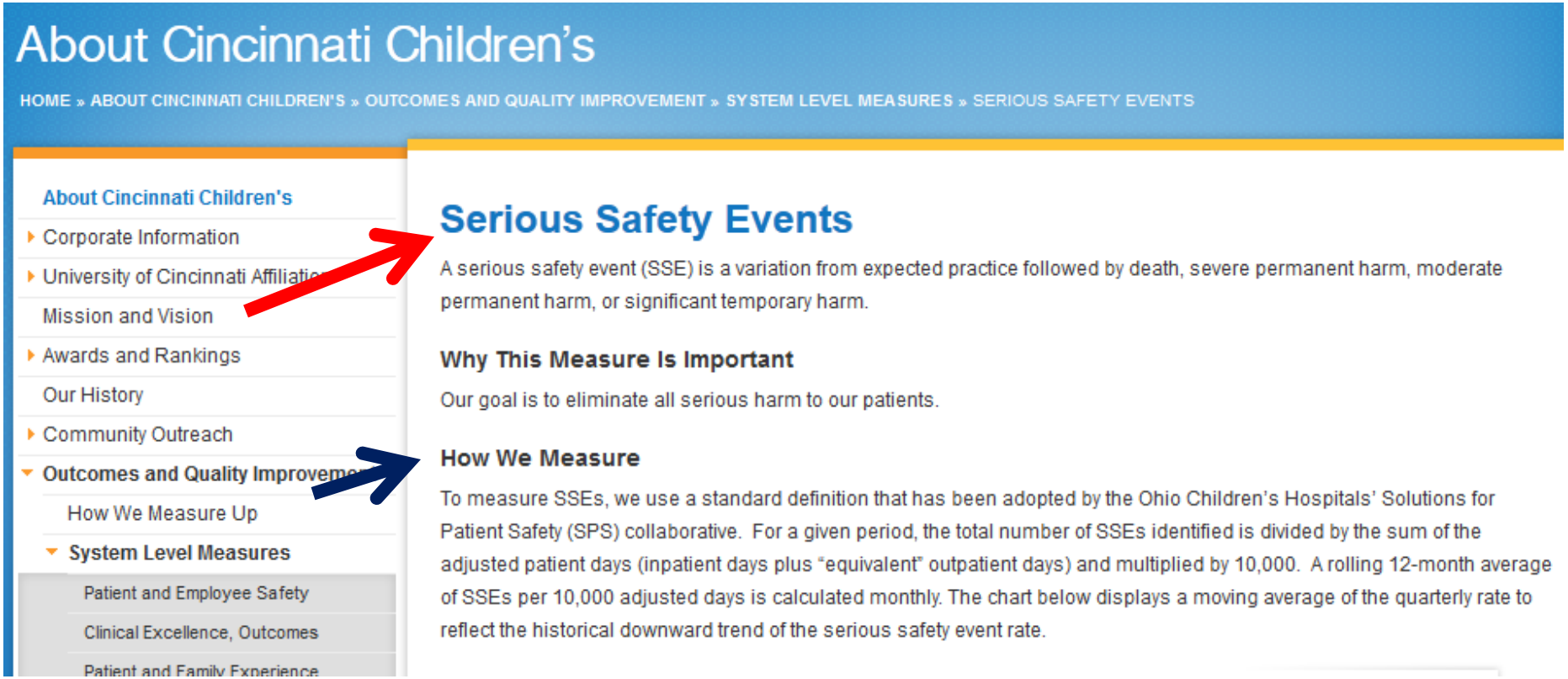
http://cincinnatichildrens.org



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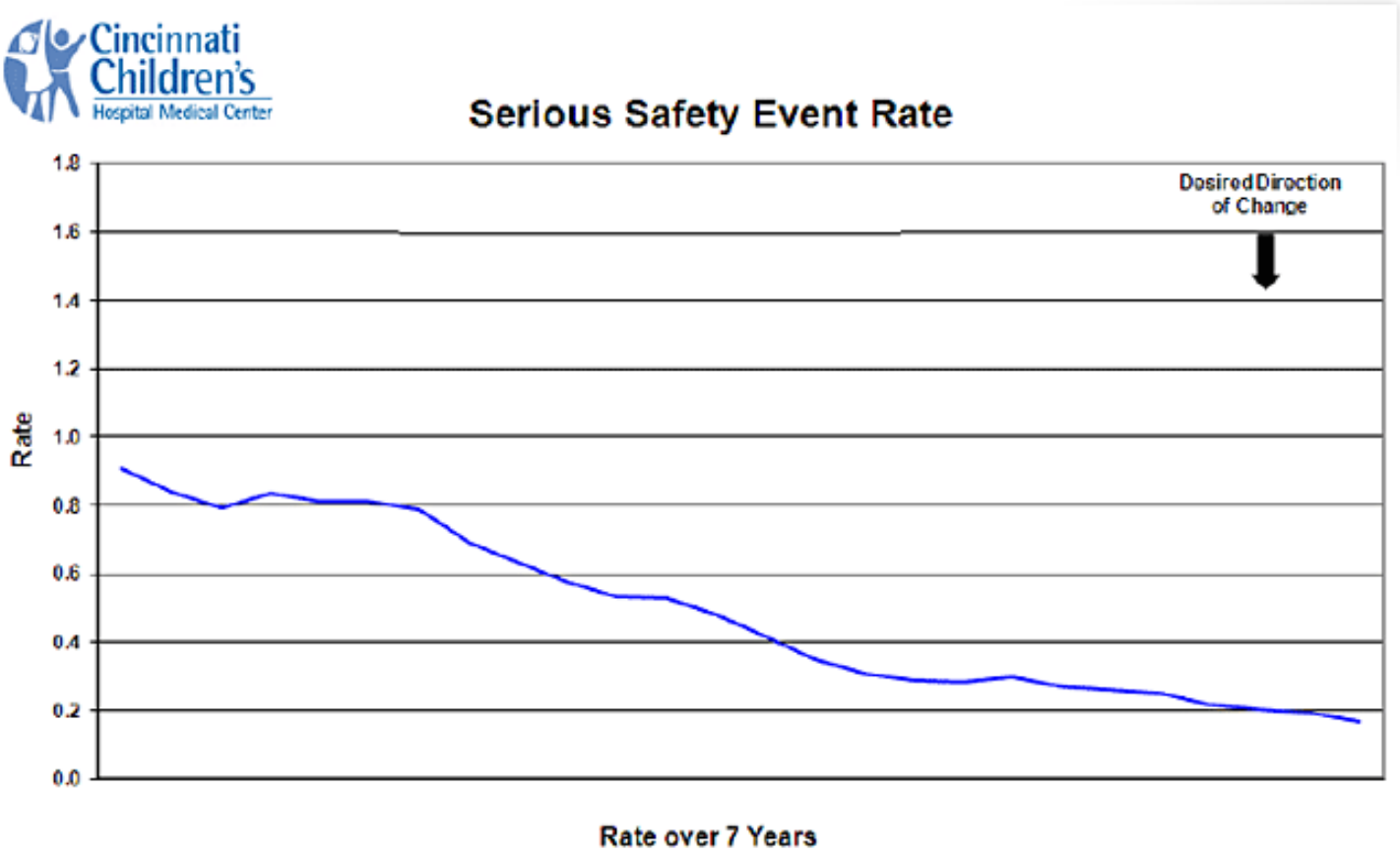

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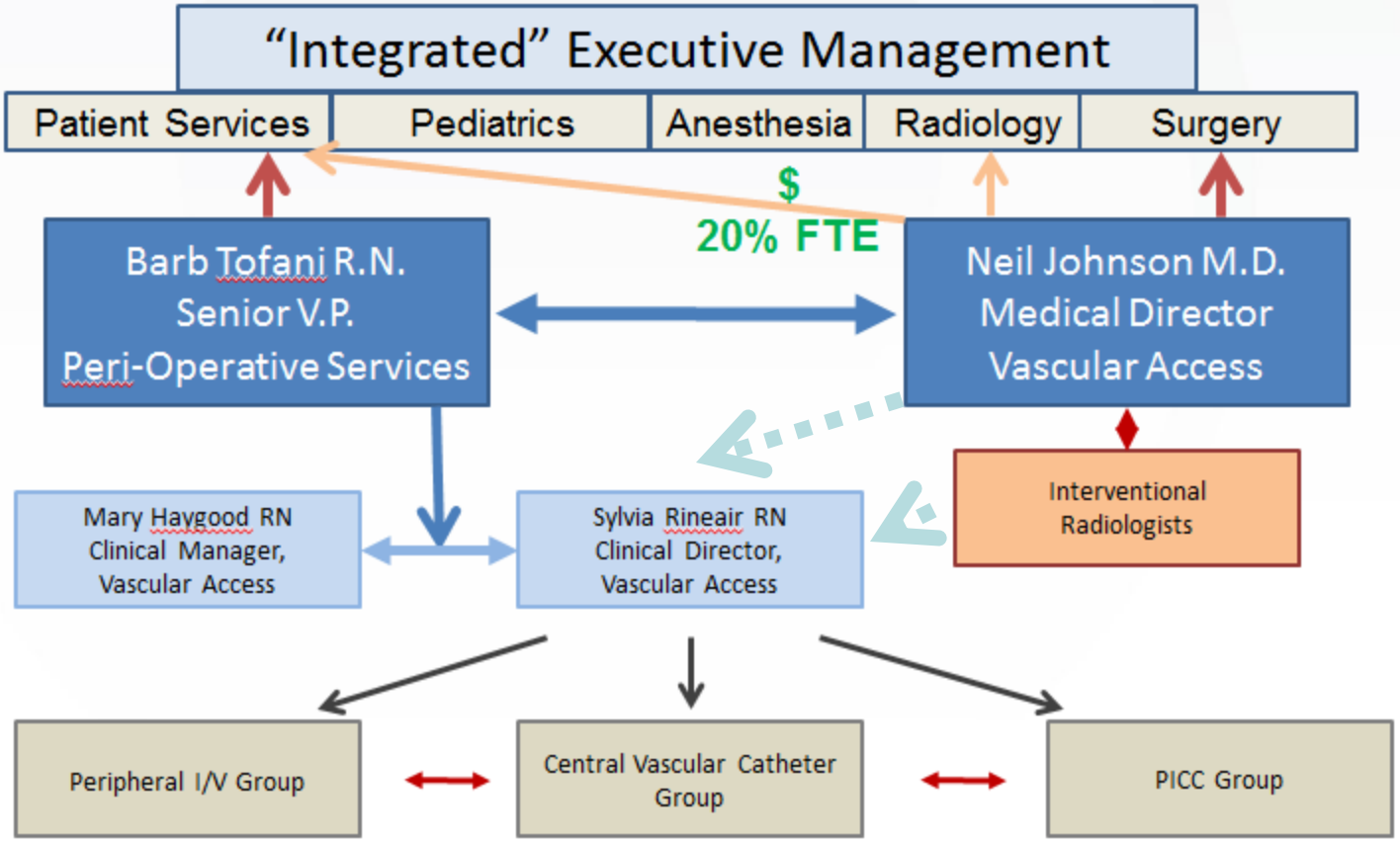
CCHMC Safety

- 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



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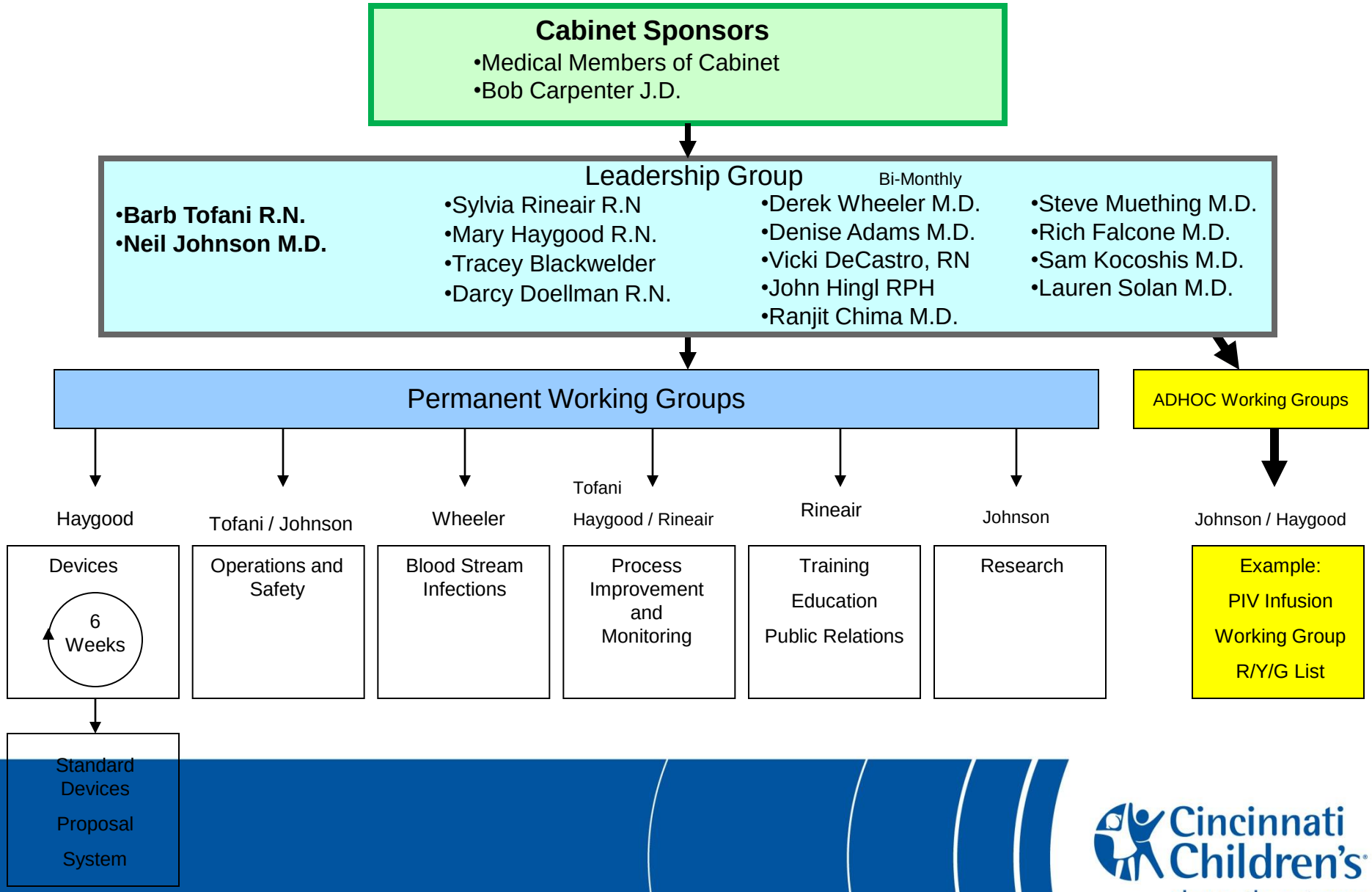
CCHMC infusion and Vascular Access Governance (iVAG)



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- Mechanisms of Extravasation Injury
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- 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…"

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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

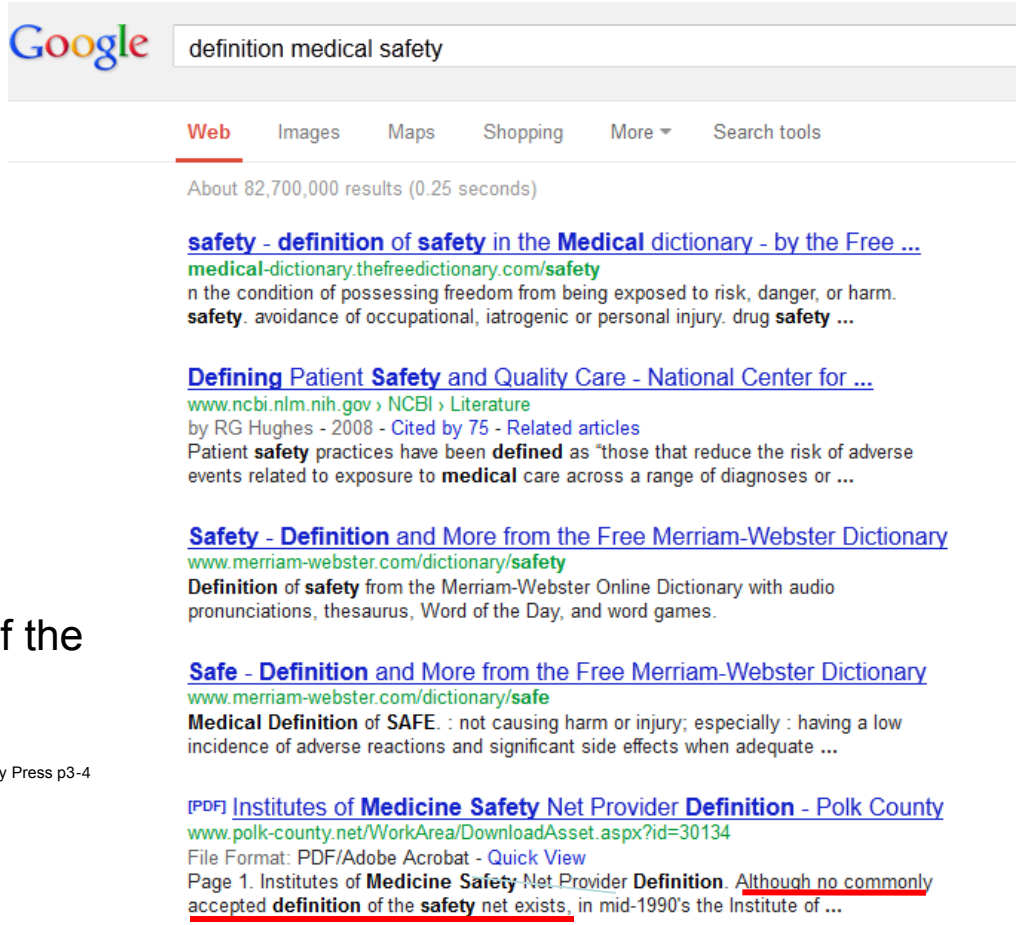
Definition

- 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

- **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

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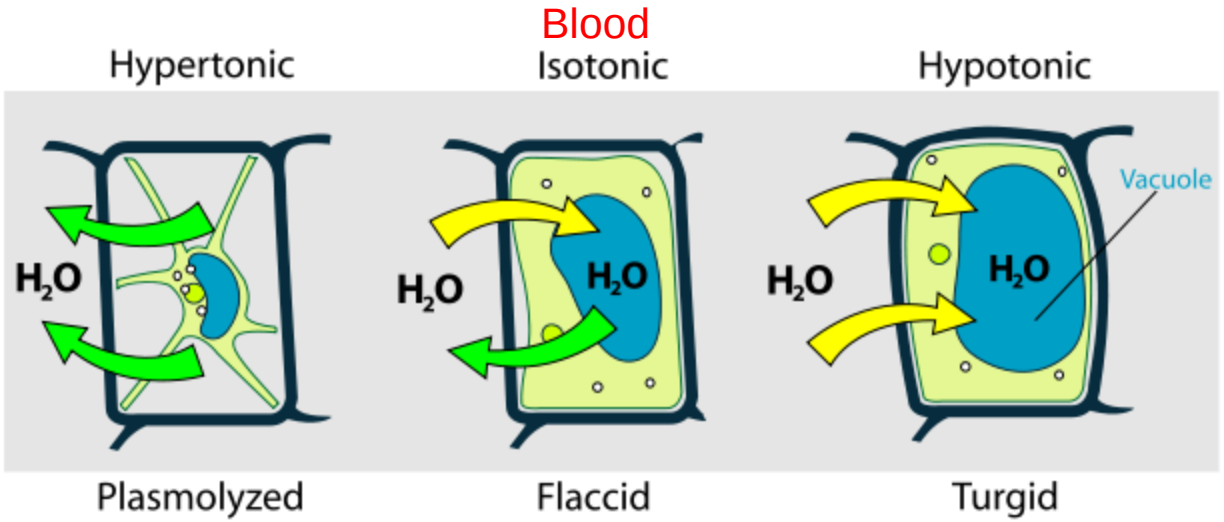
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- 2 Component Extravasation Assessment Tool
- Goodbye Grading: Why We Divorced "Grading"

- 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)

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Mechanisms of Extravasation Injury

- pH (Acid – Base)
  - Blood pH = 7.4
  - High or Low pH
    - Damages Proteins and Kills Cells
  - $pH = - \log_{10} [H^+]$
    - pH = 5 is 10 times more acidic than pH=6

pH = 2

pH = 12

pH = 11

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)
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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

Google Images

Our WORST Extravasation Injury was caused by Normal Saline

Outline

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

MINIMIZE Necessary Risk

AVOID Unnecessary Risk

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

Journal of Pediatric Nursing (2012) 27, 682–689

ELSEVIER

Quality Improvement Project to Reduce Infiltration and Extravasation Events in a Pediatric Hospital[1]

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

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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

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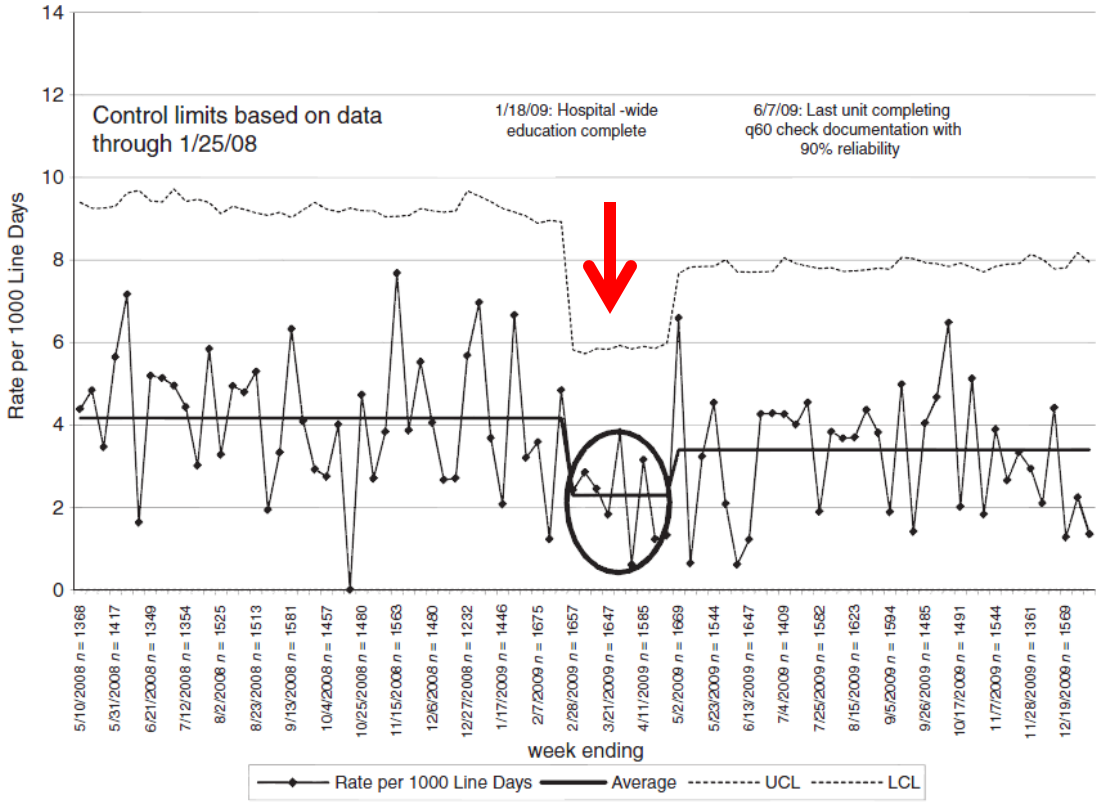
Result: Good But Not Sustained



- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity
- VOLUME (Pressure) Reliable Hourly Checks

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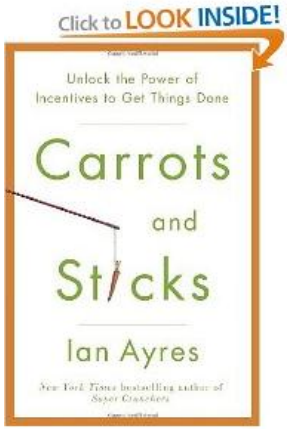
New Efforts: Reliable Hourly Checks

- 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

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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

- 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)

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“Instant” Pager Notification

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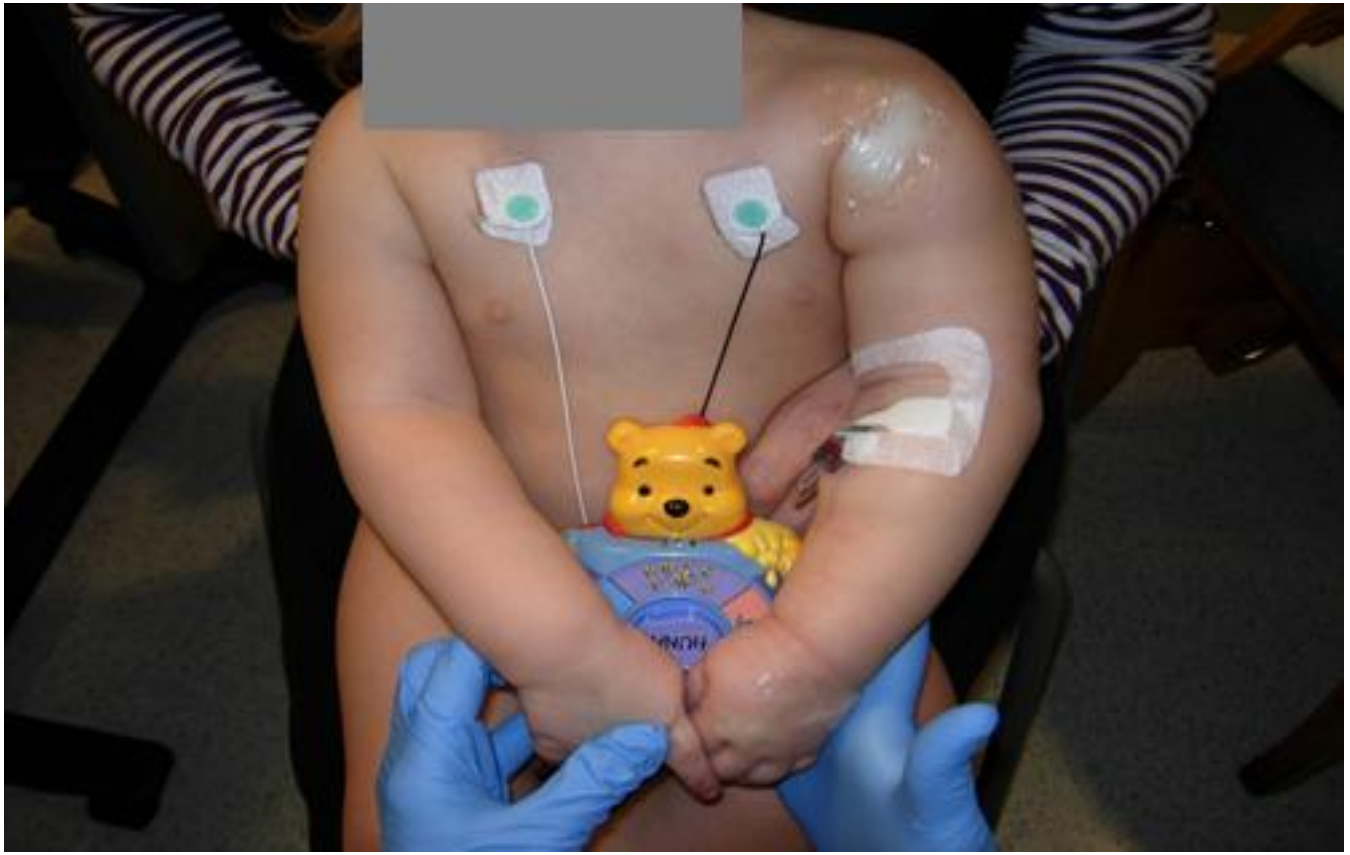
New Efforts: Personal Interview

- ALL VOLUME Extravasations >60%
  - Detailed Report Required from Unit Manager
  - Personal Interview (Tofani-Johnson-Rineair)
    - 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.)

Compare Is SO Important

Pager Feedback Strategy Identified “Compare” Not Done Reliably



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"Compare" Not Done Reliably

-Recent Change: Evidence Based

→So…. TLC Poster Revised

- TOXICITY (Local Tissue)
  - Osmolality
  - pH (Acid – Base)
  - Biological Activity
- VOLUME (Pressure) Reliable Hourly Checks

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- Cincinnati Children's Safety Environment
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- 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)

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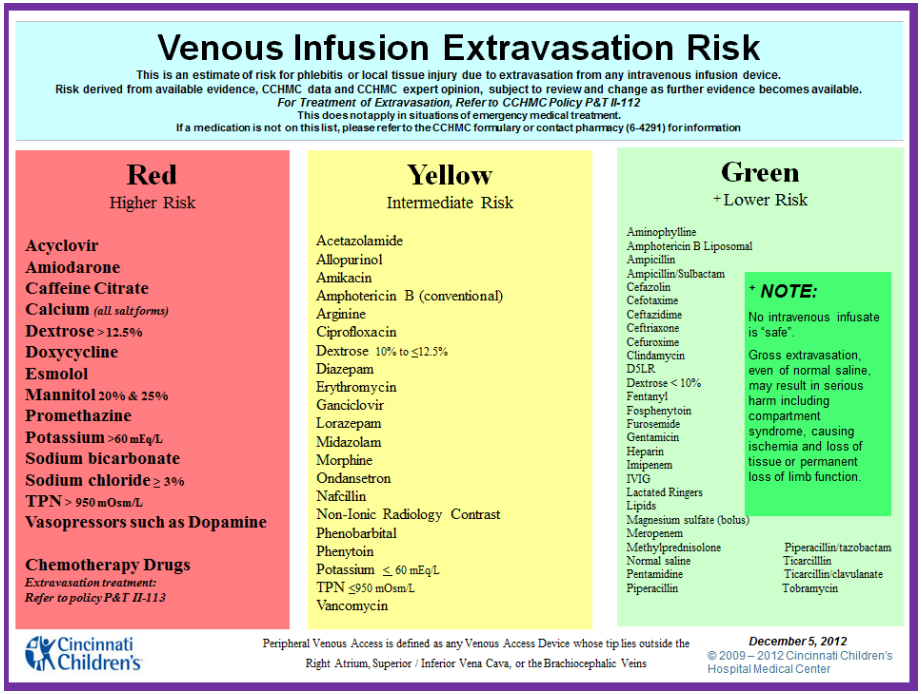
- Medication Risk Stratification
  - 18 Month Project
  - Multi-Disciplinary
    - Pharmacy
    - Nursing (VAT)
    - Physicians
    - Evidence Based Expert
    - Nutrition Service
    - NICU



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

Acyclovir
Amiodarone
Caffeine Citrate
Calcium *(all saltforms)*
Dextrose > 12.5%
Doxycycline
Esmolol
Mannitol 20% & 25%
Promethazine
Potassium >60 mEq/L
Sodium bicarbonate
Sodium chloride ≥ 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 ≤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

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
Piperacillin/tazobactam
Ticarcillin
Ticarcillin/clavulanate
Tobramycin

+ 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.

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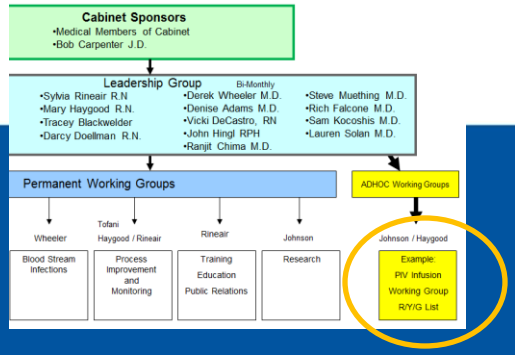
Peripheral Venous Access is defined as any Venous Access Device whose tip lies outside the Right Atrium, Superior / Inferior Vena Cava, or the Brachiocephalic Veins

December 5, 2012



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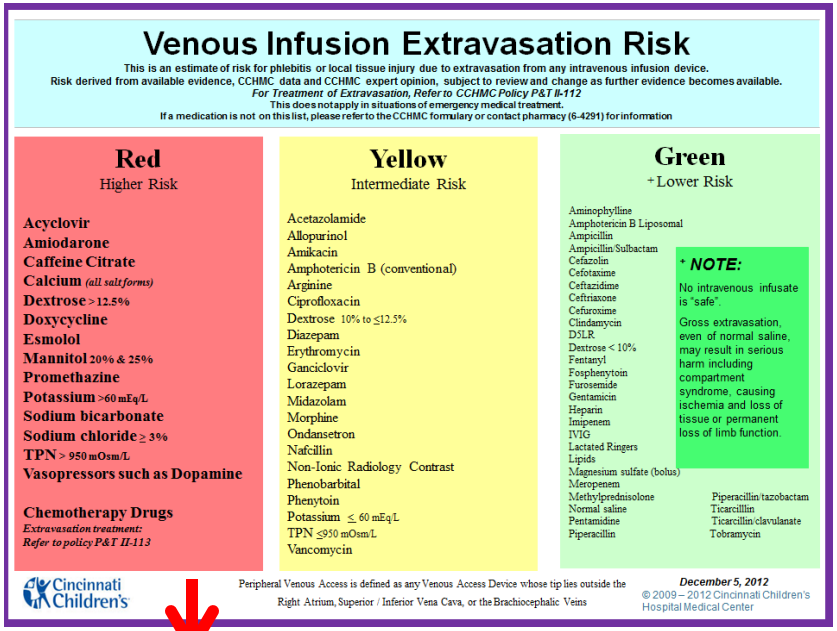
Medication Risk Stratification

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



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Higher Risk

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Amiodarone
Caffeine Citrate
Calcium *(all salt forms)*
Dextrose > 12.5%
Doxycycline
Esmolol
Mannitol 20% & 25%
Promethazine
Potassium >60 mEq/L
Sodium bicarbonate
Sodium chloride ≥ 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 ≤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

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
Piperacillin/tazobactam
Ticarcillin
Ticarcillin/clavulanate
Tobramycin

NOTE:
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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

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

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

The Art and Science of Infusion Nursing

Eloise Clark, MPH, MBA
Barbara K. Giambra, MS, RN, CPNP
John Hingl, MBA, RPh
Darcy Doellman, BSN, RN, CRNI®, VA-BC
Barbara Tofani, MSN, RN
Neil Johnson, MD

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

Author Affiliations: Anderson Center for Health Systems Excellence (Ms Clark), Center for Professional Excellence–Research and Evidence-Based Practice (Ms Giambra), Division of Pharmacy (Mr Hingl), Vascular Access Team (Ms Doellman), Patient Services–Perioperative Administration (Ms Tofani), and Department of Radiology (Dr Johnson), Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio.

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.

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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John F. Hingl, BS Pharmacy, MBA, RPh, is pharmacy operations manager at Cincinnati Children's Hospital. He is responsible for pharmacy development of administration systems and implementation of automated IV dispensing systems and is a member of the Pharmacy Safety Team, Intravenous Access Group, and Chemotherapy Safety Working Group.

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.

Barbara Tofani, MSN, RN, is assistant vice president of Patient Services at Cincinnati Children's Hospital Medical Center, with oversight over Perioperative Services and Vascular Access Services at the Academic Medical Center.

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.

TABLE 4 Continued

Medication[a]	Harm[b]	pH	OSM	CONC	DIL	Citations[c]
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[1,16]
TPN >950 mOsm/L	F, C	Varies	>950	NA	NA	• >950 mOsm/L in references (C harm)[40-42] • OSM in references unknown (F, C harm)[1,12,14,16,30,31,33,43-47]
Vasopressors such as dopamine (vasoactive)	F, C		—			Dobutamine in reference[39]
	F, C	2.9	997	80 mg/mL	D5W	27,43
Chemotherapy agents (*cytotoxic*)	F, C		Various			43,48-59
Intermediate risk						
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	63-67
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
		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
Phenobarbitol	C	8.2	2159	10 mg/mL	SW	73
Phenytoin	N	10.9	>2000	50 mg/mL	NA	34,35,60-62,68,74,75

Journal of Infusion Nursing Vol 36, Number 1. Jan/Feb 2013

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Each Update has a Different Color Border

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 ≥ 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 ≤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

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
Piperacillin/tazobactam
Ticarcilllin
Ticarcillin/clavulanate
Tobramycin

+ 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.

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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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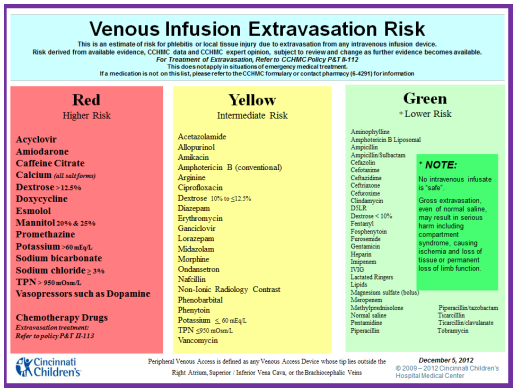
Unexpected Positives

- Universal Availability R/Y/G
  - Every Computer Workstation
  - Every Pyxis etc.
  - Hard To Avoid



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Sodium chloride ≥ 3%
TPN > 850 mOsm/L
Vasopressors such as Dopamine

Chemotherapy Drugs
Extravasation treatment:
Refer to policy P.E.T.H.113

Yellow
Intermediate Risk

Acetazolamide
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Lorazepam
Midazolam
Morphine
Ondansetron
Nafcillin
Non-Ionic Radiology Contrast
Phenobarbital
Phenytoin
Potassium ≤ 60 mEq/L
TPN ≤850 mOsm/L
Vancomycin

Green
* Lower Risk

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

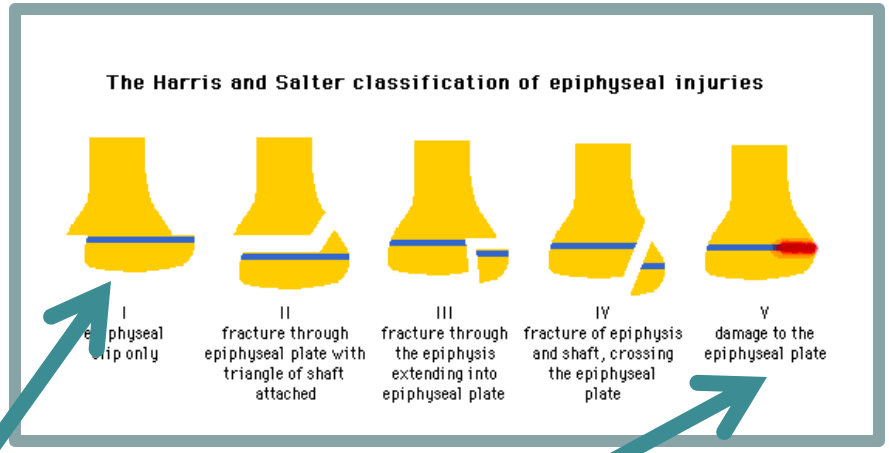
- Nurses Strongly Influence Doctor Behavior (!)
  - Trend → Central Access for Red Drugs
  - Increased Awareness of IV Risks of Red Drugs
  - "Pseudo Policies" are *Sometimes* a Positive Phenomenon

Outline

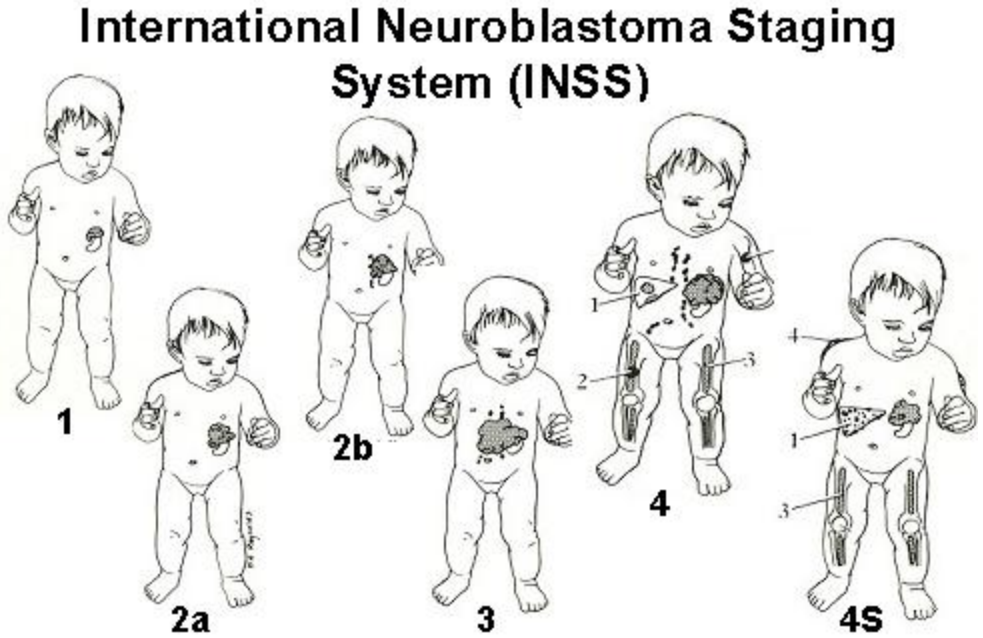
- The Cincinnati Children's Safety Environment
- Definitions
- Mechanisms of Extravasation Injury
- Reliable Hourly I/V Checks (Volume / Swelling)
- Medication Risk Stratification (Tissue Toxicity)
- Goodbye Grading: Why We Divorced "Grading"
- 2 Component Extravasation Assessment Tool

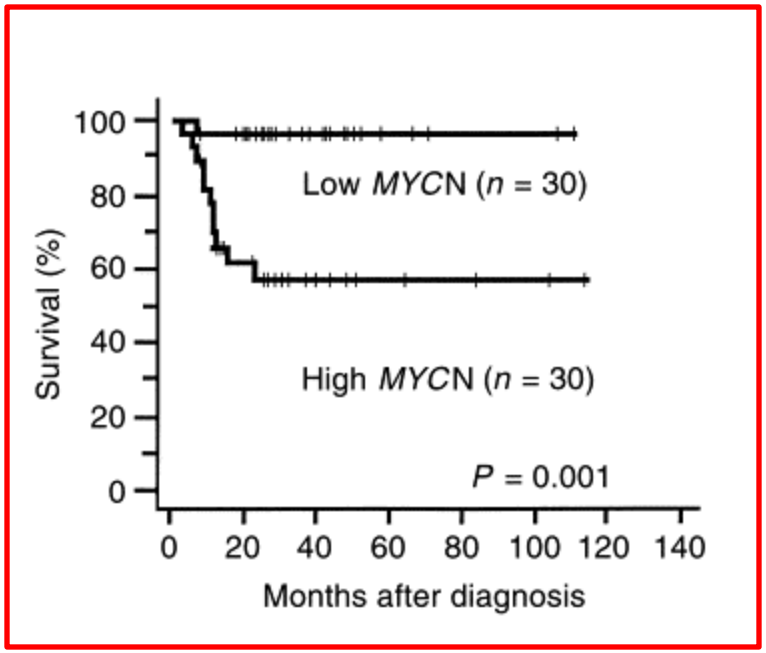
Medical Grading Systems: Fractures

- 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





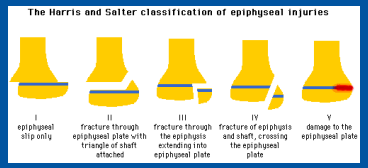
NANT Web Site

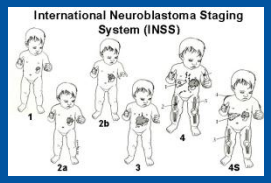
The INS Grading System (Briefly)

- 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[a]

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





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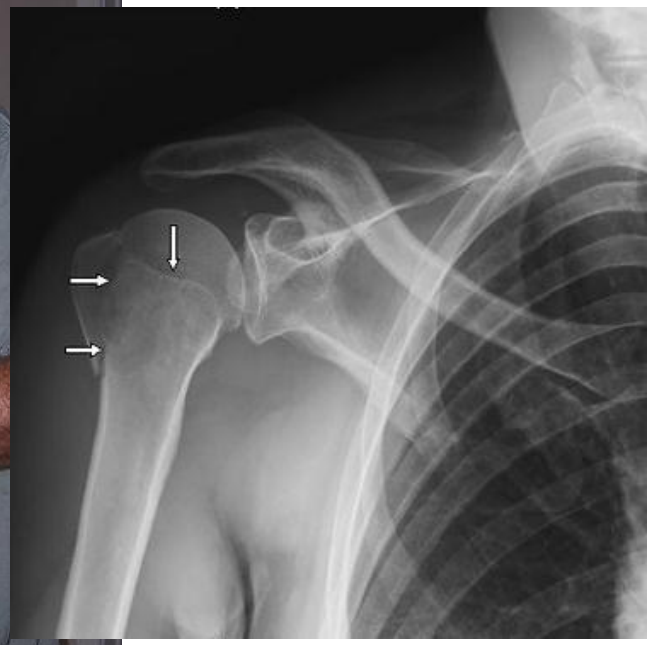
The INS Grading System (Briefly)

- "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 →

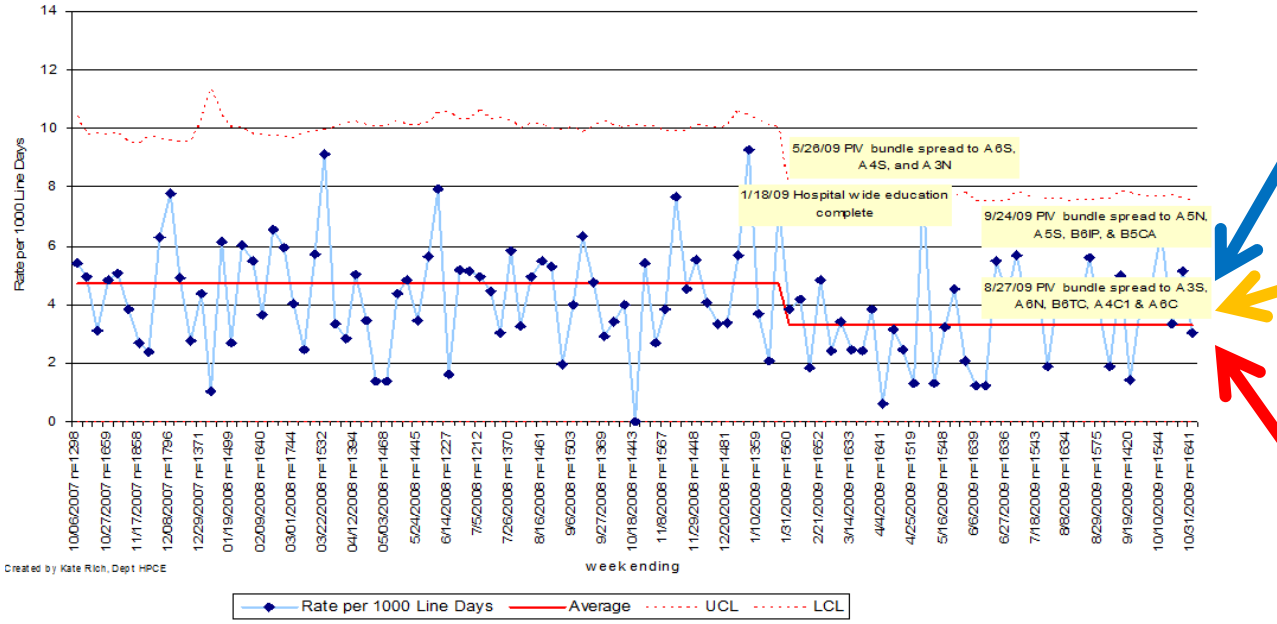
Blood Products Dangerous = Grade 4 ?

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

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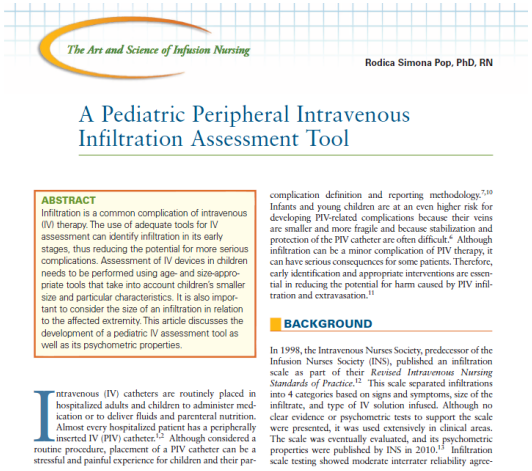
The INS Grading System

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



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.

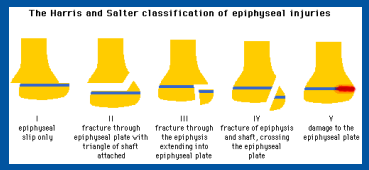
Intravenous (IV) catheters are routinely placed in hospitalized adults and children to administer medication or to deliver fluids and parenteral nutrition. Almost every hospitalized patient has a peripherally inserted IV (PIV) catheter.[1,2] Although considered a routine procedure, placement of a PIV catheter can be a stressful and painful experience for children and their parents.[3] 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.[4] 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.[11]

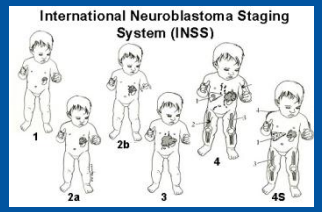
BACKGROUND

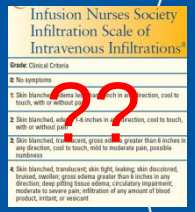
In 1998, the Intravenous Nurses Society, predecessor of the Infusion Nurses Society (INS), published an infiltration scale as part of their *Revised Intravenous Nursing Standards of Practice*.[12] This scale separated infiltrations into 4 categories based on signs and symptoms, size of the infiltrate, 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.[13] Infiltration scale testing showed moderate interrater reliability agreement definition and reporting methodology.[7,10]

See Excellent Discussion in:

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







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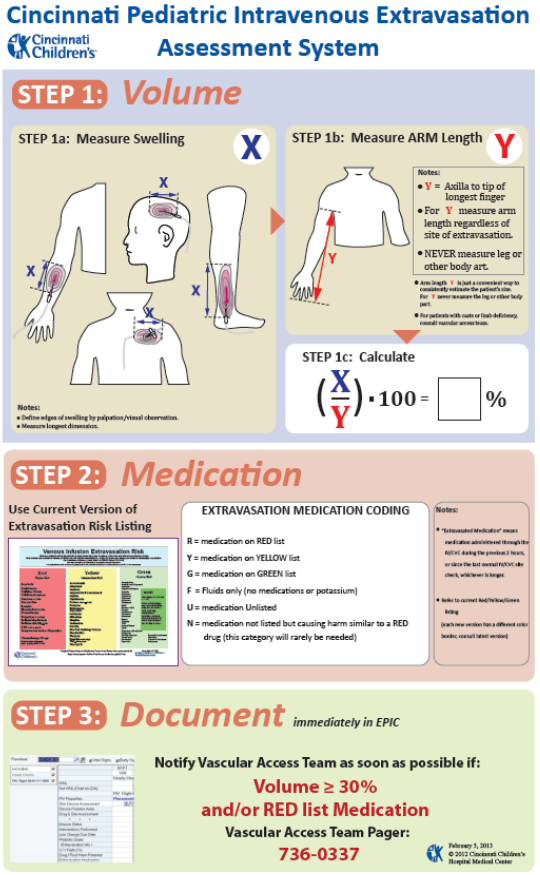
- Goodbye Grading: Why We Divorced "Grading"
- CCHMC
  - 2 Component
  - Extravasation Assessment / Coding Tool

CCHMC Extravasation Coding System

- Step 1 - VOLUME Measurement
- Step 2 - MEDICATION (If Any)

- Step 3 - DOCUMENTATION



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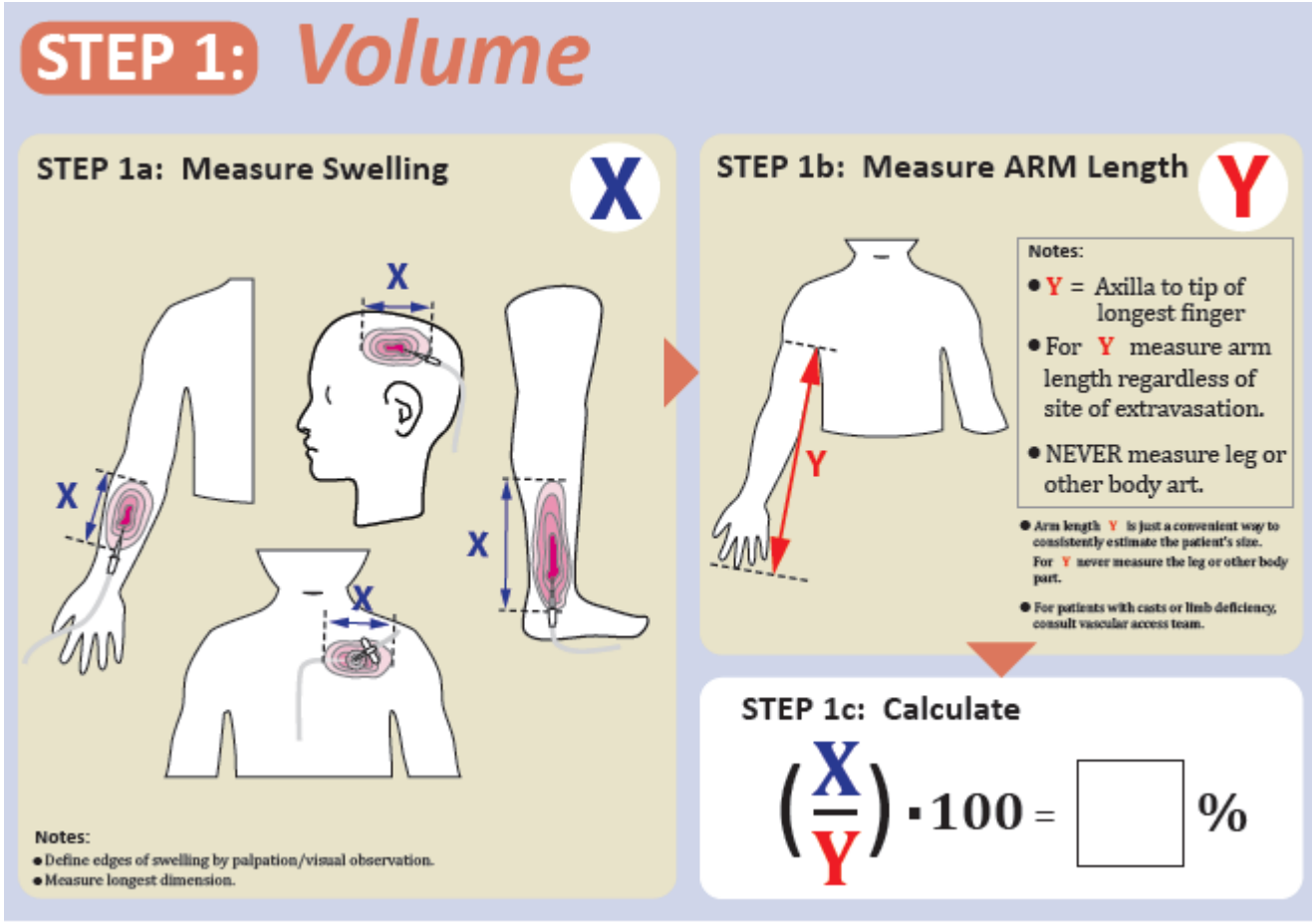
Step 1: VOLUME



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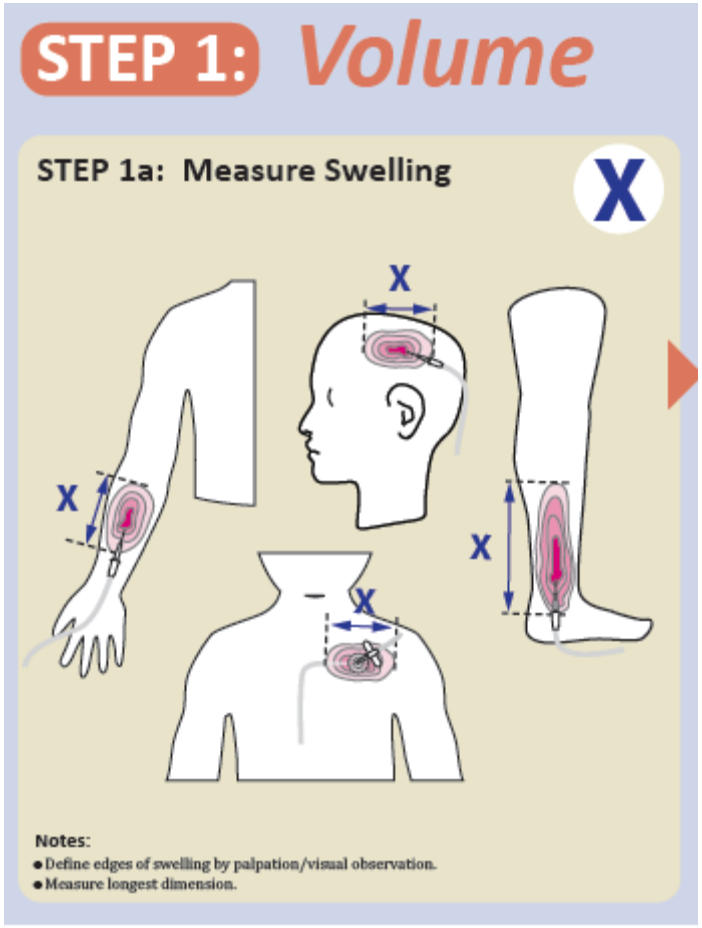
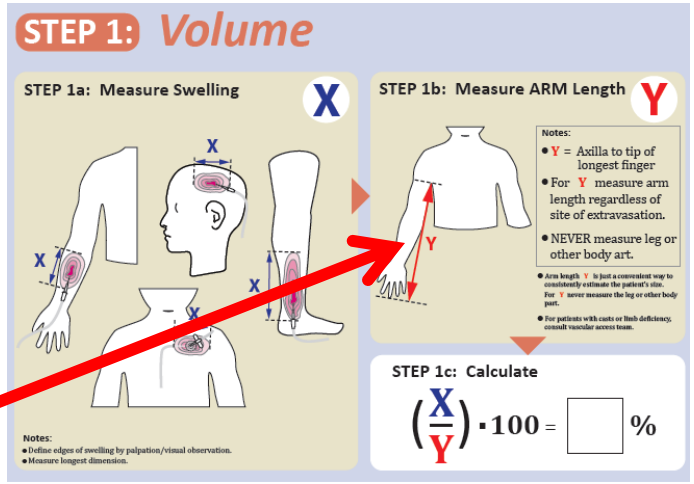
Step 1a:

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



Step 1b:



- Measure ARM Length
  - Surrogate for Body Size

- "**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

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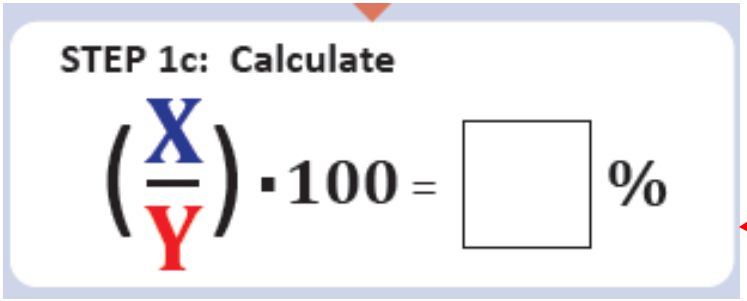
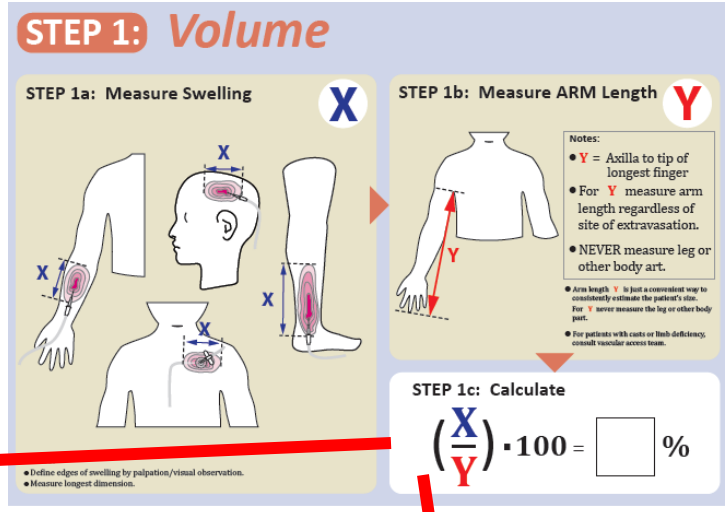
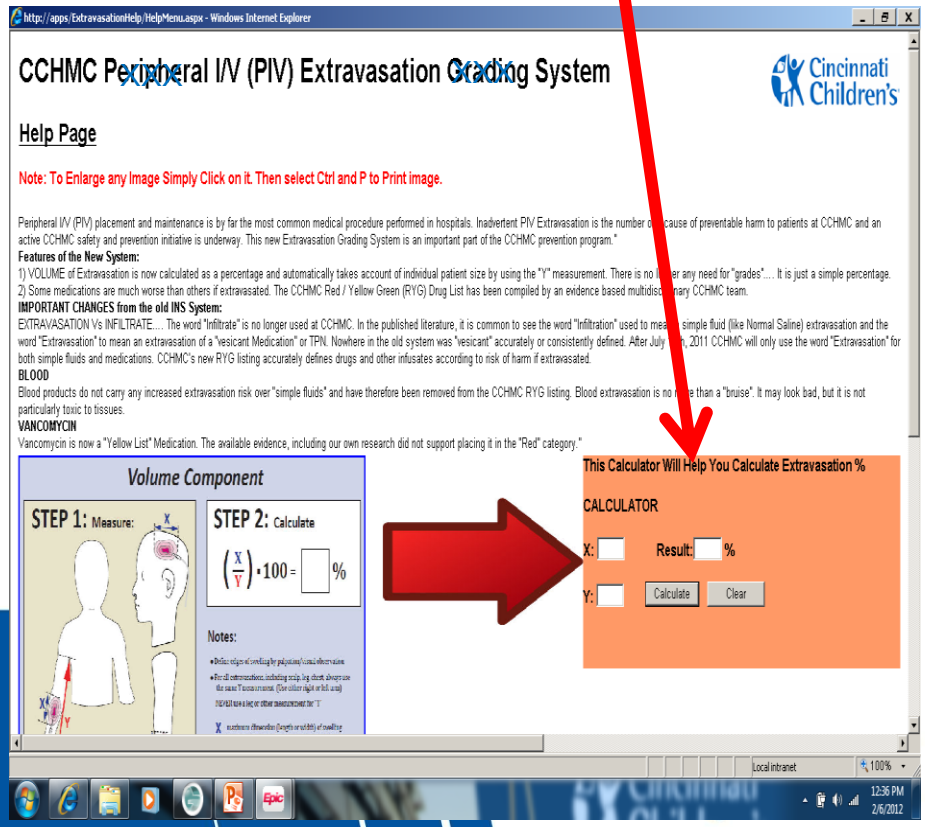
Step 1c: Calculate





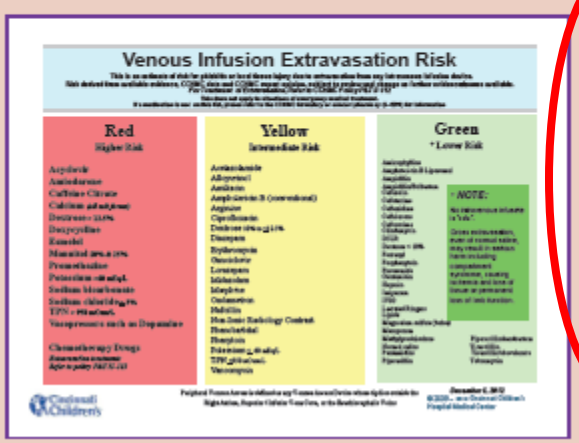
Nurses USE Mobile Phone or…
CCHMC Online Calculator
(In EPIC)



Step 2: MEDICATION

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 medication administered through the IV/CVC during the previous 2 hours, or since the last normal IV/CVC site check, whichever is longer.
- Refer to current Red/Yellow/Green listing

(each new version has a different color border, consult latest version)

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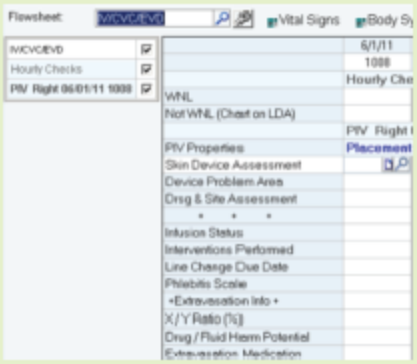
Step 3: DOCUMENT

- CCHMC Uses EPIC

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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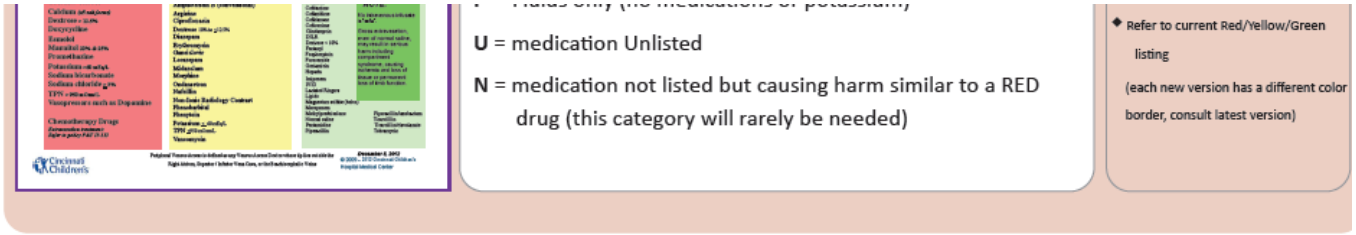
Step 3: DOCUMENT

- Other Institutions



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.

February 5, 2013

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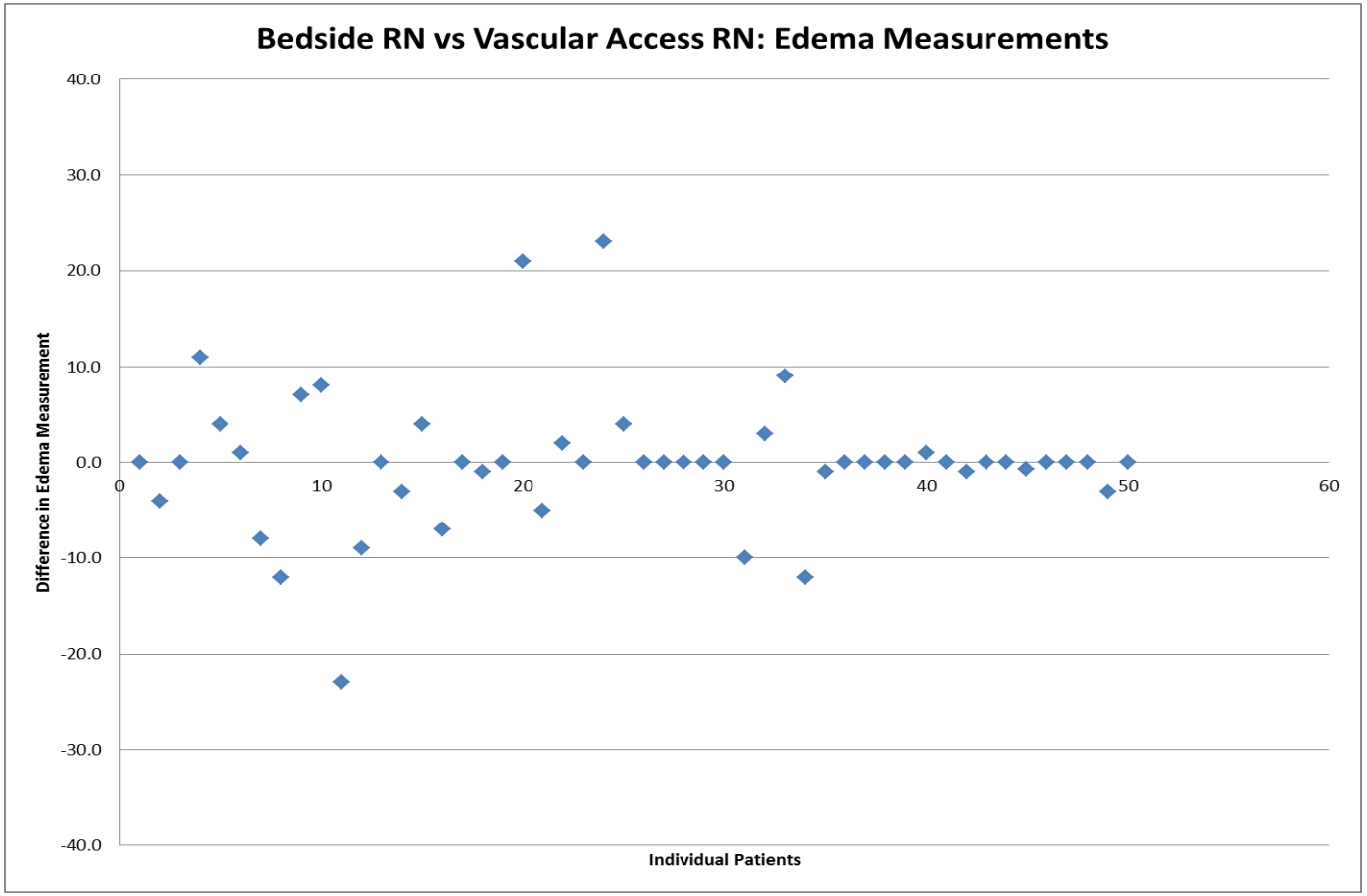
Implementation

- 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



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CCHMC System: Driving Treatment

% Swelling and Infusate Component	Action
Extravasation >/= 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 **Hyaluronidase** is clinically indicated. Decision criteria include imminent skin loss, and / or peripheral circulation impairment (compartment syndrome).
Extravasation >/= 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 **Hyaluronidase** treatment usually **NOT** 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)	**Consult and TREAT:** 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**. **Rx Phentolamine** **PICU / CICU /NICU Attending Or Dr. Johnson**

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

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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.

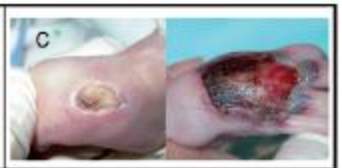
OUTCOME
or
TREATMENT
Based

Outline

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

Other "Grading" Systems

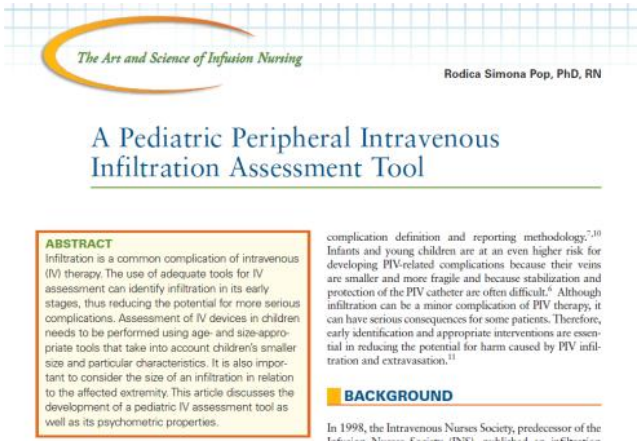
A New Approach to Management of Intravenous Infiltration in Pediatric Patients
Ibrahim Amjad M.D. et.al.
J. Infusion Nursing Vol 34 #4 July / August 2011

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

- 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.[7-10] 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.[6] 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.[11]

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

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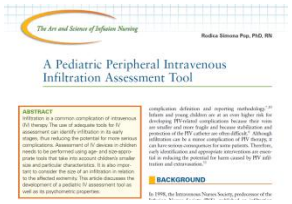
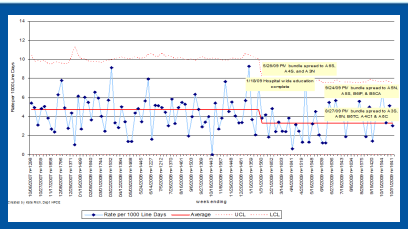


CMC Dallas System

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**

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



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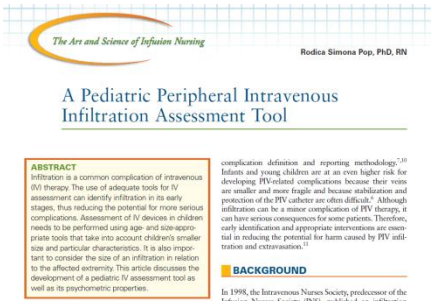

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complication definition and reporting methodology.[10] Infants and young children are at an even higher risk for developing PIV-related complications because their veins are smaller and more fragile and because stabilization and protection of the PIV catheter are often difficult.[9] 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.[11]

BACKGROUND

In 1998, the Intravenous Nurses Society, predecessor of the

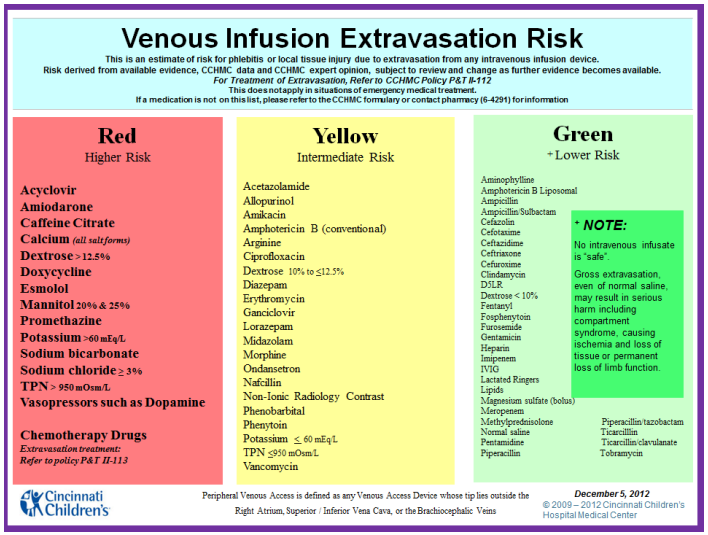
CMC Dallas J. Inf. Nursing Paper

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, 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 8-112
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 saltforms)*
Dextrose > 12.5%
Doxycycline
Esmolol
Mannitol 20% & 25%
Promethazine
Potassium >60 mEq/L
Sodium bicarbonate
Sodium chloride ≥ 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 ≤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

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
Piperacillin/tazobactam
Ticarcillin
Ticarcillin/clavulanate
Tobramycin

*** 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.

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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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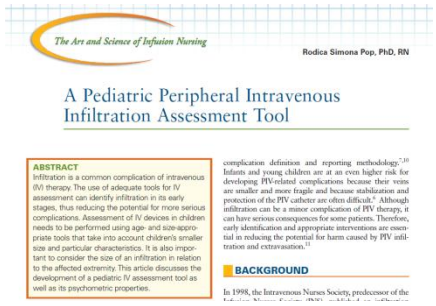
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BACKGROUND

In 1998, the Intravenous Nurses Society, predecessor of the

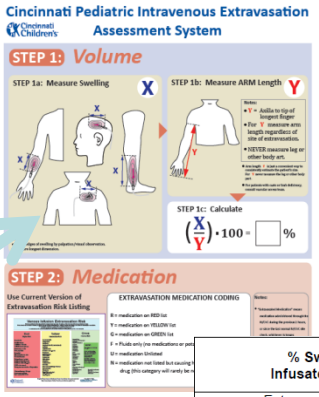
CMC Dallas J. Inf. Nursing Paper

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.[20] 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



% Swelling and Infusate Component	Action
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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 **Hyaluronidase** is clinically indicated. Decision criteria include imminent skin loss, and / or peripheral circulation impairment (compartment syndrome).
Extravasation >/= 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 **Hyaluronidase** treatment usually **NOT** 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)	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**.

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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

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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"

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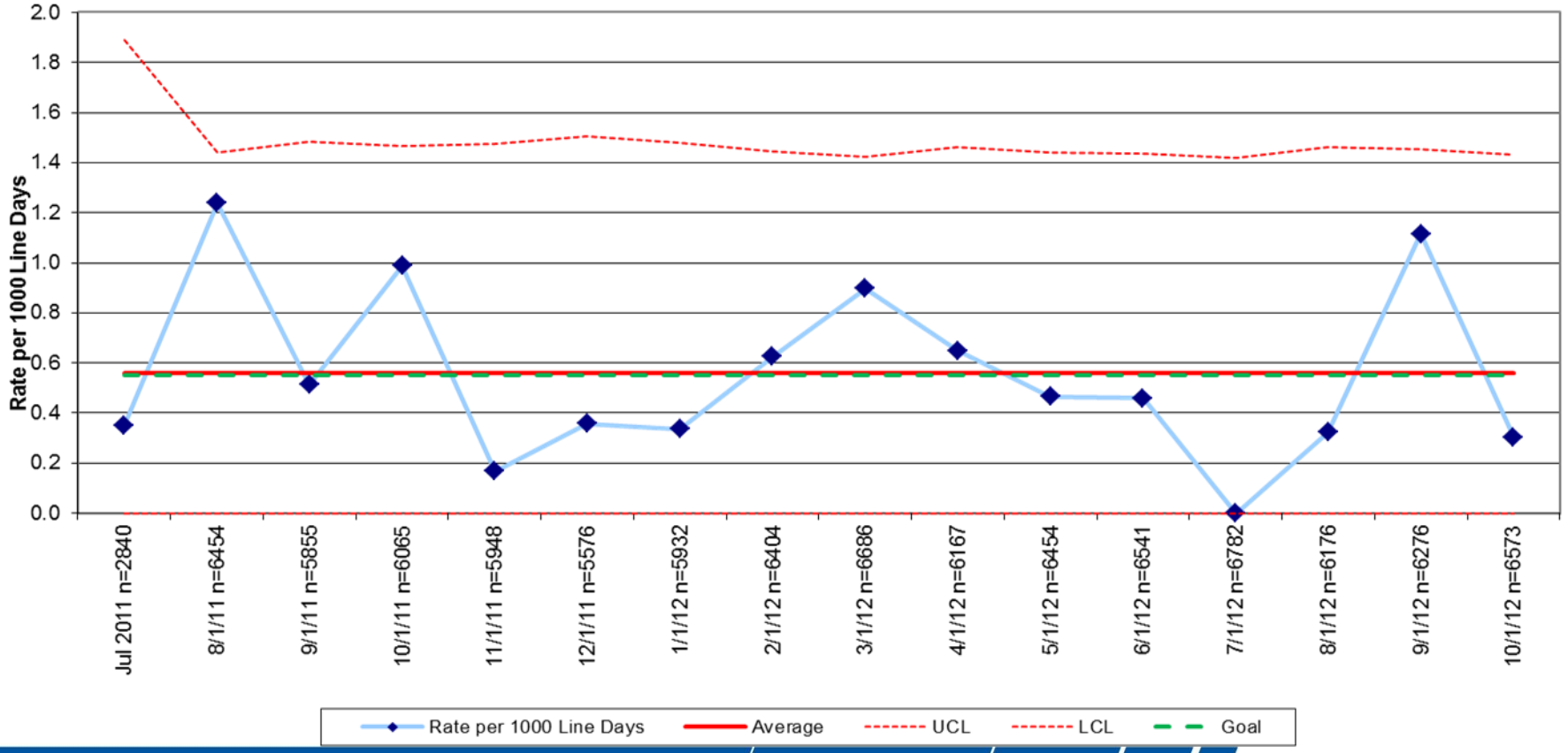
CCHMC PIV Extravasation Rate per 1000 Line Days (>60% Edema) - Inpatients
U-Chart

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



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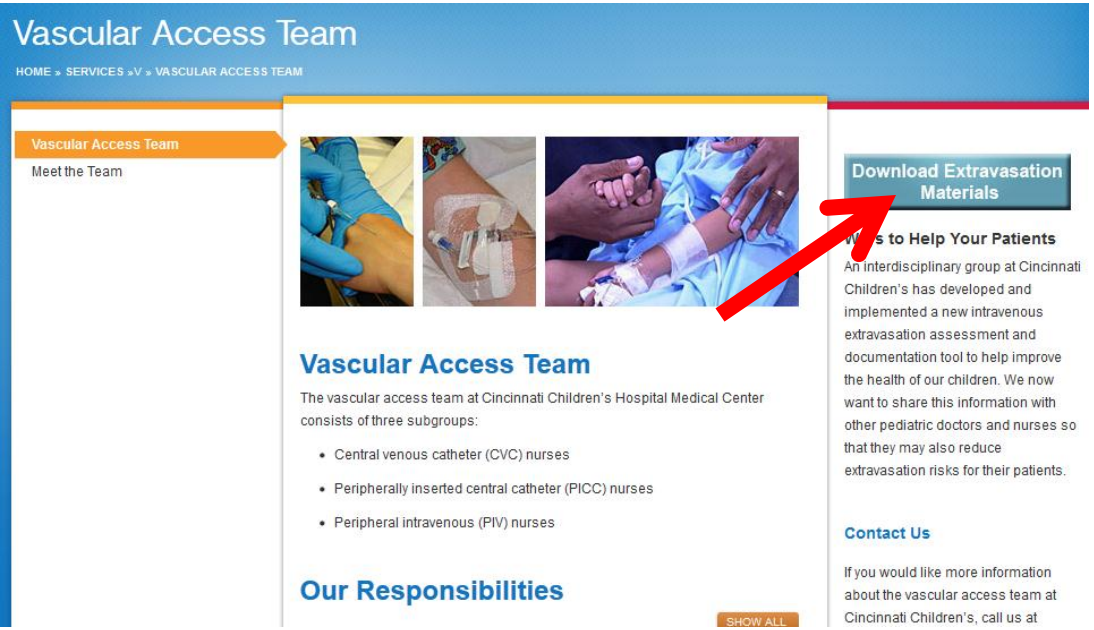
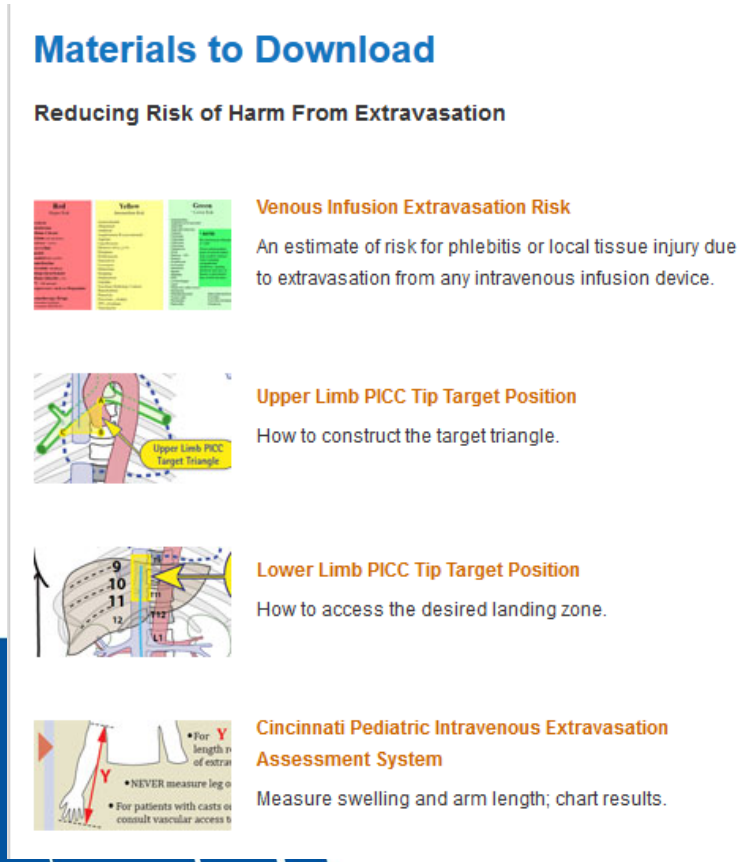
Documents Available:

- http://cincinnatichildrens.org/vascularaccess





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

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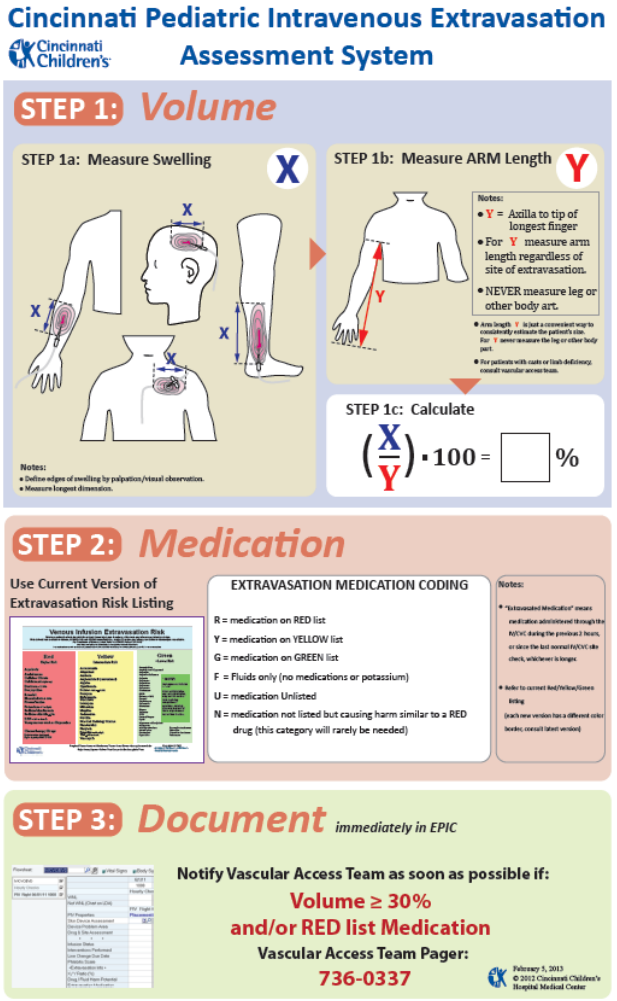
Thanks

- 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



Manuscript Submitted:
J. Infusion Nursing, January 2013

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Questions????

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