

Common Drug Errors and Medication Safety in Internal Medicine

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Aaron Hamilton MD, MBA

Medical Director Patient Safety and Clinical Risk



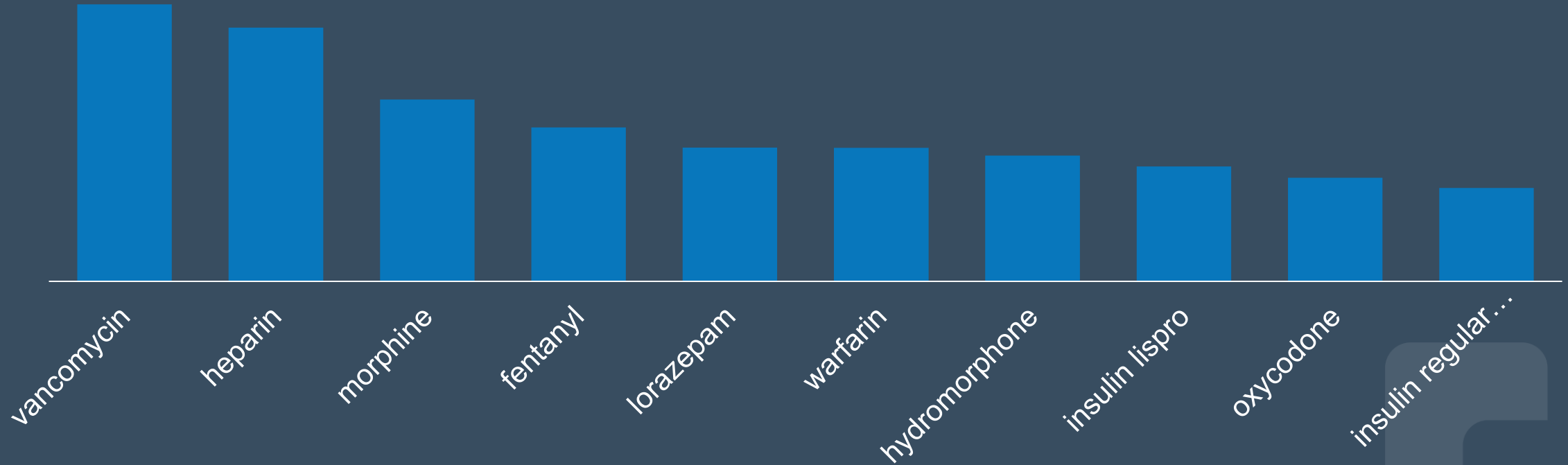
Overview

- Data Overview
- Framework
- Cases
 - Anticoagulants
 - Insulin
 - Opioids
 - Renal dosing



Top 10 Medications Inpatient Events

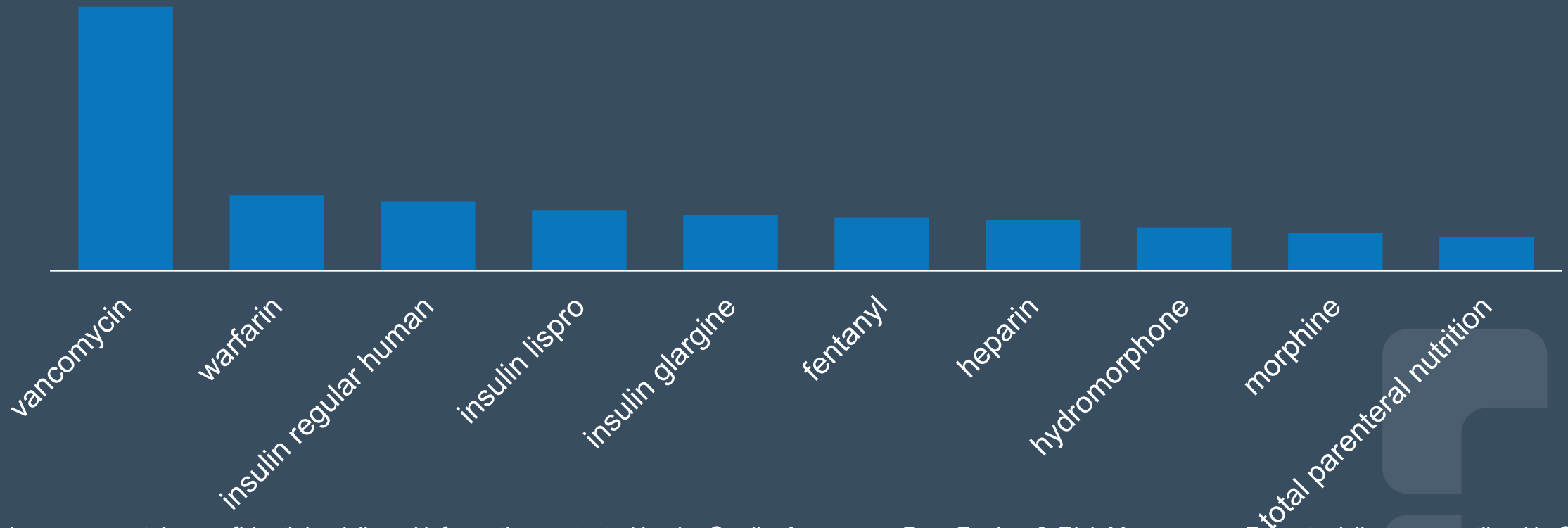
2013 – Q3 2018



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Top 10 Medications Inpatient HARM Events

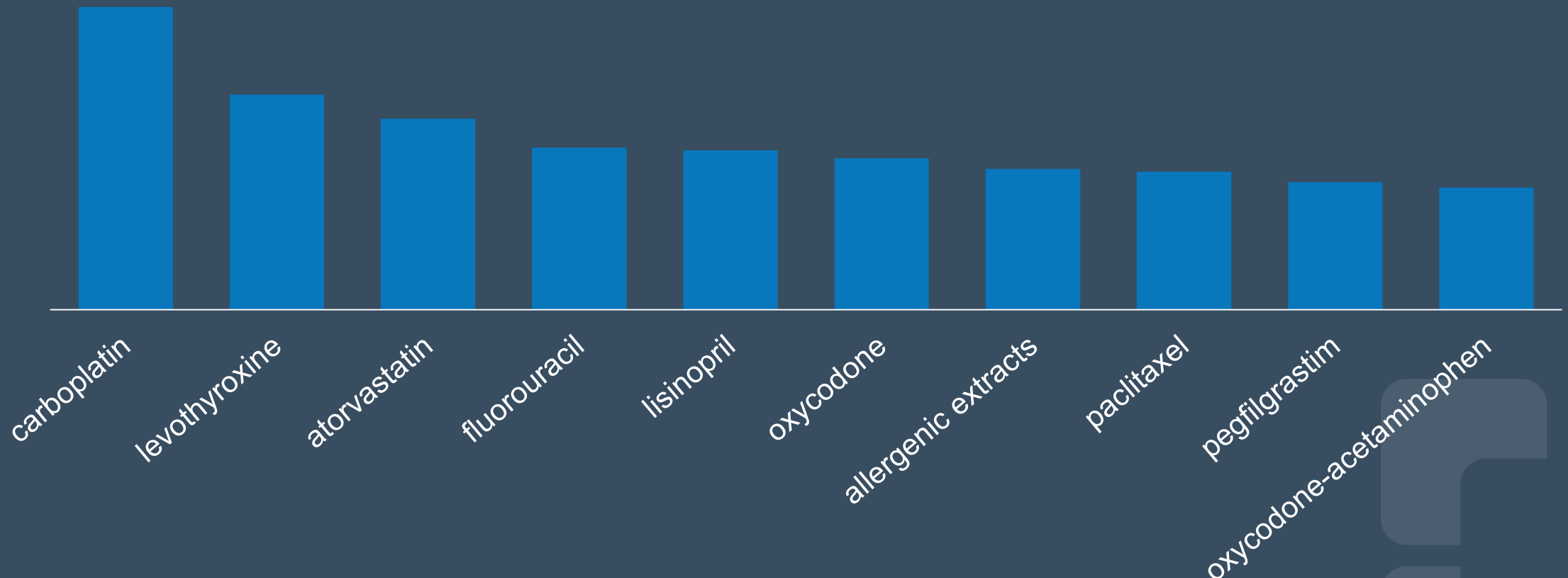
2013 – Q3 2018



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Top 10 Medications Outpatient Events

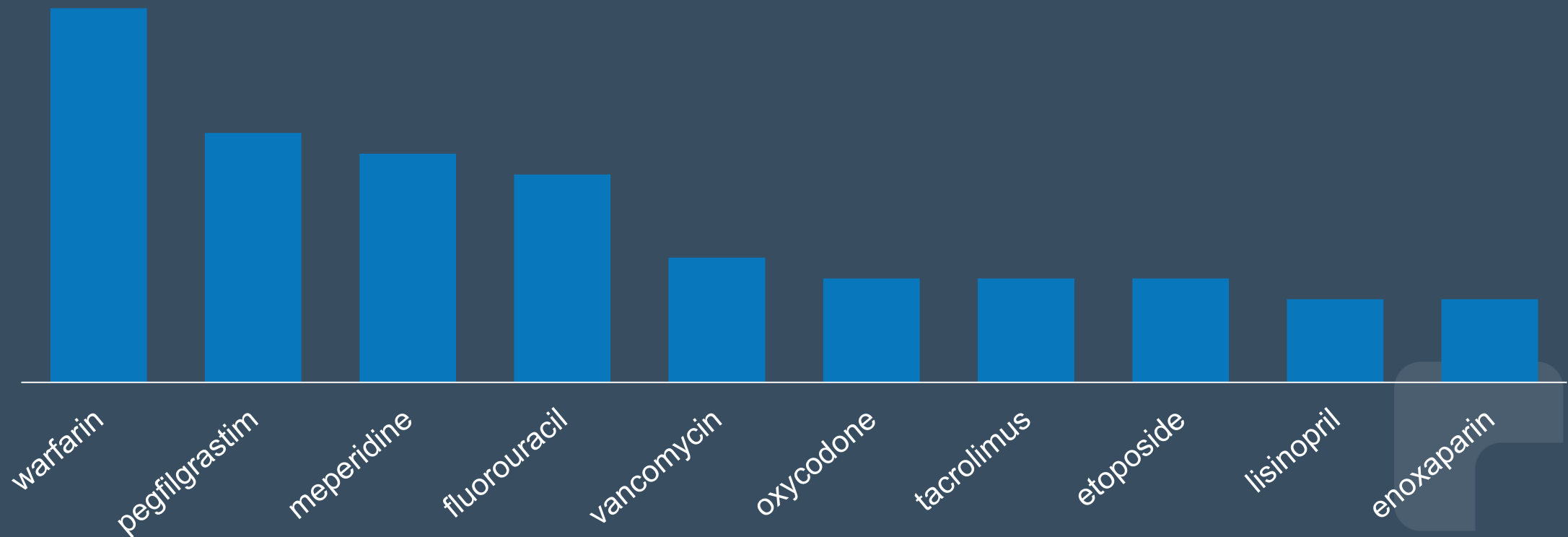
2013 – Q3 2018



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Top 10 Medications Outpatient HARM Events

2013 – Q3 2018

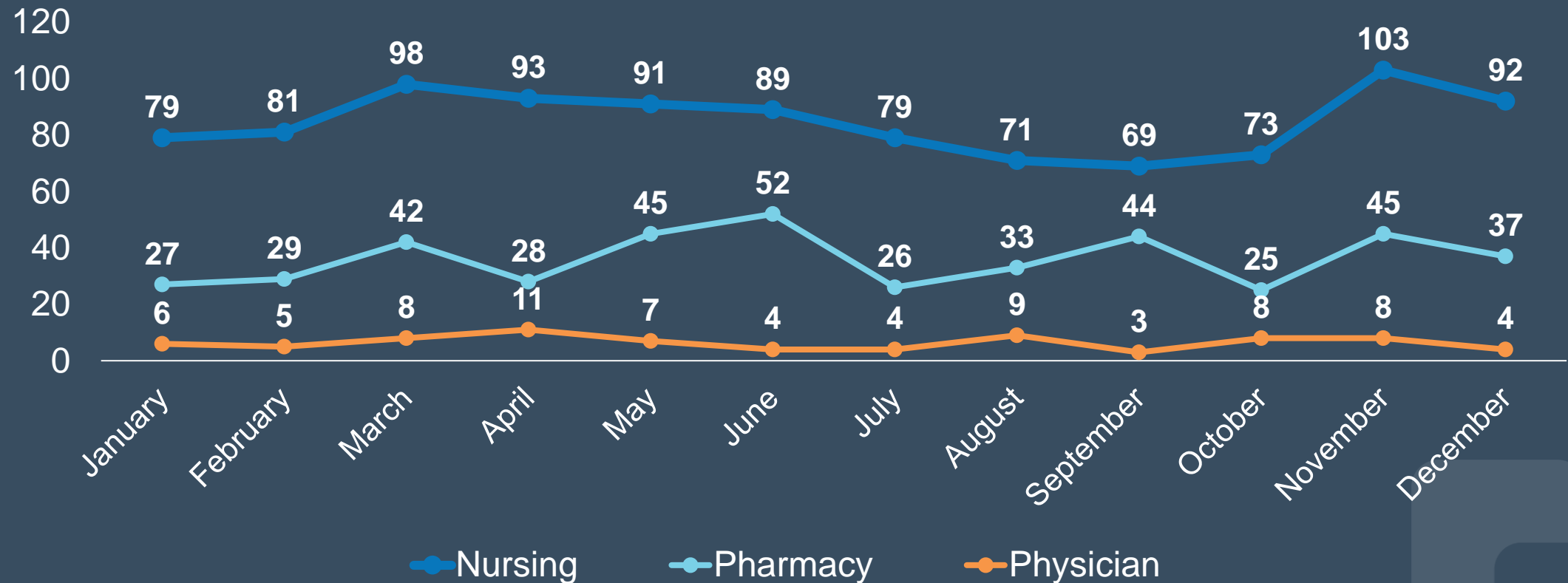


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Reported Events by Process Node

	2018	2017	2016	2015	2014	2013
Administering Events	36%	45%	47%	48%	49%	56%
Dispensing Events	31%	26%	22%	24%	23%	21%
Prescribing Events	11%	13%	15%	15%	13%	13%

Reported Events by Caregiver Role



Source: Safety Event Reporting System, 07/10/2018 Excludes 99 and Employee events.

Error Reduction Strategy

Least Effective

Policies,
Education,
Auditing

Minimize consequences
of error

Increase error visibility

Make it easy to do the right thing

Make it hard to do the wrong thing

Eliminate the opportunity for error

Most Effective

Standardize & Simplify

Source: Adapted from
OSHA Hierarchy of
Controls

High Reliability in Healthcare

“Every caregiver in a high reliability organization finds what could go wrong, speaks up, and works to achieve consistent excellence every day”

**HIGH
RELIABILITY**

LISTEN
to each other

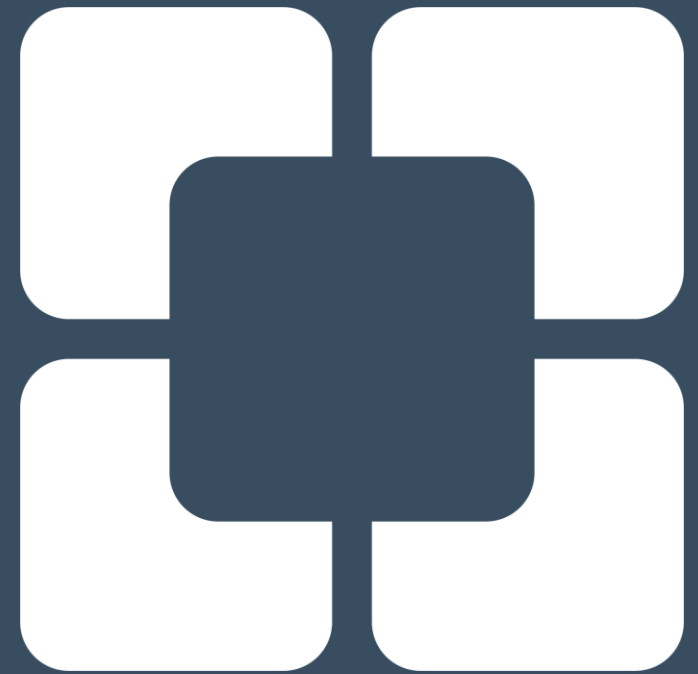
LEARN
from each other

LEAD
together



Cleveland Clinic

Anticoagulants

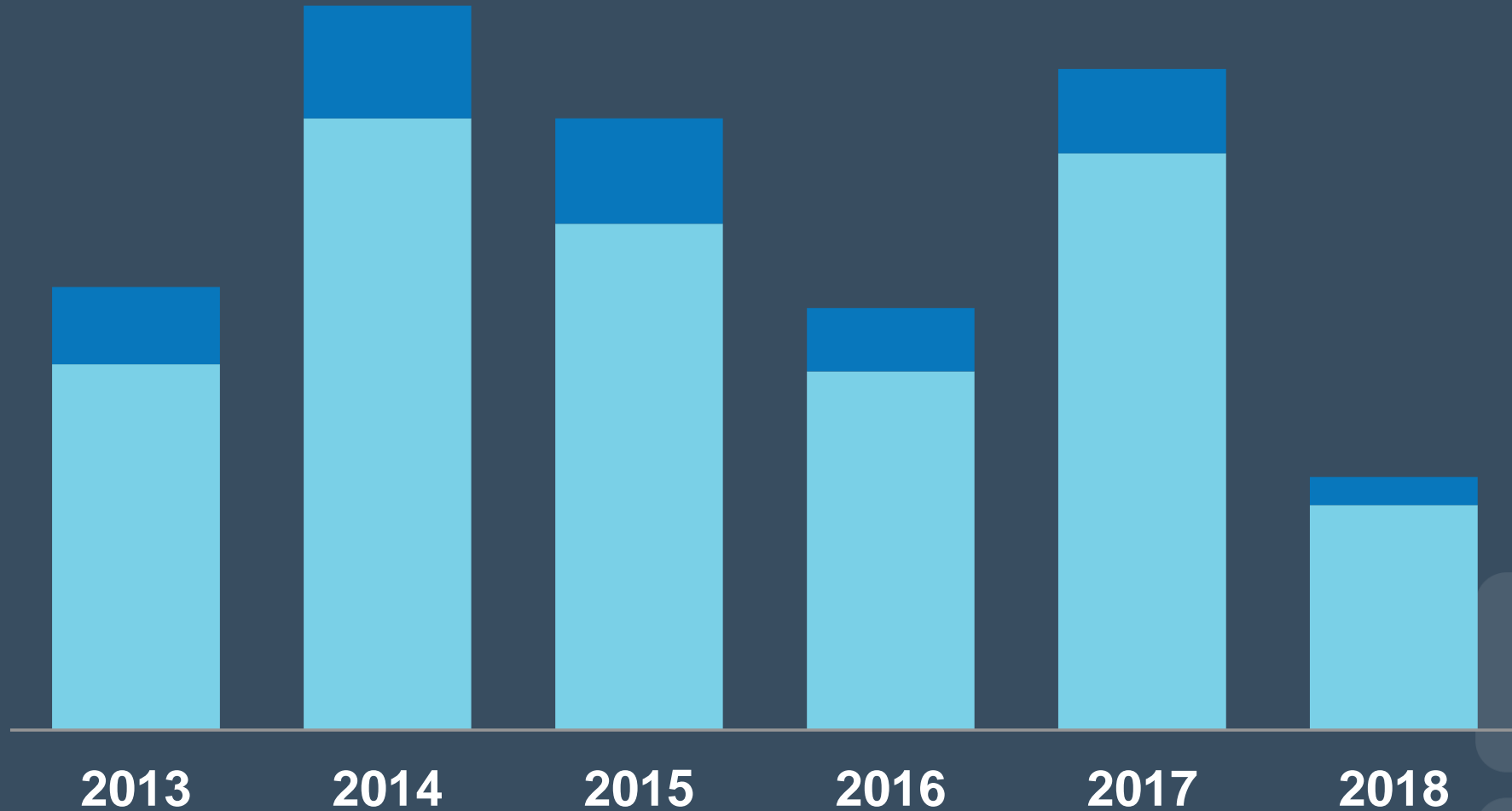


Cases



Anticoagulant Error Trends

■ Harm Events



Heparin Infusion Therapy Risk Points

- Management of supratherapeutic APTT_{AC}
- Timing of APTT_{AC} collections
- Process for discontinuing heparin prior to a procedure
 - Communication to nurse caregivers
- Restarting infusion following a procedure

Calculator Enhancements

- Clearer instructions for patients with out of range PTTAC
- Transitioning to Epic-based dosing calculator

PTTAC (seconds)

***There are no valid PTTAC results documented within the last 6 hours. Please confirm and manually enter the aPTT result to calculate the rate change.**

Current Infusion Dose (units/hr)

Weight (kg)

Bolus Dose

Hold heparin infusion and verbally speak with prescriber for orders

***Elevated PTTAC results greater than 150 secs will need to be evaluated by the LIP. After evaluation of the patient consider one of the following:**

After one hour of holding heparin infusion obtain another PTTAC and reevaluate the heparin dose

OR

Repeat an aPTT STAT if there is concern that the result is inconsistent with previous result

OR

After one hour of holding the heparin infusion, decrease infusion by 3 to 4 units/kg/hour

Providers should refer to the reference document on the MAR for further dosing information.

Infusion Dose

Nomogram Changes: Improved Access

- All calculators and reference document available in both manage orders and the EMAR without additional clicks

The screenshot shows the 'Manage Orders' window with a list of medications. The second entry, 'heparin iv infusion (STANDARD NOMOGRAM) 25,000 units in NaCl 0.45% 250 mL PREMIX', has its 'DOSE CHANGE CALC' link highlighted with a red circle. The interface includes tabs for 'Active', 'Signed & Held', 'Home Meds', 'Cosign', 'Order History', and 'Recurring Treatment'. A 'Go to: Medications' dropdown and a 'Show details' checkbox are also visible.

The screenshot shows the EMAR interface for the same three medication entries. Each entry includes a visual representation of the infusion rate (a bar chart) and a '1500 Due' button. The 'DOSE CHANGE CALC' link for the 'STANDARD NOMOGRAM' entry is circled in red. The interface also includes icons for user, settings, and other actions.

Pre-op case

Hey Doc, what should I do about my apixaban?

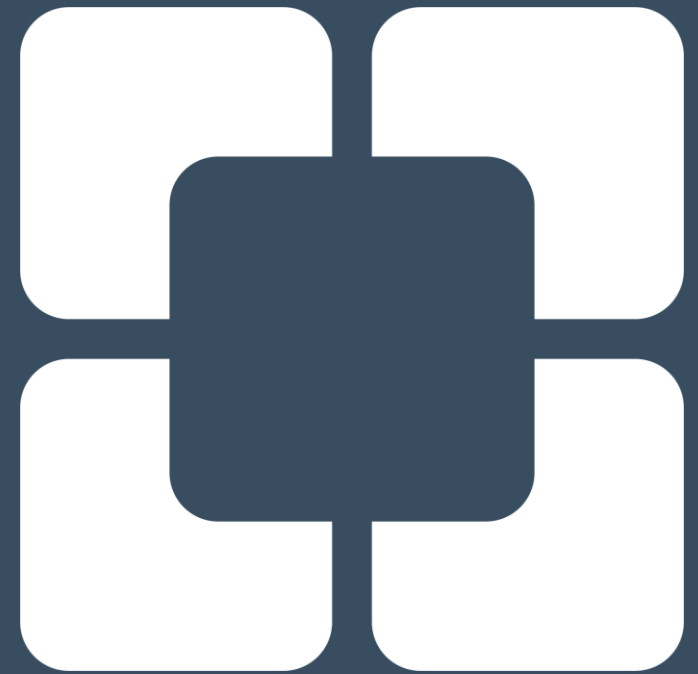


When to stop?

Perioperative management of oral direct thrombin inhibitors and factor Xa inhibitors

Anticoagulant	Renal function and dose	Interval between last dose and procedure	
		NOTE: No anticoagulant is administered the day of the procedure	
		High bleeding risk	Low bleeding risk
Dabigatran	CrCl >50 mL/minute Dose 150 mg twice daily	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip two doses on the day before the procedure)
	CrCl 30 to 50 mL/minute Dose 150 mg twice daily	Give last dose five days before procedure (ie, skip eight doses on the four days before the procedure)	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)
Rivaroxaban	CrCl >50 mL/minute Dose 20 mg once daily	Give last dose three days before procedure (ie, skip two doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip one dose on the day before the procedure)
	CrCl 30 to 50 mL/minute Dose 15 mg once daily		
Apixaban	CrCl >50 mL/minute Dose 5 mg twice daily	Give last dose three days before procedure (ie, skip four doses on the two days before the procedure)	Give last dose two days before procedure (ie, skip two doses on the day before the procedure)
	CrCl ≤50 mL/minute Dose 2.5 mg twice daily		
Edoxaban	CrCl 51 to 95 mL/minute Dose 60 mg once daily	Give the last dose three days before the procedure (ie, skip two doses on the two days before the procedure)	Give the last dose two days before the procedure (ie, skip one dose on the day before the procedure)
	CrCl ≤50 mL/minute* Dose 30 mg once daily		

Insulin

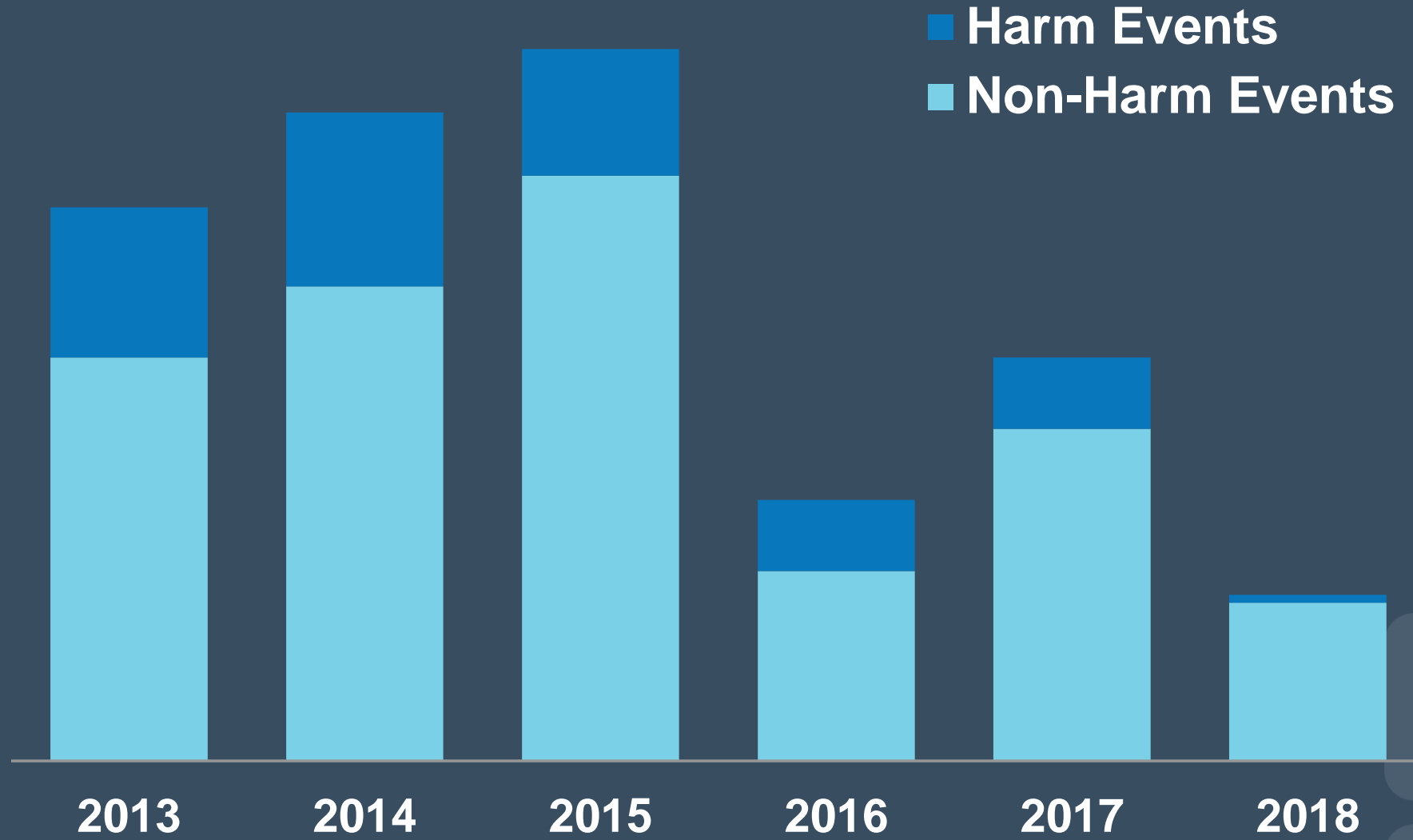


Cases

- What should I do with the insulin overnight?
- What about that endocrinologist?



Insulin Error Trends



Insulin Therapy Risk Points

- Issues related to diet changes
- Continuous Subcutaneous Insulin Infusion (insulin pumps)
- Diagnostic testing and medication timing
- Initiation of steroids
- Hyperkalemia treatment



Insulin Orders and Diet Changes

BestPractice Advisory

⚠️ **Reminder: This patient is on insulin. Placing this NPO Diet order may require the INSULIN dose to be adjusted to prevent hypoglycemia.**

✓ **Accept**

Cancel

Reminder: This patient is on insulin. Placing this NPO Diet order may require the INSULIN dose to be adjusted to prevent hypoglycemia.

Date	User	Actions Taken	Triggers	Comment
		None	Sign Orders <ul style="list-style-type: none">• DIET NPO [1252013]• INSULINS [9917]• Order: insulin regular human 20 Units injection (short acting) (NovoLIN R, HumuLIN R)• Order: insulin 70/30 NPH/regular units/mL (NOVOLIN 70/30 U-100 INSULIN)• Order: insulin glargine 18 Units pen (long acting) (LANTUS SOLOSTAR, BASAGLAR)• Order: insulin regular human injection (short acting) (NovoLIN R, HumuLIN R)• Order: DIET NPO	[Add]

Insulin Orders and Diet Changes

Standing Order Information

Remaining Occurrences

0/1

Interval

ONCE

Last Released

Released Orders

Released On

Released By

Comments

Hold IF at midnight

Continuous Subcutaneous Insulin Infusion (Insulin Pumps)

- Event trends include:
 - Prescribing of incorrect insulin product
 - Use of nursing communication orders to continue insulin pump use, but no medication order placed for insulin
 - Omission of orders for point of care (POC) BG monitoring
 - Lack of hypoglycemia treatment orders

Continuous Subcutaneous Insulin Infusion (Insulin Pumps)

- Challenges with use of orderset
 - Simplify orderset
 - Clarify process instructions
 - Evaluate urgency of Endocrinology consult
 - Implement barcode medication administration for insulin pumps

▼ MED INSULIN PUMP ORDERS FOR PATIENT SELF ADMINISTRATION

Physician/LIP Version 03/2015

INSULIN PUMP ORDERS FOR SELF ADMINISTRATION Collap

▼ INSULIN PUMP ORDER

(No Medication Selected)
300 Units, SUBCUTANEOUS, CONTINUOUS starting Today at 1100 Until Discontinued
! INSULIN PUMP FOR SELF ADMINISTRATION: Patient must sign continuous insulin pump therapy agreement Basal Rate: ***:00 = *** units/hr
***:00 = *** units/hr ***:00 = *** units/hr ***:00 = *** units/hr ***:00 = *** units/hr
***:00 = *** units/hr ***:00 = *** units/hr ***:00 = *** units/hr {carbohydrate ratio vs mealtime boluses:610073}
Correction bolus: 1 unit insulin lowers glucose *** mg/dL, correct to a target blood glucose of *** mg/dL

▼ INSULIN PUMP ORDERS FOR PATIENT SELF-ADMINISTRATION

Patient may continue to wear and operate insulin pump independently
PRN First occurrence Today at 1045 Until Specified, Routine

Patient must sign Continuous Insulin Infusion Pump Therapy Agreement and the Terms of Use and Release of Liability for Patient Owned Equipment forms (place forms in medical record)
ONCE First occurrence Today at 1045, Routine

Target blood glucose ranges: (specify)
! PRN First occurrence Today at 1045 Until Specified, Routine

Bedside glucose monitoring
P CONT (I) First occurrence Today at 1045 Until Specified, Routine

Provide bedside flow sheet record to patient for self recording of insulin pump management
ONCE First occurrence Today at 1045, Routine

ALERT: Prior to suspending or stopping the insulin pump, call the Physician for an alternative dose of rapid acting insulin
PRN First occurrence Today at 1045 Until Specified, Routine

Inform Diabetes Nurse Educator of insulin pump
! ONCE First occurrence Today at 1045, Routine

Consult to Endocrinology (page 23098, after hours notify Endocrine Physician on call)
! P ONCE First occurrence Today at 1045
Urgency of Consult: Non-Urgent

Opioids

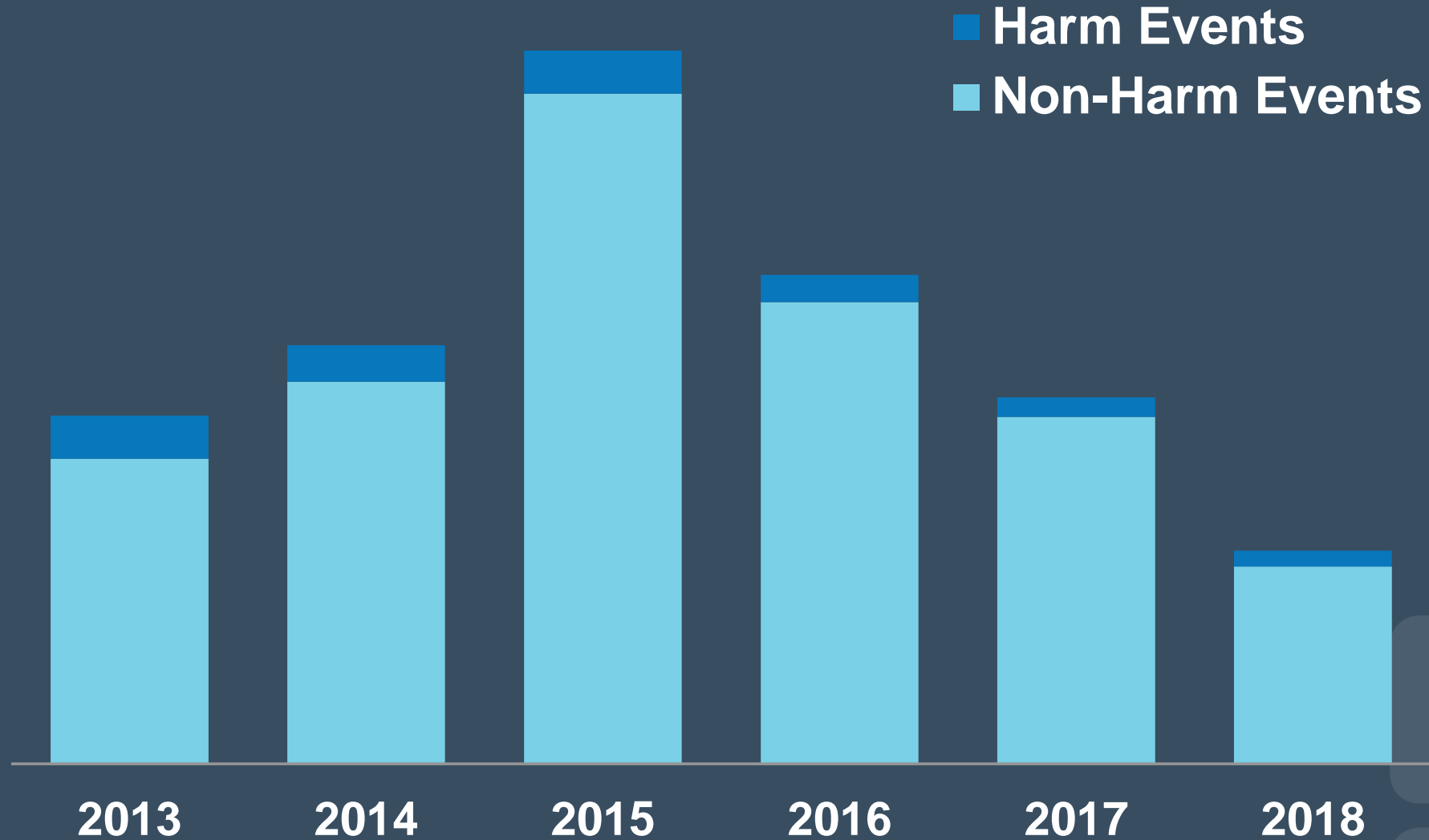


Cases



- The opioid naïve patient
- “I ran out of my pain meds”

Opioid Analgesic Error Trends



Improving

- Therapeutic Duplication with PRN Orders
- OARRS in EPIC
- MME calculator in ambulatory
- Opioid dosing “look back”
- Dose limits



Future Safety Goals

- Use of updated Epic functionality to mitigate therapeutic duplication at prescribing
- Morphine equivalent dosing report for inpatients
- Opioid dose conversion calculator



Adult Opioid Reference Guide

- Developed by Pain Management and CCHS Drug Information Center
 - Basic dosing and pharmacokinetic information
 - Opioid conversion charts
 - Naloxone dosing and administration guideline
- Available on the Intranet (Clinical Tools under Drug Information)

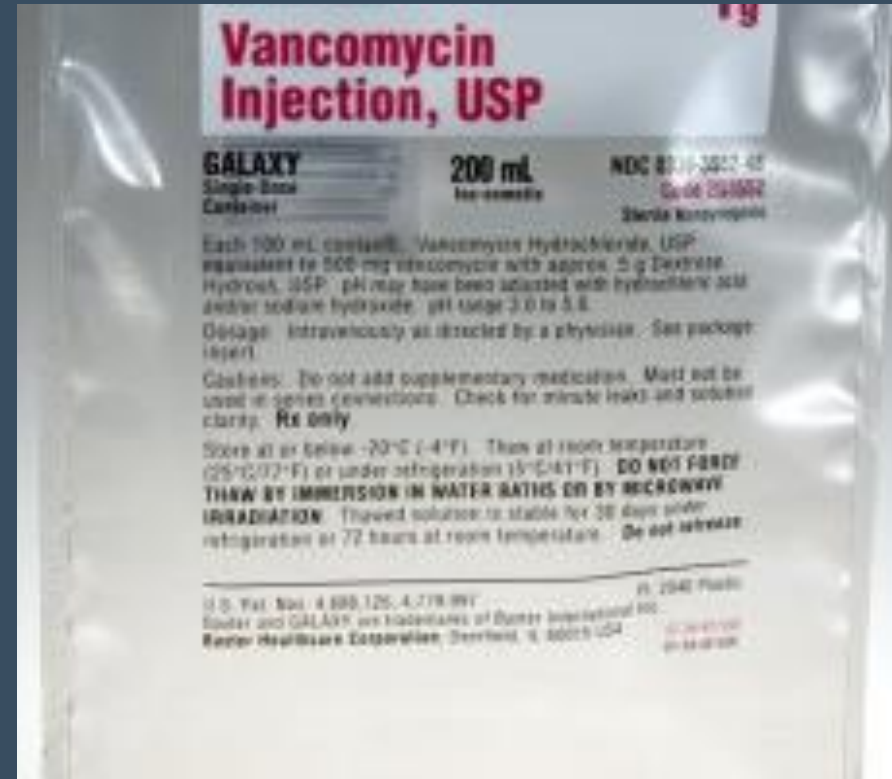


My kidneys hate that
medication



Case

- Septic patient in ED
- Vanco “continued”
- AKI developed
- High vanco level



Acute Kidney Injury (AKI)

- Common in hospitalized patients¹
- Can be a sign of drug-induced nephrotoxicity
- Risk of accumulation of drugs normally cleared by renal elimination

Epic Renal Dosing Context

- Creatinine Clearance: greater than 40 mL/min

piperacillin-tazobactam 3.375 g in dextrose (iso-osmotic) 50 mL (ZOSYN) ✓ Accept ✗ Cancel

Please document the antimicrobial indication

Priority:

Report: **No Creatinine Clearance results found.**

Reference Links: [1. Drug Info - Adult](#) [2. Drug Info - Peds](#)

Dose:

Administer Dose: 3.375 g
Administer Amount: 50 mL

Route:

Frequency:

For: Doses Hours Days

Starting:

First Dose:

Epic Renal Dosing Context

Creatinine Clearance: less than 20 mL/min

piperacillin-tazobactam 3.375 g in dextrose (iso-osmotic) 50 mL (ZOSYN) ✓ Accept ✗ Cancel

Order Inst: This order's default dose and/or frequency have been adjusted for this patient's estimated creatinine clearance of < 20 ml/min.
Please note that the alterations in the order's dose and/or frequency serve as a recommendation and do not preclude clinical judgment.

Please document the antimicrobial indication **Empiric** Pathogen-directed Prophylaxis

Priority:

Report:	Creatinine Clearance	Serum creatinine	Time Elapsed
	7.9 mL/min (A)	10 mg/dL (A)	1 minute (07/31/18 0811)

Reference Links: [1. Drug Info - Adult](#) [2. Drug Info - Peds](#)

Dose: g
Administer Dose: 3.375 g
Administer Amount: 50 mL

Route: **INTRAVENOUS**

Frequency: **q 12 H** q 8 H ONCE

For: Doses Hours Days

Starting: **Today** Tomorrow

First Dose: **Include Now** As Scheduled

Epic Renal Dosing Context

- Dialysis

piperacillin-tazobactam 3.375 g in dextrose (iso-osmotic) 50 mL (ZOSYN) ✓ Accept ✗ Cancel

Order Inst: `This order's default dose and/or frequency have been adjusted because this patient may be on intermittent hemodialysis, peritoneal dialysis, or continuous renal replacement therapy.`
`Please note that these alterations in the order's dose and/or frequency serve as recommendations and do not preclude clinical judgment.`

⚠ Please document the antimicrobial indication Empiric Pathogen-directed Prophylaxis

Priority:

Report:

Creatinine Clearance	Serum creatinine	Time Elapsed
7.9 mL/min (A)	10 mg/dL (A)	3 minutes (07/31/18 0811)

Reference Links: [1. Drug Info - Adult](#) [2. Drug Info - Peds](#)

Dose: 3.375 g

Administer Dose: 3.375 g
Administer Amount: 50 mL

Route: INTRAVENOUS

Frequency: q 12 H ONCE

For: Doses Hours Days


Starting: Today Tomorrow

First Dose: Include Now As Scheduled

Pharmacist Dosing Services

- Vancomycin dosing service
 - Original pilot in 2010 for Internal Medicine teaching service
 - Fully implemented for both adult and pediatric inpatients
- Exploring options for other dosing services
 - e.g. aminoglycosides

Key Takeaways

- Several categories of high risk medications
 - New high risk meds
 - Must learn from low severity events
 - Transitions of care are risk points
 - Clinical decision support and interoperability key
- 



Every life deserves world class care.