



Hypoglycemia Task Force: A Quality Improvement Initiative to Reduce Inpatient Hypoglycemia

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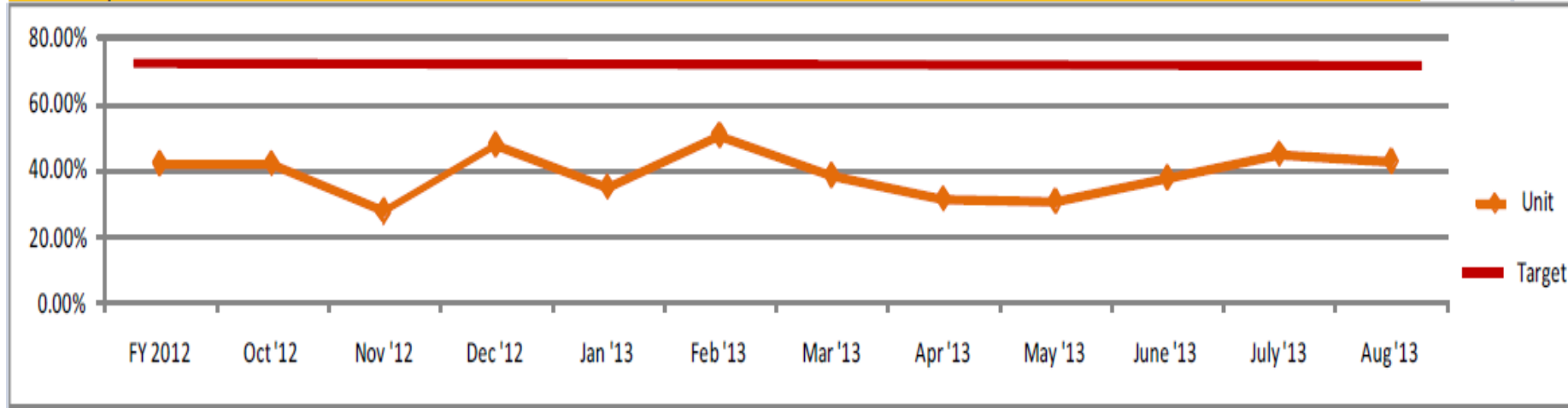
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Unified Quality Improvement Symposium

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Glycemic Control at Vidant Medical Center (VMC) Hyperglycemia

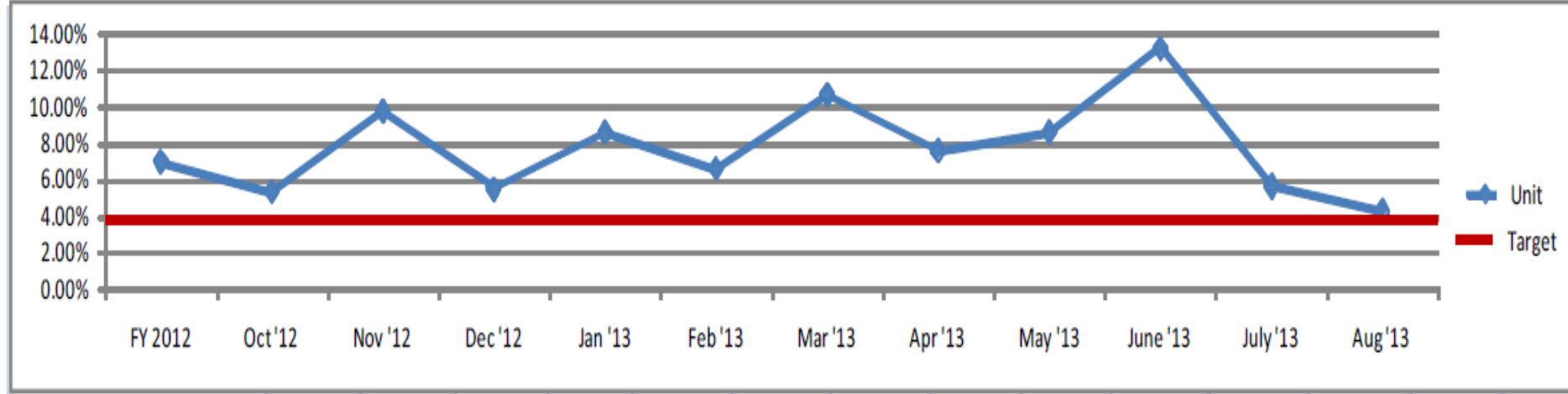
Glycemic Control: Target >75%	FY 2012	Oct '12	Nov '12	Dec '12	Jan '13	Feb '13	Mar '13	Apr '13	May '13	June '13	July '13	Aug '13		
Unit - MIU	42.17%	42.13%	27.87%	47.78%	35.03%	50.69%	38.58%	31.59%	30.81%	37.84%	45.11%	42.74%		
Service Line - AMS	39.79%	40.80%	32.63%	41.50%	35.64%	43.12%	39.02%	32.66%	34.77%	36.85%	43.86%	44.16%		
Overall Hospital	42.00%	42.03%	36.58%	41.03%	40.11%	43.33%	41.16%	37.09%	37.50%	38.87%	42.95%	44.03%		



Glycemic Control at VMC

Hypoglycemia

Hypoglycemia: Target <4%	FY 2012	Oct '12	Nov '12	Dec '12	Jan '13	Feb '13	Mar '13	Apr '13	May '13	June '13	July '13	Aug '13
Unit - MIU	7.03%	5.36%	9.77%	5.53%	8.62%	6.64%	10.69%	7.60%	8.64%	13.22%	5.68%	4.31%
# of DM Patient Days	4814	438	398	466	405	457	426	479	526	544	439	469
Service Line - AMS	8.82%	6.36%	6.70%	5.72%	6.90%	6.76%	9.70%	7.65%	7.25%	8.00%	7.50%	6.00%
Overall Hospital	7.29%	5.55%	6.18%	5.71%	6.21%	5.81%	7.64%	6.97%	7.23%	7.27%	7.35%	5.96%



Inpatient Hypoglycemia

- 7-10% of hospitalized patients have \geq one episode of hypoglycemia
- An important barrier to glycemic control efforts.
- Can cause symptoms ranging from confusion to seizures, ventricular arrhythmia, coma, and death.
- Severe hypoglycemic episodes increase morbidity and mortality, transfers to higher level of care, length of hospital stay, and healthcare expenditures.

Background : Hypoglycemia at VMC

- About 1/3rd patients receive insulin (diabetes + stress hyperglycemia)
- Overall rate of hypoglycemia (<70mg/dL) for FY 2012 was 7.40% of diabetes patient-days.
- A review of 393 cases of severe hypoglycemia (< 50mg/dL) from Oct 2012-May 2013 revealed:
 - excessive insulin dosing (47%)
 - renal impairment (43%)
 - decreased nutrition (31%)
 - prescribing home insulin dose (22%)
- 46% of these events were preceded by a hypoglycemia event in the previous 24 hours.

Background : Hypoglycemia at VMC

- 2013 Vizient data (formerly University Health Consortium – UHC)

	Patients with Hypoglycemia	Patients without Hypoglycemia
Mean LOS Observed	14.79	6.74
LOS Index	1.47	1.00
% Death Observed	15.1	3.39
Mortality Index	1.4	0.85

VMC Hypoglycemia Task Force

- Shiv Patil, MD, MPH (Faculty, ECU Family Medicine)
- Sandra Hardee, PharmD, CDE (Diabetes Program Manager, VMC)
- Niti Armistead, MD (Faculty, ECU Internal Medicine)
- Meredith Hollinger, PharmD (Pharmacy Supervisor, VMC)
- Dustin Allis, MLS (ASCP), MPH, VMC Clinical Quality
- Kim Crickmore, PhD, RN (Vice President of Operations and Care Coordination, VMC)
- Robert J Tanenberg, MD (Faculty, ECU Endocrinology)

VMC Hypoglycemia Task Force Co-chairs Contact Info:

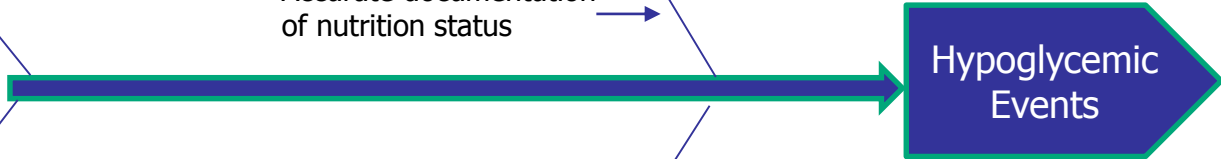
- Shiv Patil, patils@ecu.edu, 252-744-2451
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People

Nursing/ clinical inertia → Lack of knowledge re. need for nutrition documentation
Lack of insulin use knowledge → Compliance with hypoglycemia protocol
Lack of order set use knowledge → Lack of knowledge re. how to order carb controlled diet
Efficacy of automatically prescribing home meds vs. reassessing current needs →

Process

Lack of order set use → Timing of FSBS-insulin-meals
Provider:Provider communication → RN:Provider communication
RN:RN communication → PharmD:Provider communication
Point-of-care results visibility → Difficult transition from IV to SQ insulin
Accurate documentation of nutrition status → Multiple high-acuity patients on Endotool on one pod
Time constraints among practitioners



Patient

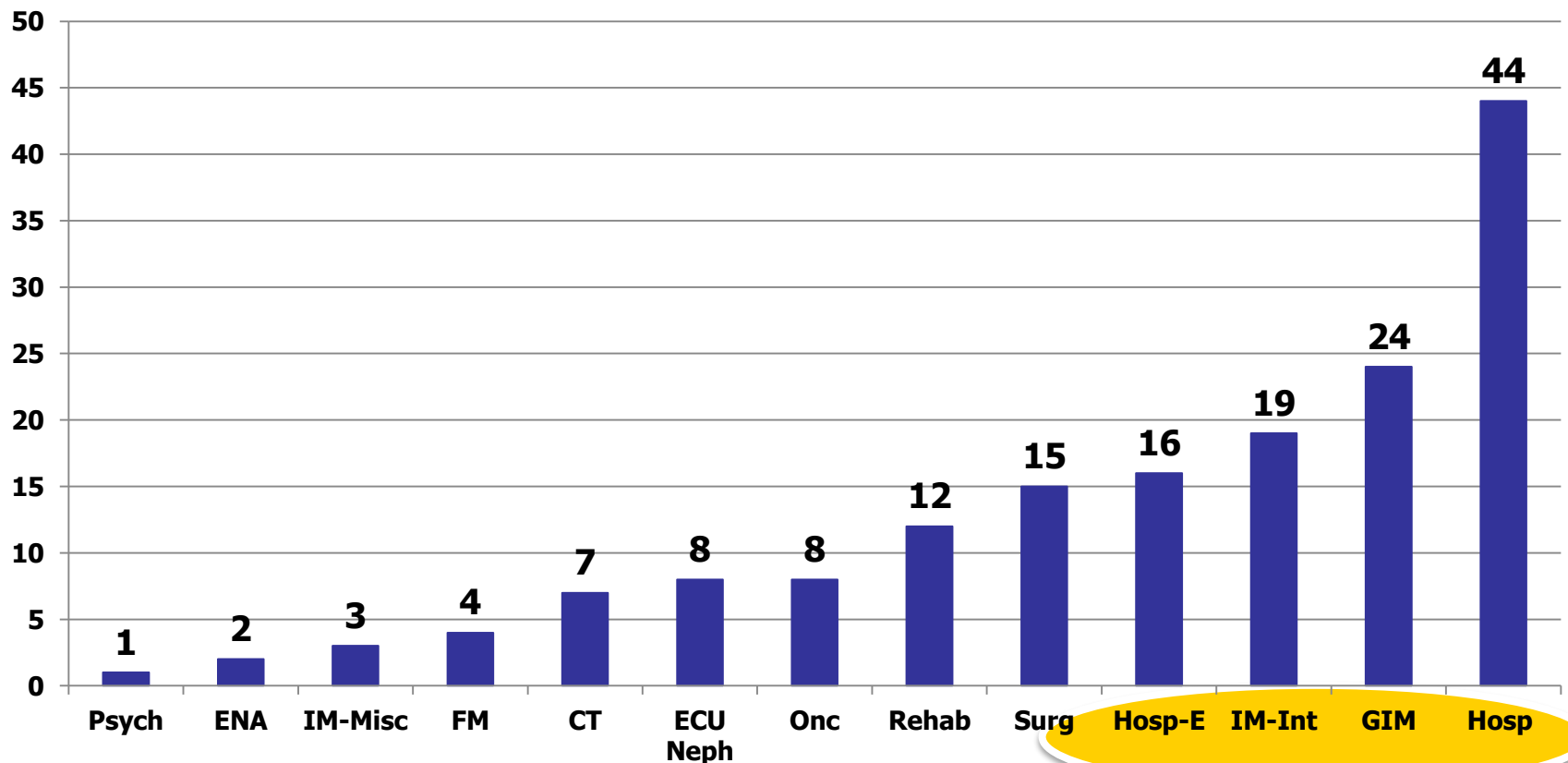
Pt communication of home insulin regimen → Pre-existing comorbidities (CKD, heart disease, glycemic control)
Pt non-compliance (diet, refusing meds, insistence on home meds) → Newly diagnosed pts with short stay/new diagnosis near discharge of long stay
Iatrogenic conditions (steroid tapering, NPO status etc.) →

Equipment

No process in EHR for flagging low blood sugars
Blood glucose monitor-EHR interface glitches
Optimal use of IV Insulin

Number of Hypoglycemia Events by Service (Blood Sugar <50 mg/dL)

Feb 1-Mar 31, 2014
n=163



AMS Hypoglycemia Strike Team

The AIM Statement

To decrease the number of validated severe hypoglycemic events (<50 mg/dL) on Adult Medical Services (AMS) by 25% by December 31, 2014 at Vidant Medical Center.

(Validated hypoglycemic events: Data on hypoglycemic events <50mg/dl was obtained by a daily report generated from EHR by the Diabetes Program Manager, a PharmD and CDE and subsequent chart review identified events occurred due to glucose-lowering medications.)

Measures of Success

Measure of Success	Baseline (April – June 2014)	Target	% Change Targeted
Validated Hypoglycemia Events	33/mo	25/mo	↓ 25%
Rate of Hypoglycemia	2.0%	1.5%	↓ 25%
Order Set Usage	38%	57%	↑ 50%
Hypoglycemia Protocol Compliance- Appropriate Treatment	40%	60%	↑ 50%
For all patients given insulin			
Mean LOS (days)	7.3	7.1	↓ 2.7%
Observed mortality	5.8%	5.3%	↓ 8.6%

- We also decided to compare these outcomes with non-AMS patients.

Improvement Strategies Employed

- 1) General Internal Medicine (GIM): Monthly case-based educational sessions emphasizing weight-based insulin dosing and order set usage for residents
- 2) Weekly review of hypoglycemic cases with hospitalists promoting peer education
- 3) Pharmacist monitoring of BG trends and making recommendations to the providers
- 4) Initiatives to improve hypoglycemia management protocol compliance by nursing
- 5) Promoting documentation of hypoglycemia in a safety event reporting system

Timeline

- April-June 2014: Baseline data collection
- July-September 2014: PDSA cycles of individual interventions
- October-December 2014: Evaluation of interventions

Outcomes

- GIM education intervention: An increase in use of insulin order set (OS) from 44% to 64% and a decrease in the number of validated hypoglycemia events from an average of 5 episodes per month to 3.67 per month.
- Hospitalist intervention group: Insulin OS use increased from a baseline of 38% to 58%, while the number of validated hypoglycemic events were reduced from 15 events per month to 7.3 per month.
- Clinical pharmacists intervention: Reviewed a total of 1,968 patient charts and intervened on 162 patients. The pharmacist recommendations were accepted 97% of the time by providers.
- Hypoglycemia protocol compliance group: Pre-intervention level of nurses' knowledge about hypoglycemia management was high (86%), with no change seen at post-intervention (88%). Overall compliance with providing appropriate treatment for hypoglycemia increased from 40% at baseline to 54% at the end of intervention period.
- Safety Intelligence reports of hypoglycemia: There were no Safety Intelligence reports of hypoglycemia by GIM physicians.

Change in order set use

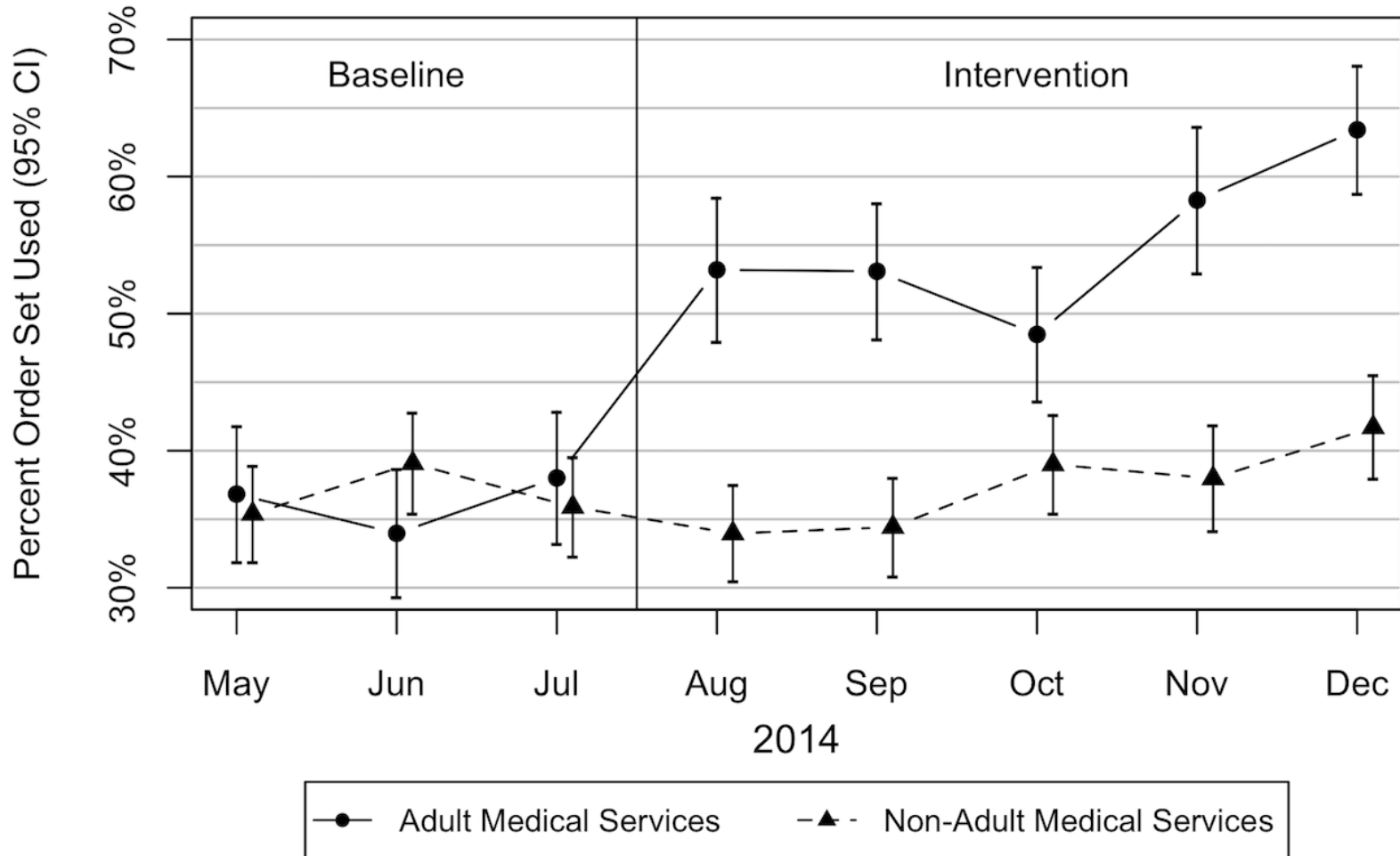
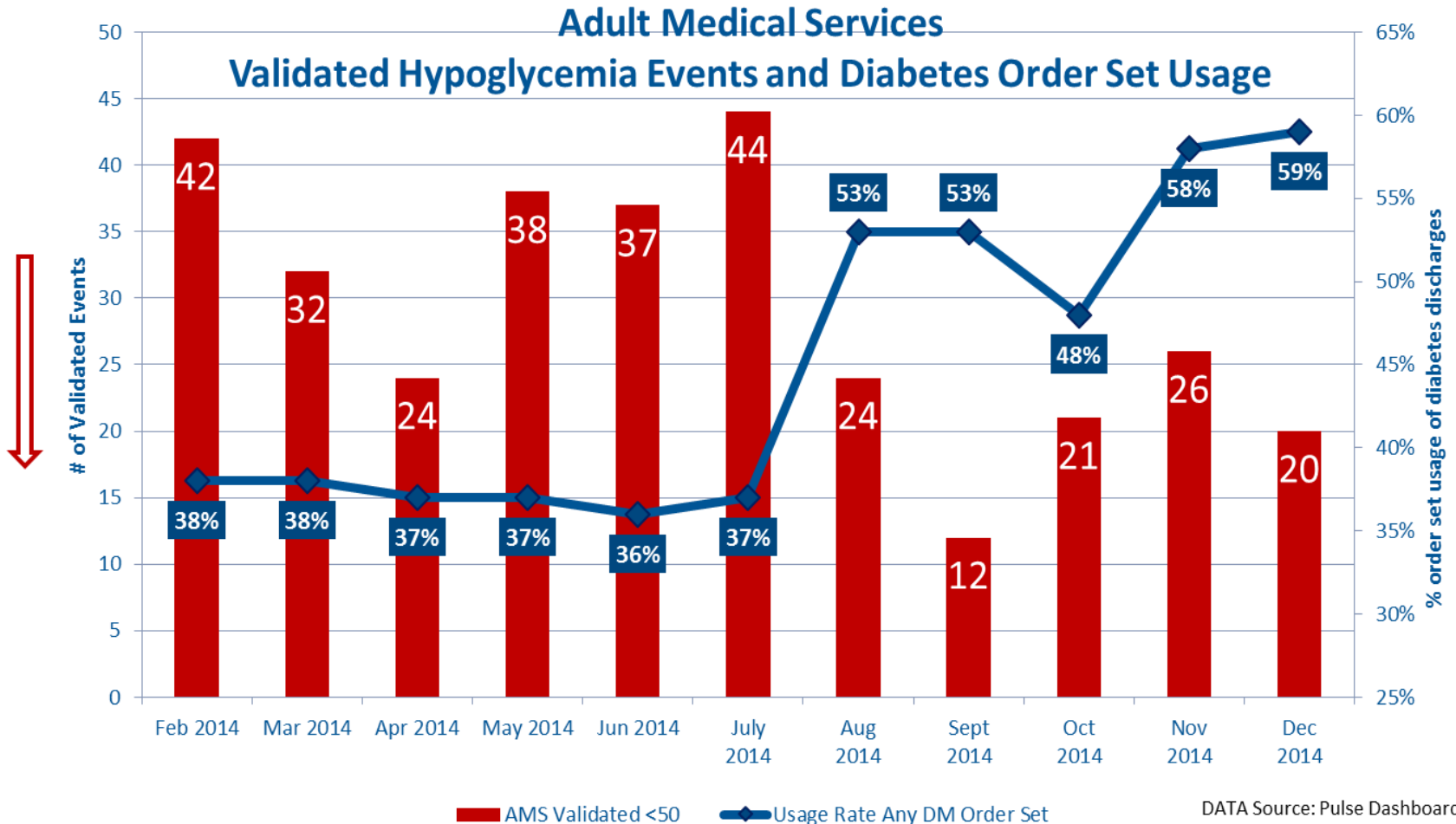


FIG. 1. Use of insulin order set.

Percentage insulin order set usage and number of validated hypoglycemia events <50 mg/dL



Outcome

Measure of Success	Baseline (April – June 2014)	Target	% change targeted	Results achieved (October – December 2014)	% change achieved
Validated Hypoglycemia Events	33/mo	25/mo	↓ 25%	22.3/mo	↓ 32%
Rate of Hypoglycemia	2.0%	1.5%	↓ 25%	1.2%	↓ 40%
Order Set Usage	38%	57%	↑ 50%	55%	↑ 45%
Hypoglycemia Protocol Compliance- Appropriate Treatment	40%	60%	↑ 50%	54%	↑ 35%
For all patients given insulin					
Mean LOS (days)	7.3	7.1	↓ 2.7%	6.7	↓ 8.2%
Observed mortality	5.8%	5.3%	↓ 8.6%	5.6%	↓ 3.5%

Outcome

Measure	AMS	Non-AMS	VMC
Decrease in hypoglycemia blood glucose < 50 mg/dL (% of diabetes patient days**)	0.7 (P <0.001*)	0.07 (p = 0.478)	0.34 (p < 0.001*)
Decrease in mean length of stay (days)	0.33 (p = 0.182)	0.16 (p = 0.631)	0.31 (p = 0.145)
Increase in hyperglycemia blood glucose > 250 mg/dL (% of diabetes patient days**)	1.43 (p = 0.007*)	0.92 (p = 0.026*)	1.06 (p = 0.003*)

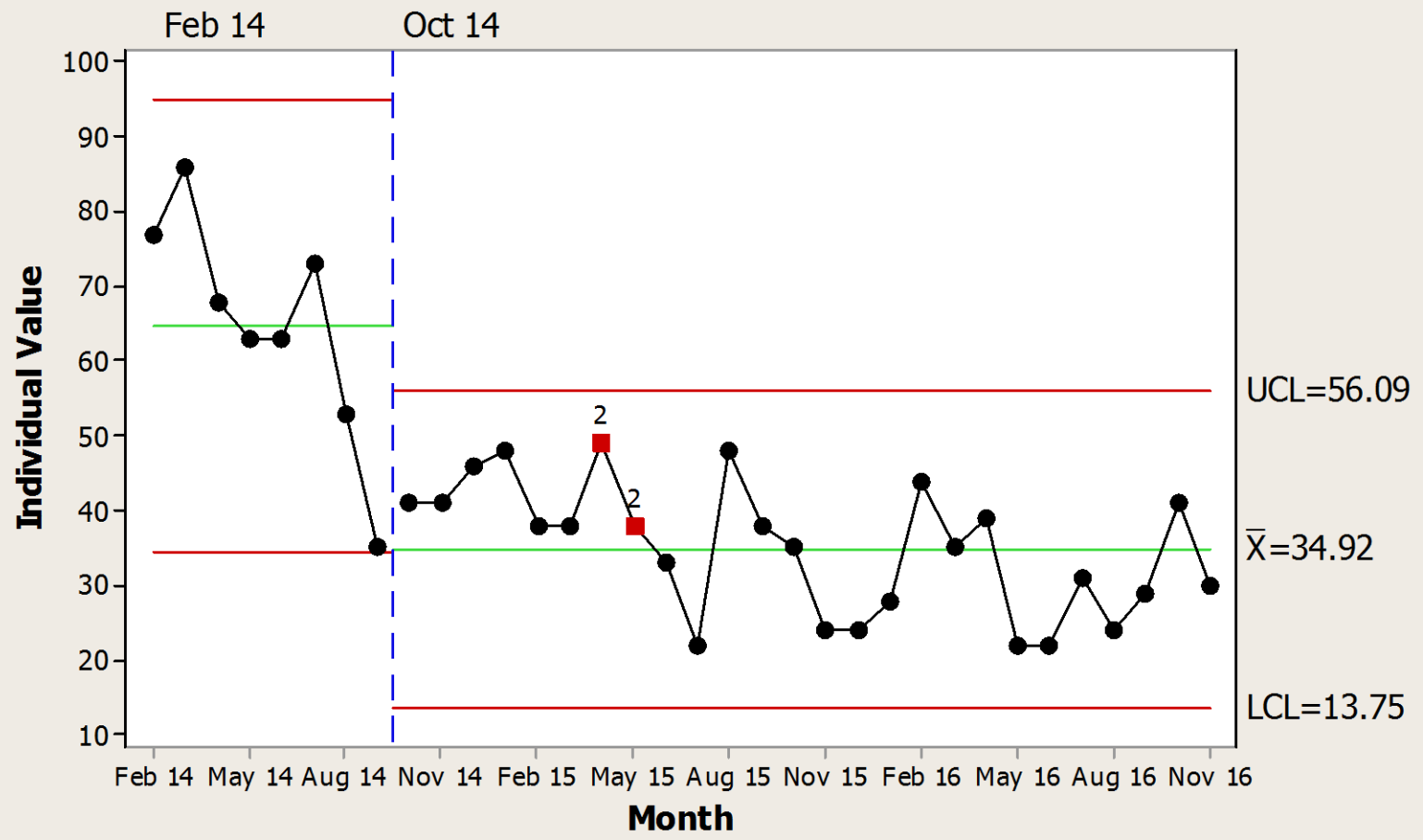
*Statistically significant ($p < 0.05$)

**Diabetes patient day: The presence of an admitted patient at midnight, who has a diagnosis of diabetes at discharge.

Acknowledgement: Thanks to Dr. Qiang Wu, Associate Professor of Biostatistics, ECU College of Allied Health Sciences for statistical analysis!

Sustainability

VMC-Validated Hypoglycemic Events <50mg/dl



Lessons Learned

- A multidisciplinary approach that combines provider education, feedback on use of order sets and quality data, as well as collaboration with pharmacists can drive improvement in safety and quality of patients being treated with insulin.
- This approach that leverages optimal use of the electronic health record with interdisciplinary collaboration and timely, meaningful feedback can be adapted to other services as well as other conditions to have a transformative impact on the safety and quality of care we deliver.

Challenges / Next Steps

- Continued monitoring and addressing hypoglycemia.
- We noted the need for preventing significant hyperglycemia while reducing hypoglycemia.
- Interventions are being designed / in process to address hyperglycemia (e.g. pharmacist intervention, psychological evaluation of young adults with type 1 diabetes with admissions for recurrent DKA etc.)

Thank You!

- VMC Diabetes Best Practice Steering Committee
- Afreen Shariff, Agnes Buckman, Al Anderson, Christina Brizendine, Ghiath Almasri, Greg Knapp, Heather Hall, Todd Lineberry, Kelly Rafferty, Mark Jacob, Maria Javaid , Mary Wilson, Michael Bard, Keosha Joyner, Rhoshanda Artis, Caroline Houston, Sri Radhakrishnan, Tammy Goda , Teresa Clark , Marilyn Williams, April Quidley, Eric Meyer, Vengamamba Polu

