

"The Evidence"

Research indicates that the mortality of patients undergoing open heart surgery with higher glucose levels have a significantly higher mortality

Define



D M A A I C Define

- Lack of consistent Glucose Control in postoperative cardiac surgery patients
- Root causes were varied
- Evidence-based practice to reduce or elimination of surgical infections
- Publicly reported measure
- Contributes to Value Based Purchasing Score

Define

D/M/A/I/C

"The Problem"



High Level **Process Map**

START: Patient Arrives to ICU From Surgery

- Initial Accucheck Done
- Patient Placed on Appropriate Protocol
- Accuchecks and Insulin Administration as Indicated
- Patient is Extubated and Starts on Liquids
- If diabetic, patient is given Lantus at 6am POD 1
- If applicable, drip is discontinued 2 hours after Lantus
- Patient transferred to Telemetry
- Patient is placed on Hospitalist Sliding Scale

END: Glucose Results 6am POD 2



Baton Rouge General Medical Center **Cardiac Glucose Control**

D M A D C

IMPROVE

					pathways		Baton Rouge	Check for ST General	
Baton Ro	□ cr uge General DRDER SHEET	neck for STAT	RX Patient Label	+	$4 \vee$		All orders must be written on this s Routine orders, telephone and/or ve ALLERGIES: ADMITTING DIAGNOSIS:	_ Time:	ted, timed a
e:// orders must be written o	Time:	l orders.	d timed and signed by the physician		Lise of Nov		PC Tr	OSTOP CAB/VALVE ICU INSUI ransition from Insulin Infusion to la TO BE USED WITH CAB/VA	LIN PROT nsulin Slid
LERGIES:	WEIGHT:		Pregnant/Lactating		vs. Regu	lar <	NON-DIABETIC PATIENTS: A. Discontinue insulin drip at 4a B. Do <u>NOT</u> give Lantus Insulin C. Accurchecks every 3 hours w	am on POD 1	B//alve IC
	POSTOP C		INSULIN PROTOCOL (Page 1 of	f 2)	Insulin		PIABETIC PATIENTS: the done at 4am on POD This protocol uses long-acting Has the guarage of the last eight	11 to assist in transition from infusion to g insulin	o sliding so
LEVEL 1		Do immediate Ac	ccucheck upon arrival to ICU.				Use the average of the last eight Use the form below to calculate *This worksheet must be filled Rate at 2100: unit(s)/	n nours of the insulin infusion rates to be the average insulin drip rate for the p d out in its entirety. /hour	o determin previous e
atients with	Blood Glucose Result 60 mg/dL or less	Novolog Give NO Insulin		in 15 minutes			Rate at 2200: unit(s)/ Rate at 2300: unit(s)/ Rate at 0000: unit(s)/ Rate at 0100: unit(s)/	/hour /hour /hour /hour	
140 mg/dL and Accuchecks - nours while _	61 to 110 mg/dL	Notify MD Give NO Insulin	extrose 50% in water) 25mi iv, recheck				Rate at 0200: unit(s)/ Rate at 0300: unit(s)/ Rate at 0400: unit(s)/	/hour /hour /hour	
in ICU	111 to 130 mg/dL 131 to 139 mg/dL 140 mg/dL or above	Give Novolog In: Give Novolog In:	sulin, 4 units, subcutaneous sulin, 6 units, subcutaneous		Clarified I	V	Sum of rates: Divided by 8 Average IV insulin rate:		
- /EL 2	Insulin Solution:	CAB/VALV	/E ICU Insulin Infusion		push for		Mark average IV insulin rate fr Select Drip Rate Average I O -	Drip Rate Lantus Dose 0.2 0	se for PO
tients with subsequent ucose of	1 unit of regular insulin/m with 0.9% sodium chloric	II in 0.9% sodium ch le at 10 ml per hour	loride in 100ml bag to be run in concurr	rent mode	bolus dos	es	0.3 · 0.61 · 0.61 · 1.01 · 1.01 · 1.26 · 0.61 · 0.6	- <u>0.6</u> 3 - 1.00 8 - 1.25 10 - 1.50 18	
IL or greater inue cks every	Blood Glucose Result I 60 mg/dL or less	Regular Insulin Bolus D50W 50ml	Based on subsequent blood glucose r Regular Insulin Infusion HOLD insulin infusion x 60 minutes ar	Rate nd check blood			1.51 1.76 2.26 2.26 2.26	- 1.75 22 - 2.25 26 - 2.50 32	
le patient rip.	61 to 79 mg/dL	0	glucose every 15 minutes until 80 mg Notify MD HOLD insulin infusion x 60 minutes ar	g/dL or greater			2.76 · 2.76 · 3.01 · 3.26 ·	- 3.00 42 - 3.25 44 - 3.50 48	
s not 20 mg per	80 to 110 mg/dL 111 to 130 mg/dL	0	0 units/hour 2 units/hour	Jul of greater	Eliminatio	n of	3.51 3.76 4.01 and	- 3.75 52 - 4.00 56 d greater Give 56 units, then call I	MD
is not - n 8 hours	131 to 150 mg/dL 151 to 180 mg/dL 181 to 250 mg/dL	0 2 units IV Push	3 units/hour 4 units/hour 5 units/hour		falling bo		Time Lantus dose administere Discontinue insulin drip at Lantus same dose next AM. A	ed: (on POD 1) (4 hours after Lantus g Administer at 2am on POD 2 to assist	jiven) t patient t
es not	251 to 300 mg/dL 301 to 350 mg/dL	6 units IV Push 10 units IV Push	6 units/hour 8 units/hour			5.	May hold second dose of Lan Once IV Insulin Infusion has bee If patient returns to insulin drip of	ntus (2am on POD 2) if current glucos en discontinued, return patient to Leve on POD 2, continue to give the 2am L	e level le el 1, CAE antus do
ey may 1.	351 to 400 mg/dL Greater than 400 mg/dL	15 units IV Push Notify MD	10 units/hour			6.	orders, ordered by physician, or Prior to transfer to the floor, atta PROTOCOL (MR-MSS-6839) and	r meets criteria according to accuche ach Baton Rouge General POST CAB Id check off average drip rate and app	cks. / VALVE 1 propriate
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Interdisciplinary **Team Work Out**



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Scale			
tus dose. s.			
m and POD 2 at 2am. Inded Novolog Sliding Scale			
LOW			
HIGH			
o home regimen (bedtime use) 10 mg/dL U Sliding Scale while patient re scontinue drin when patient ce	emains in ICU		
RY SLIDING SCALE Sliding Scale.	120		









DMAIC

nalyze

Chi Square

Variable	Data Type	Statistically Significant?	p value	Practically Significant?
6am Lantus	Discrete	YES	Chi Square: 0.011	YES
			N/A (small n size, but 63%	
POD 2	Discrete	YES	of fallouts occur on day 2)	YES
Diabetic	Discrete	YES	Chi Square: 0.00	YES
2am AC on POD 1	Discrete	YES	Chi Square: 0.011	YES
Additional MD orders	Discrete	YES	Chi Square: 0.022	YES
Protocol followed from Arrival in ICU-6am POD 1	Discrete	?	Chi Square Inconclusive	YES
6am Lab	Discrete	NO	Chi Square: 0.579	NO
2am AC on POD 2	Discrete	NO	Chi Square: 0.246	NO
1st BG w/in 1 hr	Discrete	NO	Chi Square: 0.395	NO
DC Drip 2hrs	Discrete	NO	Chi Square: 0.423	NO
ICU LOS	Discrete	NO	Chi Square: 0.339	NO
Protocol followed from 6am POD 1-6am POD 2	Discrete	NO	Chi Square: 0.156	YES

Analyze

Root Causes

- Lantus was not given at recommended time or dose Recommended dose was not AACE recommendations • The ICU protocol was confusing & open to interpretation Hospitalist scale was not effective on Telemetry • Documentation of bolus doses was incomplete; the workflow was not user friendly
- Variation in insulin ordering practices of consulting MDs Knowledge deficits
- glucose control importance in this population
- lead to hesitation to give Lantus in recommended dose

Results CONTROL Percent of CABG/Valve Patients with Controlled Postoperative Glucose Implemented new protocols and 100.00% processes in February 97.60% 95.00% 90.00% Continue to work 85.00% closely with 85.45% interdisciplinary team 80.00% Post Improv for continued n=55 n=214 improvement DPMO Sigma Score Total Compliant Improved Sigma and DPMO 47 8 55 145,455

23,364 3.49

214

**2-sample % defective, p=0.001