

ASCO's Quality Training Program

Reducing Morning Hypoglycemia in Children Undergoing Treatment for ALL

Christine Bolen, MD

Ashraf Mohamed, MD

Jennifer Morgan, MSN, RN, CPON

Patricia Rice, BSN, RN, CPHON

St. Jude Children's Research Hospital, Memphis, TN

The Children's Hospital at Saint Francis, Tulsa, OK

Novant Health Hemby Children's Hospital, Charlotte, NC

July 12-13, 2017

Institutional Overview St. Jude Affiliate Program

- A network of 8 pediatric hematology-oncology clinics, hospitals, and universities united to extend the mission of St. Jude.
- Serves as a referral base to St. Jude for patients eligible for protocol-based care.
- Serves as a site where care can be administered to the patient close to home enabling more children to benefit from the care and benefits of St. Jude.
- Collaborates with staff of St. Jude to deliver protocol related care to pediatric oncology patients.
- St. Jude Benefits = 437 accruals on trials from the affiliates thru 2.27.17



Institutional Overview Charlotte



Institutional Overview Tulsa



Hospital	Affiliate Clinic at Novant Health Hemby Children's Hospital	The Children's Hospital at Saint Francis is located in Tulsa, Oklahoma
Care Region	Greater Charlotte	Tulsa and throughout eastern Oklahoma as well as neighboring states.
Affiliation	Presbyterian Medical Center which is a community based non-teaching hospital.	An academic center associated with the University of Oklahoma and Oklahoma State University
Staff	4 physician providers, 3 nurse practitioners, 7 full-time nurses, two full-time child life, a pediatric counselor, and a LCSW.	3 physicians, 1 nurse practitioner, 7 registered nurses, a pharmacist, a child life specialist, a pediatric psychologist and a LCSW.
Volume	over 5000 patient visits per year and has typically 40 new diagnoses of children with cancer per year.	over 4000 patient visits a year with an average of 60 newly diagnosed oncology patients a year.

Problem Statement

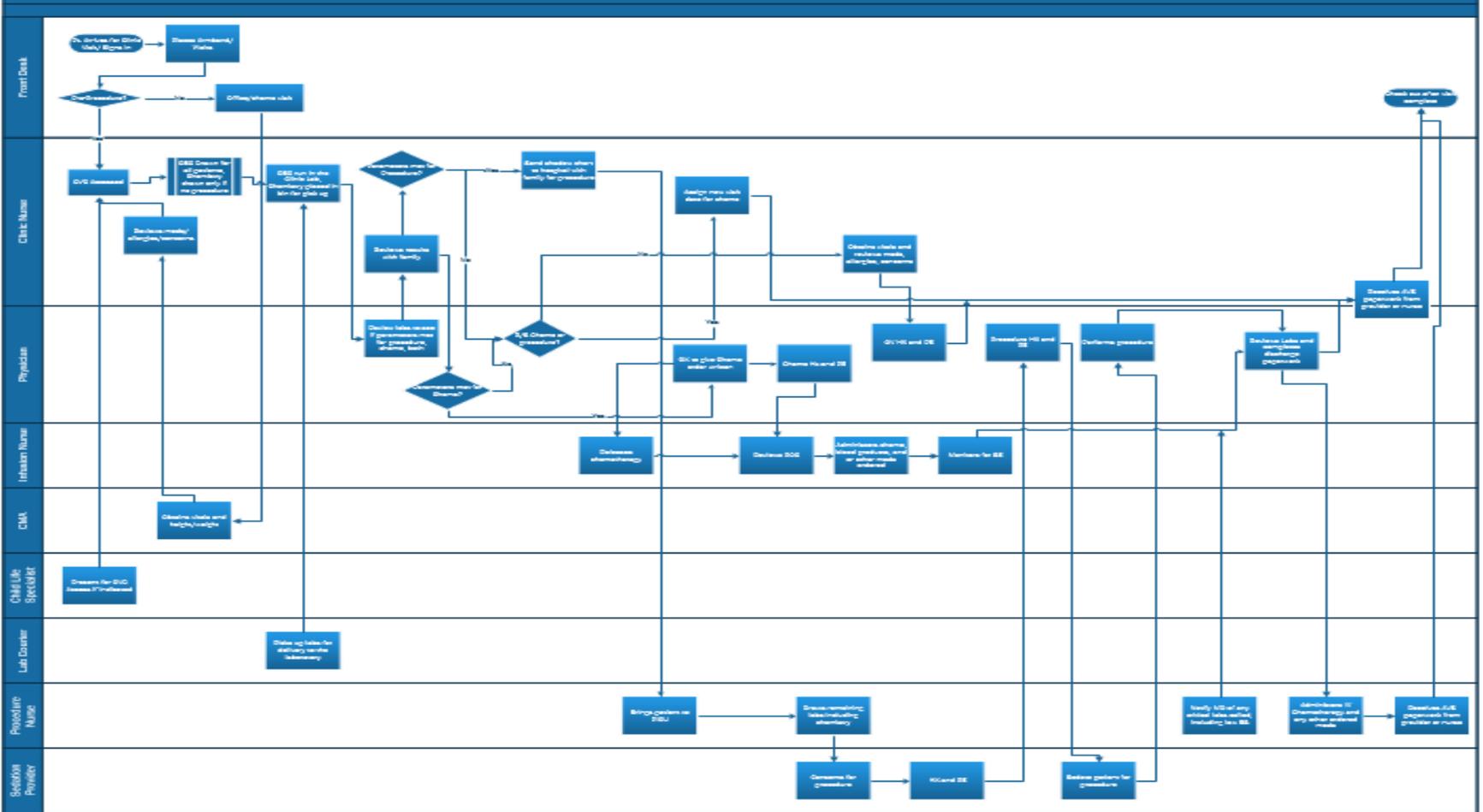
32% of children on therapy for ALL at the Charlotte and Tulsa St. Jude affiliates experienced morning hypoglycemia based on a clinic blood sugar result of <70 mg/dl between January and March 2017 putting patients at risk of symptomatic hypoglycemia and corresponding procedure delays, increased resource utilization, decreased patient satisfaction and risk for adverse cognitive outcomes.

Team Members

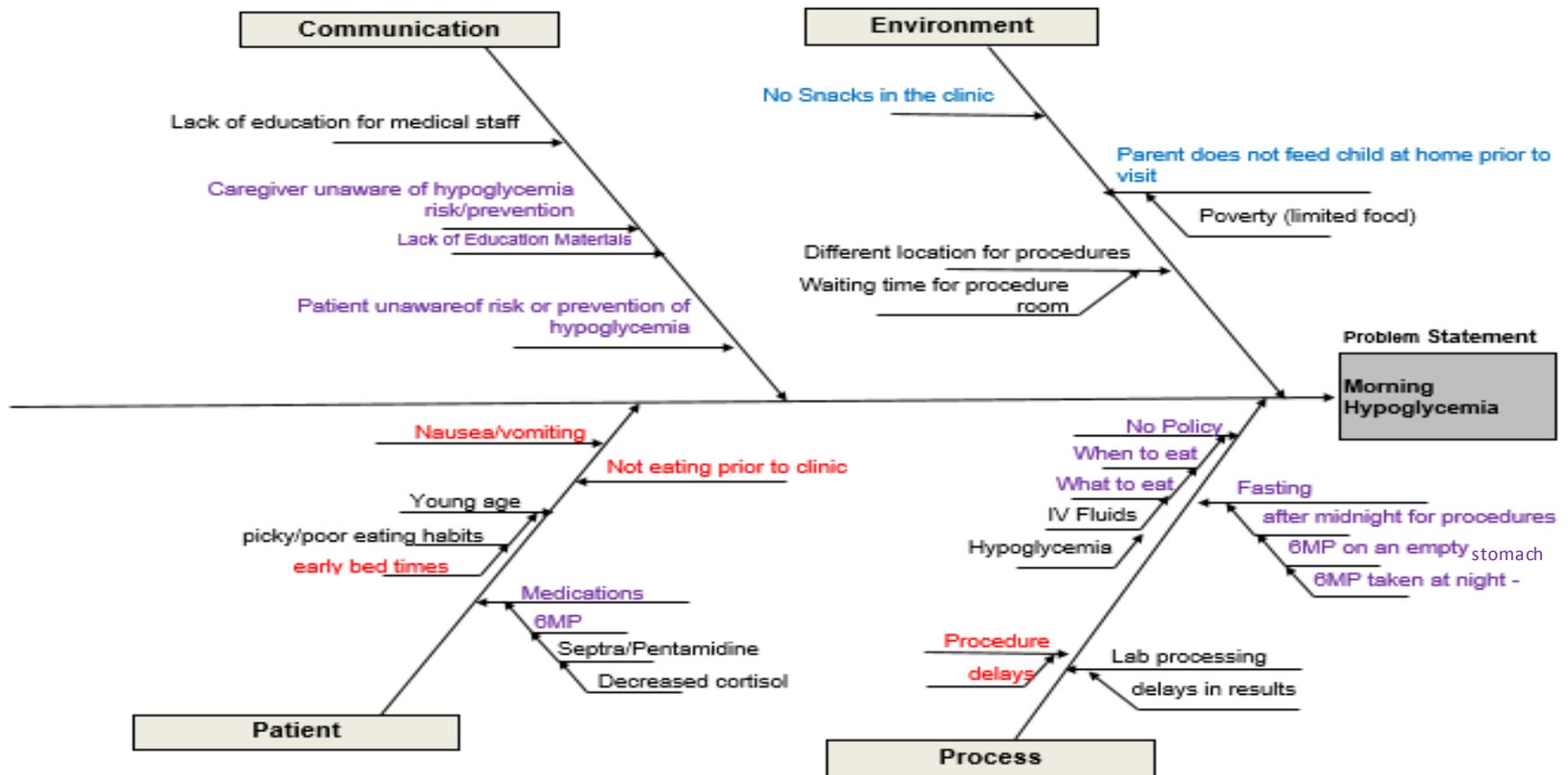
Project Team Members and Roles		
Role	Name	Job Function
<i>Project Sponsor[#]</i>	Caroline Russo	Team support – resources and implementation
<i>Team Leader[†]</i>	Dr. Ashraf Mohamed	Oversee the completion of the QTP project – Tulsa team leader
<i>Core Team Member[*]</i>	Dr. Christine Bolen	Charlotte team leader
<i>Core Team Member[*]</i>	Patricia Rice	Tulsa team
<i>Facilitator</i>	Jennifer Morgan	Team member who facilitates the team meetings to optimize group processes.
<i>Other Team Member[^]</i>	Meredith Speas	Charlotte clinic nurse
<i>Other Team Member[^]</i>	Lena Gleaton	Charlotte procedure nurse
<i>Other Team Member[^]</i>	Beth Benjamin	CMA for Charlotte
<i>Other Team Member[^]</i>	Suzanne Boyd	Tulsa Clinical Pharmacist
<i>Other Team Member[^]</i>	Rusty Wilson	Tulsa Nurse Tech/procedure coordinator
<i>Other Team Member[^]</i>	Teri Caldwell	Tulsa Inpatient/Outpatient Nurse Liaison
<i>Other Team Member[^]</i>	Rhonda Speyer	Tulsa Clinic Director
<i>Patient/ Family Member</i>	Heather Snyder Megan McKinney	Charlotte Leukemia patient parent Tulsa Leukemia patient parent
<i>QTP Improvement Coach</i>	Stephanie Amport	Provides remote support to the team regarding the science of quality improvement and participation in the QTP.

Charlotte Process Map

Charlotte Hypoalbuminemia in ALL Patients



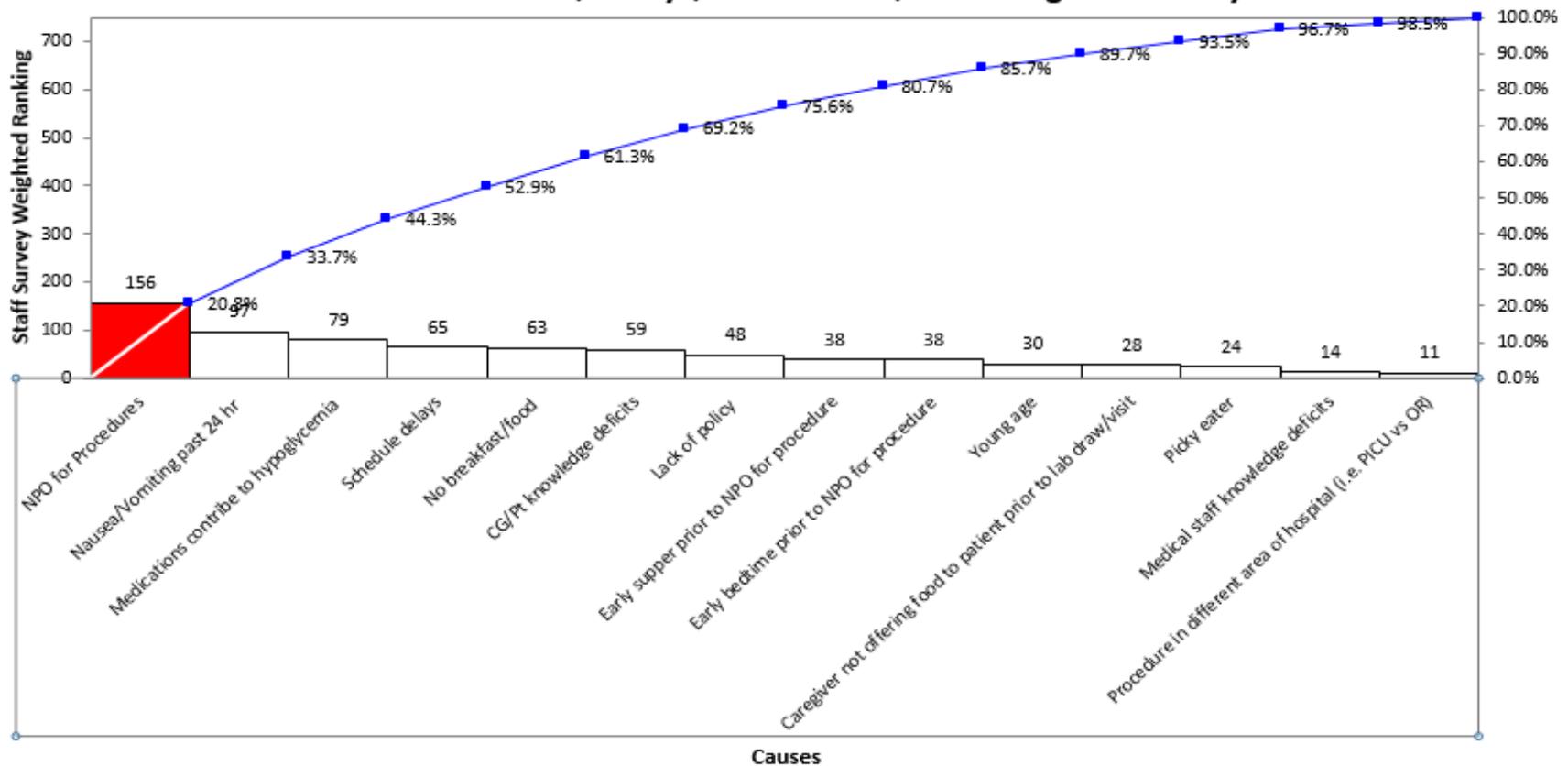
Cause & Effect Diagram



Top Causes based on Survey Results: Staff, Parent, Common in Both

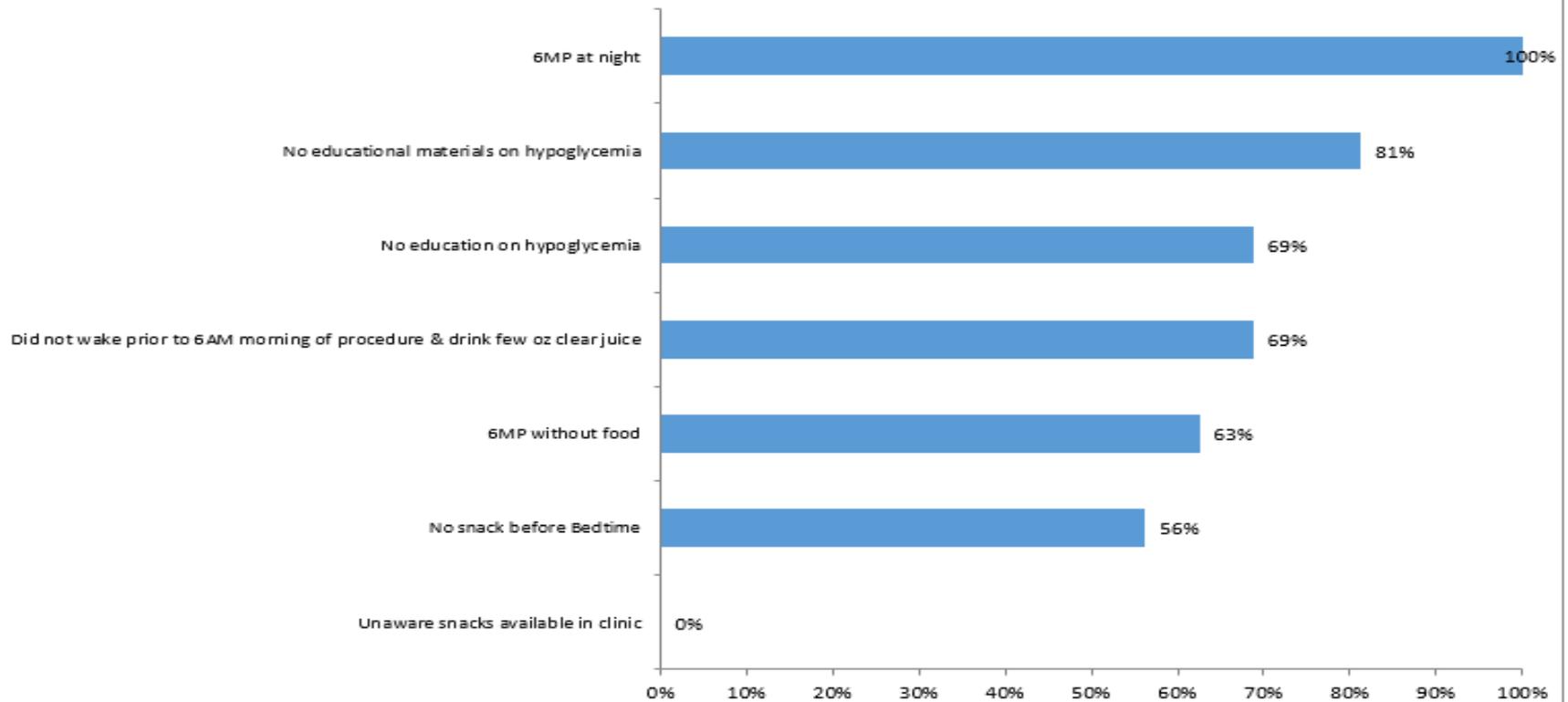
Diagnostic Data Staff Survey

Top causes of morning hypoglycemia per staff are related to NPO, Nausea/Vomiting, Medications, Delays, Lack of food, Knowledge and Policy



Diagnostic Data Patient Survey

**Giving 6MP at night, without food and lack of education are the top gaps per patient/parent questionnaire regarding knowledge of morning hypoglycemia and prevention.
(n=16)**



Aim Statement

By October, 2017, reduce morning hypoglycemia (blood sugar less than 70 mg/dl) in children on therapy for ALL at the Charlotte and Tulsa St. Jude affiliates by 50%.

Materials Developed

Staff survey on potential causes of morning hypoglycemia

1. In your opinion, what are the most common causes of morning hypoglycemia for patients with Acute Lymphoblastic Leukemia (ALL) in the medical setting? Please select five choices and rank them 1st through 5th (i.e. 1st choice = top choice, 5th choice = last choice).

	First choice	Second choice	Third choice	Fourth choice	Fifth choice
Caregiver/patient unaware of hypoglycemia risk/prevention	<input type="radio"/>				
Patient refuses breakfast/food prior to lab draw/visit	<input type="radio"/>				
Caregiver not offering food to patient prior to lab draw/visit	<input type="radio"/>				
Patient has had nausea or vomiting within past 24 hours prior to lab draw/visit	<input type="radio"/>				
NPO for a procedure	<input type="radio"/>				
Delay in a scheduled procedure (i.e. sedated LP)	<input type="radio"/>				
Procedure in different area of hospital (i.e. PICU vs OR)	<input type="radio"/>				
Medical staff uneducated on symptoms/risk of hypoglycemia	<input type="radio"/>				
Lack of policy for procedural hypoglycemia prevention (when to eat, what to eat)	<input type="radio"/>				
Patient currently on medications contributing to hypoglycemia (6MP, sepra, pentamidine)	<input type="radio"/>				
Young age	<input type="radio"/>				
Early bedtime prior to being NPO for procedure	<input type="radio"/>				
Early supper prior to being NPO for procedure	<input type="radio"/>				
Picky eater	<input type="radio"/>				

Parent survey to assess the current state process

Patient/ Parent Questionnaire

1. Did you receive any education on hypoglycemia (Low Blood Sugar)?
Yes ___ No ___
2. Did you receive any educational materials on hypoglycemia? Yes ___ No ___
3. Are you aware that snacks are available in the clinic for patients? Yes ___ No ___
4. When your child is scheduled for a procedure, do you wake the child up prior to 6 am the morning of the procedure and have your child drink few ounces of clear juice?
Yes ___ No ___
5. When do you usually give your child 6MP? am ___ pm ___
6. Do you usually give 6MP with food? Yes----- No -----
7. If the answer is No to Q#6, how far from meal or snack do you give 6MP? 1 h --- 2h
8. Do you give your child 6MP to take at night? Yes ___ No ___
9. Do you give your child a snack before bedtime? Yes ___ No ___

Outcome Measures

- Outcome Measure: % morning hypoglycemic episodes (BS < 70 mg/dl)
- Patient population: Pediatric ALL patients on treatment seen in the Tulsa and Charlotte St. Jude Affiliates and had glucose level drawn.
- Calculation methodology:
 - Numerator: Number of hypoglycemic episodes (BS < 70 mg/dl)
 - Denominator: Number of patients on treatment for ALL
- Data source: Epic patient medical record review of lab results.
- Data collection frequency: Monthly
- Data quality limitations: A single patient can have multiple episodes of hypoglycemia in 1 month.

Process Measures 1

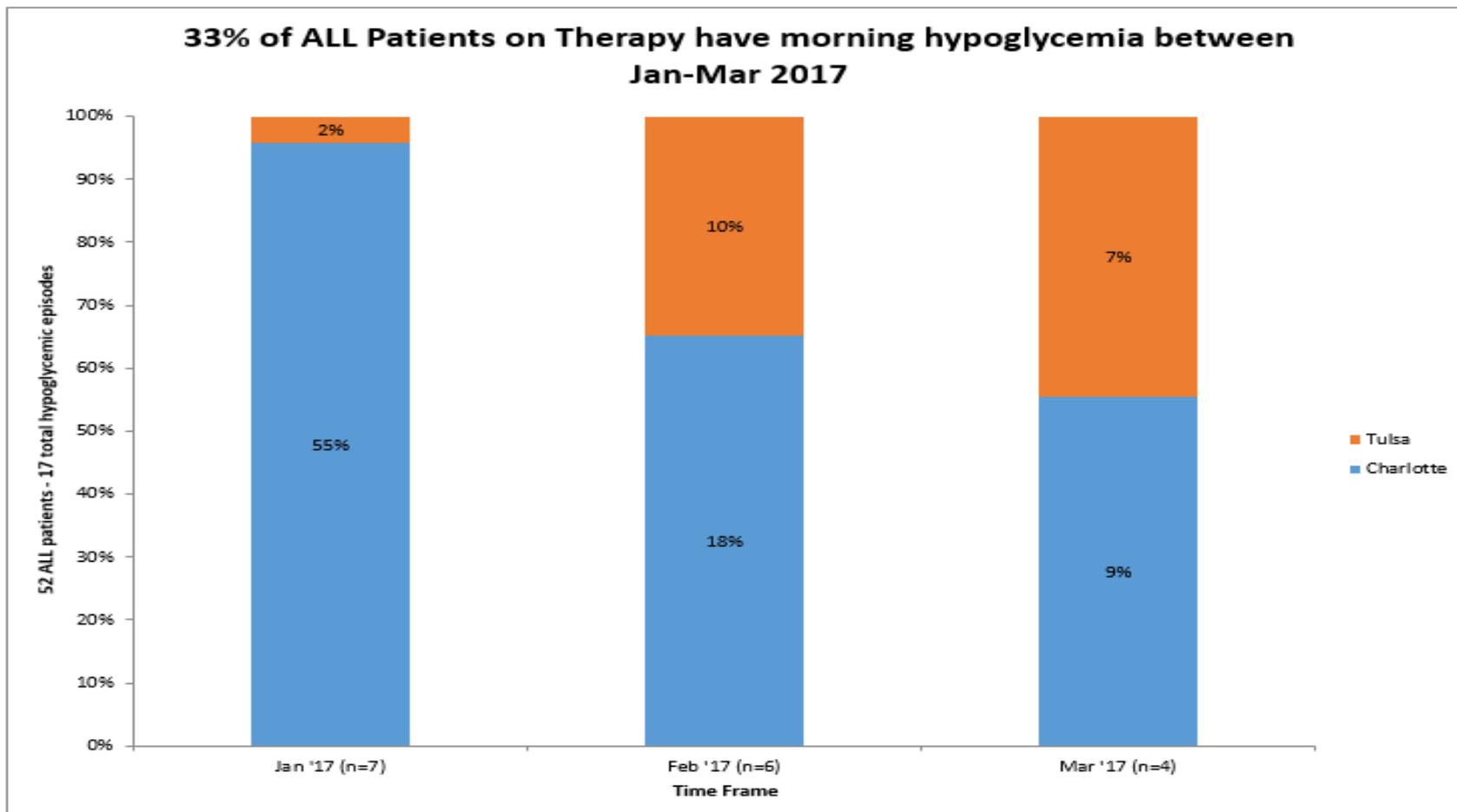
- Process Measure 1: % ALL patients on treatment who received hypoglycemia prevention education by the clinic nurse.
- Patient population: Pediatric ALL patients on treatment seen in the Tulsa and Charlotte St. Jude Affiliates.
 - Exclusions: Multi-day treatment patients will not receive hypoglycemia prevention education every time.
- Calculation methodology:
 - Numerator: Number of patients who received hypoglycemia prevention education
 - Denominator: Number ALL Patients that had blood glucose drawn that month
- Data source: Epic patient medical record review of patient education documentation.
- Data collection frequency: Monthly
- Data quality limitations:

Process Measures 2

- Process Measure 2: % ALL patients on treatment and/or their caregivers who demonstrate knowledge of morning hypoglycemia causes and prevention.
- Patient population: Pediatric ALL patients on treatment seen in the Tulsa and Charlotte St. Jude Affiliates.
- Calculation methodology:
 - Numerator: Number of patients/caregivers who demonstrate knowledge hypoglycemia prevention education
 - Denominator: Number of patients on treatment for ALL
- Data source: Patient/Caregiver survey regarding knowledge of morning hypoglycemia and prevention.
- Data collection frequency: Prior to implementation of education, one month after receiving education, and then again in September 2017.
- Data quality limitations: Same caregiver may not accompany the patient each visit.

Baseline Data (Jan - Mar 2017)

33% of ALL Patients on Therapy have morning hypoglycemia between Jan-Mar 2017



Priority Matrix

Solutions to prevent morning hypoglycemia

<p>Unclear 6MP Guidelines</p> <p>Lacking Education</p> <p>Med Side Effects</p> <p>Impact</p>	<p>HIGH</p> <p>Remind patients prior to procedure how to prevent hypoglycemia by RN/MD</p> <p>Reinforce 6MP does not need to be taken at night on empty stomach by RN/MD</p>	<p>Create brochure with risks and preventions for hypoglycemia for patients/families</p> <p>Improve documentation regarding hypoglycemia education to identify teaching was done</p> <p>Educate what type food to eat when taking 6MP by RN/MD</p> <p>Improve assessment/management of patient's N/V by RN/MD to increase desire to eat</p>
	<p>LOW</p>	<p>Have patients take their blood glucose levels at home</p>
	<p>LOW</p>	<p>HIGH</p>
	<p>Effort</p>	

ACTION PLAN FORM (PDSA Cycle 1)

Practice/Institution: St. Jude Affiliate Program

Dept./Unit: Charlotte, NC and Tulsa, OK Affiliates

Project AIM: Reduce morning hypoglycemia (blood sugar less than 70 mg/dl) in children on therapy for ALL by 50%.

Changes to Test and Implement to Reach Your Aim:

1. Finalize education tool and process for education
2. Educate all staff on patient education process for hypoglycemia risks/prevention
3. Develop data collection tools/plan to assess education process
4. Determine measure of decreasing hypoglycemic episodes

Measure(s) to Monitor Progress:

1. % ALL patients on treatment and/or their caregivers who demonstrate knowledge of morning hypoglycemia causes and prevention
2. % ALL patients on treatment who received hypoglycemia prevention education by the clinic nurse
3. % Hypoglycemic episodes per patients with ALL on treatment.

Change #	PDSA Cycle Start and End Dates	Plan for Testing Each Change/Intervention Describe what you will need to do: a) Get ready to test this change b) How will you carry out the test (include prediction)	Action Steps	Summary of Results
1.	June 1, 2017 Sept 29, 2017	<ol style="list-style-type: none"> 1. Brochure on hypoglycemia risks and prevention 2. Educate clinical staff to reinforce hypoglycemia education prior to procedures requiring fasting 3. Educate clinical staff regarding 6MP guidelines 4. Educate clinical staff regarding documentation of education for hypoglycemia in EMR 5. Define hypoglycemia education process for who will educate the patient/family and when 	1. Charlotte: Completed brochure Aug., 2017. Tulsa: Completed brochure Sept., 2017 2-4: PowerPoint, email and flyers were used to educate staff in Charlotte Aug., 2017 and Tulsa did the same in Sept., 2017.	Brochure: content same, format flexible.
2.	August 1, 2017 Sept. 29, 2017	<ol style="list-style-type: none"> 1. Educate Clinical Staff who will complete the teaching 2. Educate Clinical Staff when the teaching should take place 3. Educate Clinical Staff what should be documented for education and where in Epic 4. Disseminate information via staff meetings and email 	Charlotte: NPs and MDs in the clinic will be completing the education and documenting with a "dot" phrase in Epic. Tulsa: Created "dot" phrase for education documentation.	Ensure "dot" phrase is consistent.
3.	Sept. 1, 2017 Oct. 31, 2017	<ol style="list-style-type: none"> 1. Chart review for ed. Documentation <ol style="list-style-type: none"> a. Review charts after start of patient education 2. Parent/Patient Survey to assess knowledge level of hypoglycemia 	Charlotte to review 11 ALL patient charts for proper patient/parent education for Sept. 1-29, 2017. Charlotte sent knowledge assessment survey to parents Sept. 20-29, 2017	
4.	September 1, 2017 October 31, 2017	<ol style="list-style-type: none"> 1. Review hypoglycemic episode data from April to June 2017 <ol style="list-style-type: none"> a. determine numerator and denominator 2. Continue review of hypoglycemic episodes after start of education 	Charlotte's pt. education process began 9/1/2017, Tulsa's pt. education process began 10/1/17.	

Charlotte Hypoglycemia Education Brochure

SIGNS & SYMPTOMS OF LOW BLOOD SUGAR

Nausea/Vomiting

Irritability

Drowsiness

Headache

Sweating

Trembling

Blurry Vision

Pale Skin Color

Confusion

St. Jude Affiliate Clinic
at Novant Health
301 Hawthorne Lane
Suite 100
Charlotte, NC 28204

Phone: 704-384-1900
Fax: 704-384-1919

Prevent the
CRASH!



The Adventures of *Sugar Girl* and Her Fight Against Low Blood Sugar



Learn about causes of low blood sugar...
And ways to avoid it.



Fighting Low Blood Sugar

Low blood sugar, or hypoglycemia, has been linked to patients currently taking an oral chemo called 6MP. Low blood sugar can also occur when a patient has been fasting for greater than 10 hours (such as prior to a procedure). Patients less than 6 years old are at greater risk for hypoglycemia.

Sugar Girl will show you a few easy ways to combat low blood sugar!

6MP UPDATE

6MP/Mercaptopurine does NOT have to be taken on an empty stomach

If tolerated, 6MP can be given in the morning to help prevent low blood sugar

6MP should be given every day at the same time of day, as directed by your doctor

NPO STATUS UPDATE

Clear liquids will be allowed up to 2 hours prior to scheduled procedure (example: LP, bone marrow)

Small amounts of a clear liquid, such as 1/2 cup, is preferred

Clear liquids include apple juice, water, Sprite/Ginger Ale, Gatorade/Powerade, and even popsicles

To prevent low blood sugar in the morning, it is recommended to eat complex carbs for dinner or snack prior to bedtime

Complex carbs are digested more slowly, which allows the sugar in the blood not to drop as low

LIST OF COMPLEX CARBS

Oatmeal

Brown Rice

Whole Wheat Bread/Pasta

Whole Grains

Corn

Quinoa

Beans

Sweet Potato

Apples/Oranges/Melon/Strawberries

Milk

Yogurt

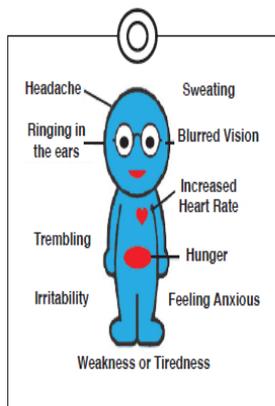


Sugar Girl is feeling great with her belly full of complex carbs

Tulsa Hypoglycemia Education Brochure

Signs and Symptoms of Low Blood Sugar

- Nausea/Vomiting
- Irritability
- Drowsiness/tiredness
- Headache
- Sweating
- Shakiness
- Blurry Vision
- Pale Skin Color
- Confusion
- Sluggish in morning upon waking



Prevent the



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The Adventures of *Sugar Hero* and the Fight Against Low Blood Sugar



Learn about the causes of low blood sugar - *And ways to avoid it!*



Fighting Low Blood Sugar

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Sugar Hero will show you a few easy ways to combat low blood sugar!

Things We Can Do to Help Prevent Low Blood Sugar

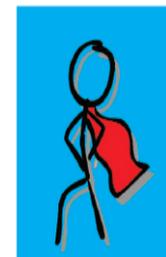
1. Eat a late dinner, to include complex carbs, the night before a sedated procedure.
2. Go to bed later and eat a snack before bed (ex. ½ a peanut butter sandwich).
3. Wake up early (at 6 a.m.) and give 6 oz. of clear juice like apple juice, cranberry juice, or Sprite/Ginger Ale.
4. Give 6MP daily, in the morning, to prevent low blood sugar overnight.

Mercaptopurine Update

- Mercaptopurine/6MP does **NOT** have to be given on an empty stomach.
- It is very important to take 6MP **at the same time**, either every day or as directed by your doctor.
- Sticking to the **same schedule, at the same time**, is your child's key to successful therapy!

List of Complex Carbs

- Oatmeal
- Brown Rice
- Whole Wheat Bread/Pasta
- Whole Grains
- Corn
- Quinoa
- Beans
- Sweet Potato
- Apples, Oranges, Melon, Strawberries, Apricots, Bananas
- Milk
- Yogurt
- Bran Muffin
- Granola
- Tortillas
- Popcorn



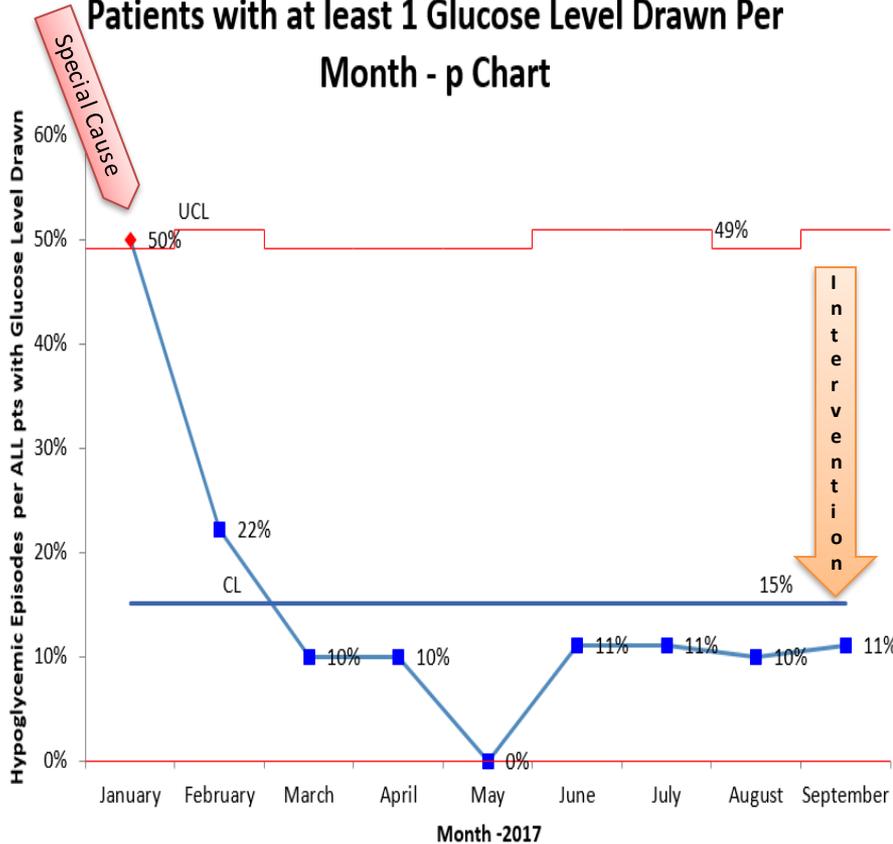
Sugar Hero is feeling great with a belly full of complex carbs.

Education Documentation dot phrases

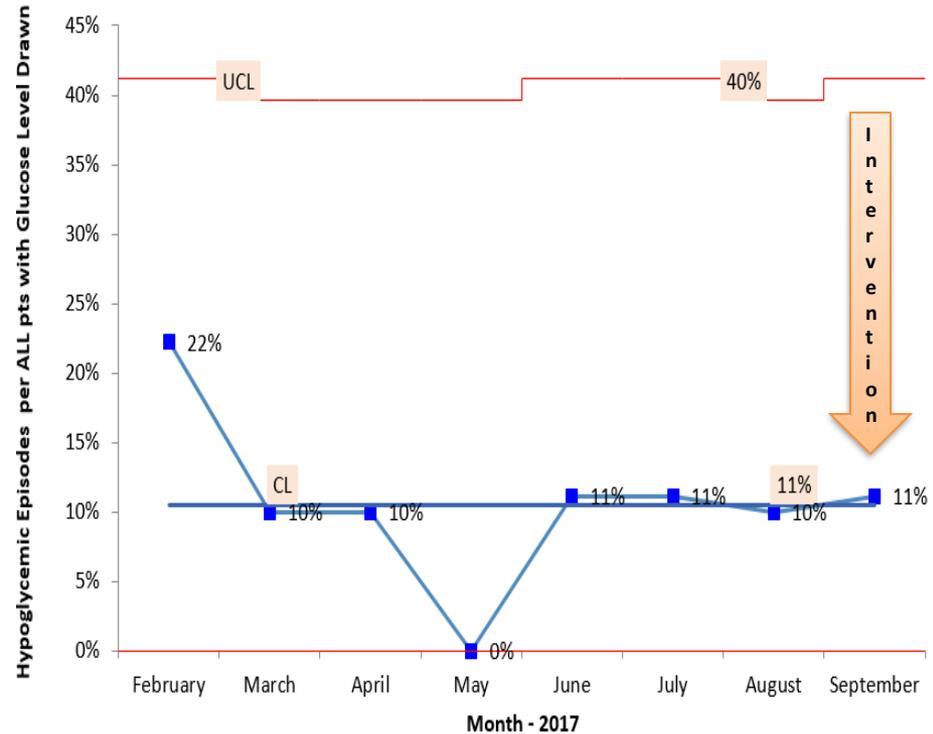
- For the standardization of patient education and documentation of education, a dot phrase was created to use with Epic medical record software in both Charlotte and Tulsa.
 - Reviewed time for NPO prior to procedure. Patient may have clear liquids up until two hours prior to procedure. To prevent low blood sugar in the morning, it is recommended to eat complex carbs for dinner or snack prior to bedtime.
 - Provided family with brochure educating on the signs and symptoms of hypoglycemia as well as recommendations for 6MP administration. Reviewed updates on 6MP administration with family to include that it may be given with food and it may be given in the morning.

Change Data - Charlotte

Charlotte - % of Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month - p Chart

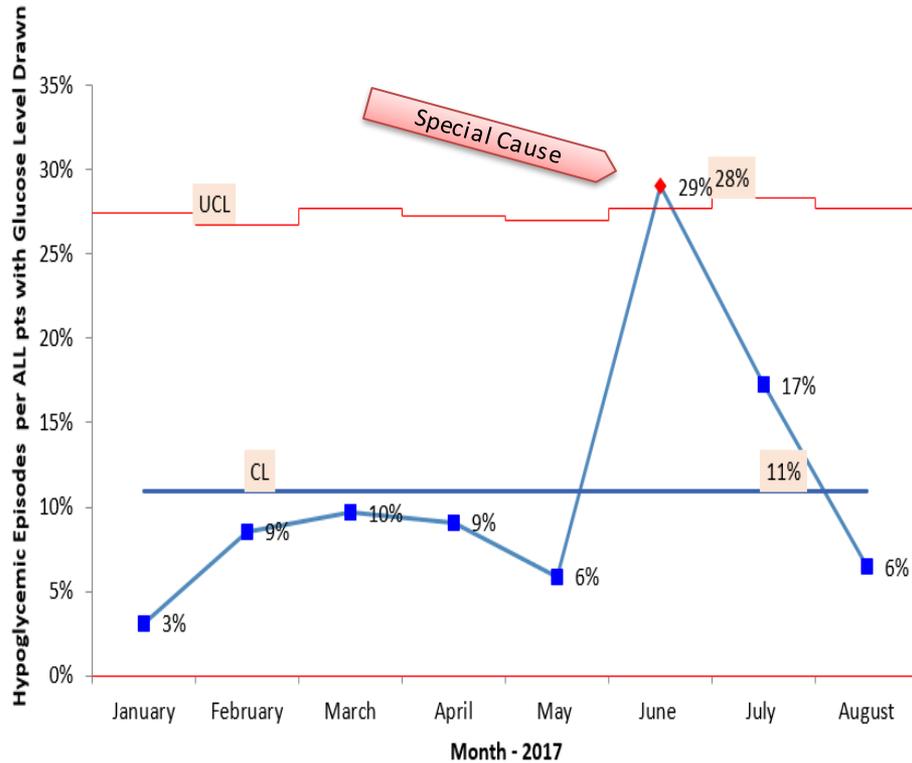


Charlotte - % Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month - p Chart

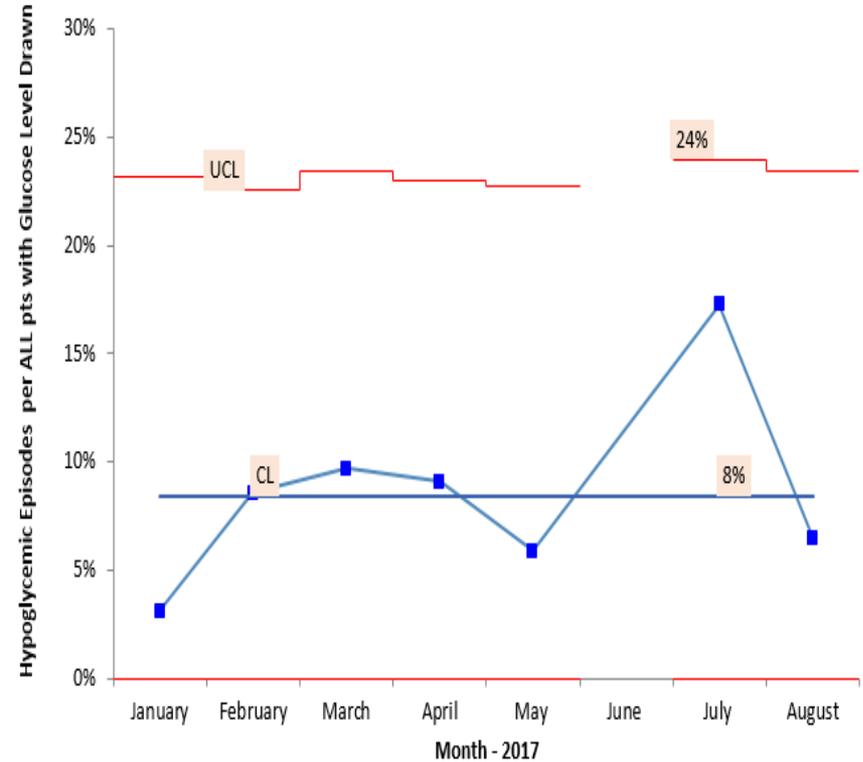


Change Data - Tulsa

Tulsa - % Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month
- p Chart

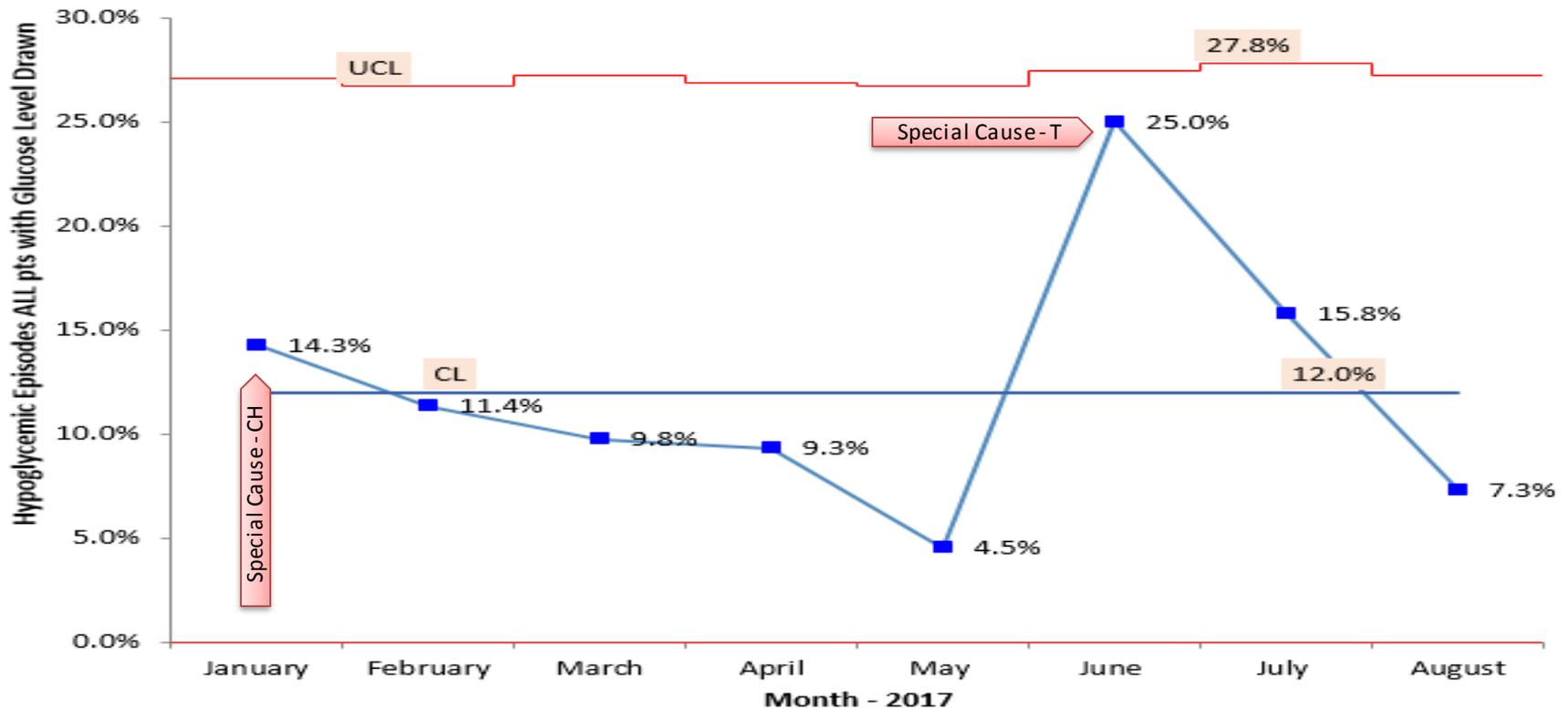


Tulsa - % Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month
- p Chart



Change Data – Charlotte & Tulsa

Charlotte and Tulsa % Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month - p Chart



Conclusions

- Pediatric patients being treated for ALL alter their dietary intake due to pre-procedural guidelines, 6MP administration guidelines, side effects of chemotherapy and just because they are kids making them susceptible to morning hypoglycemia.
- Ensure all families are educated regarding hypoglycemia risks & prevention.
 - Charlotte began educating families in Sept 2017
 - 90% of patient received education for hypoglycemia risks and prevention.
- Hypoglycemia episodes remain between 7-11% each month.
 - Education process just started in Charlotte and has not started in Tulsa to show a decrease in hypoglycemia episodes.

Next Steps/Plan for Sustainability

- Tulsa to start patient & family education process in October 2017.
 - Education documentation chart review will begin the month following start of education process.
- Charlotte and Tulsa will complete the parent follow-up survey to assess level of knowledge after hypoglycemia education
- Some patients experienced hypoglycemic episodes more frequently than others.
 - Investigate those more closely should they continue after hypoglycemic education is completed.
- Consider additional metric outcomes
 - % hypoglycemia episodes/# of glucose blood draws
 - Rate of hypoglycemic episodes/# hypoglycemic patients

Appendix

Patient Characteristics w/BG cut off of <70mg/dl (Jan 2011 – Dec 2016)

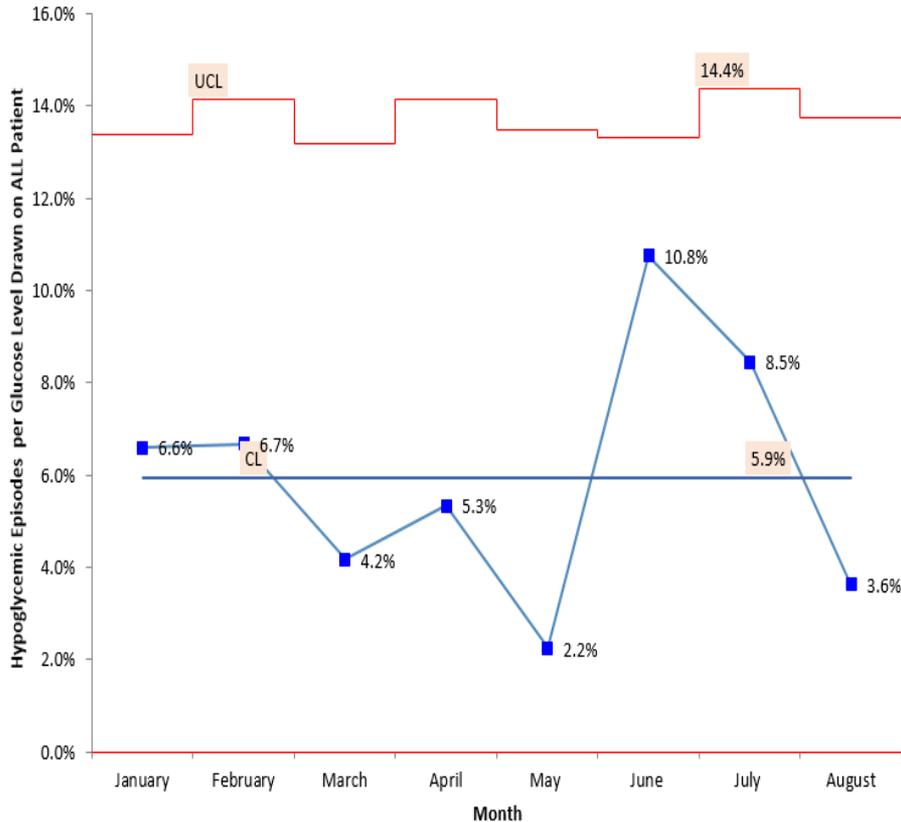
	Hypoglycemia group (< 70 mg/dL)	Normoglycemia group (≥ 70 mg/dL)	Total
n (patients)	71 (82.6%) 358 episodes	15 (17.4%)	86
Males	40 (56.3%) ^a	9 (60%) ^a	49 (57%) ^a
Females	31 (43.7%) ^a	6 (40%) ^a	37 (43%) ^a
Proportion entered maintenance therapy	47 (66.2%) ^a	7 (46.7%) ^a	54 (62.8%) ^a
Proportion not in maintenance therapy	24 (33.8%) ^a	8 (53.3%) ^a	32 (37.2%) ^a
Mean age at time of diagnosis (years) [95% CI]	5.45 ± 4.10 ^b [4.48 - 6.42]	8.87 ± 5.26 ^b [5.95 - 11.78]	6.05 ± 4.48 [5.09 - 7.01]

Distribution of BS Level During Hypoglycemia Episodes (Jan 2011 – Dec 2017)

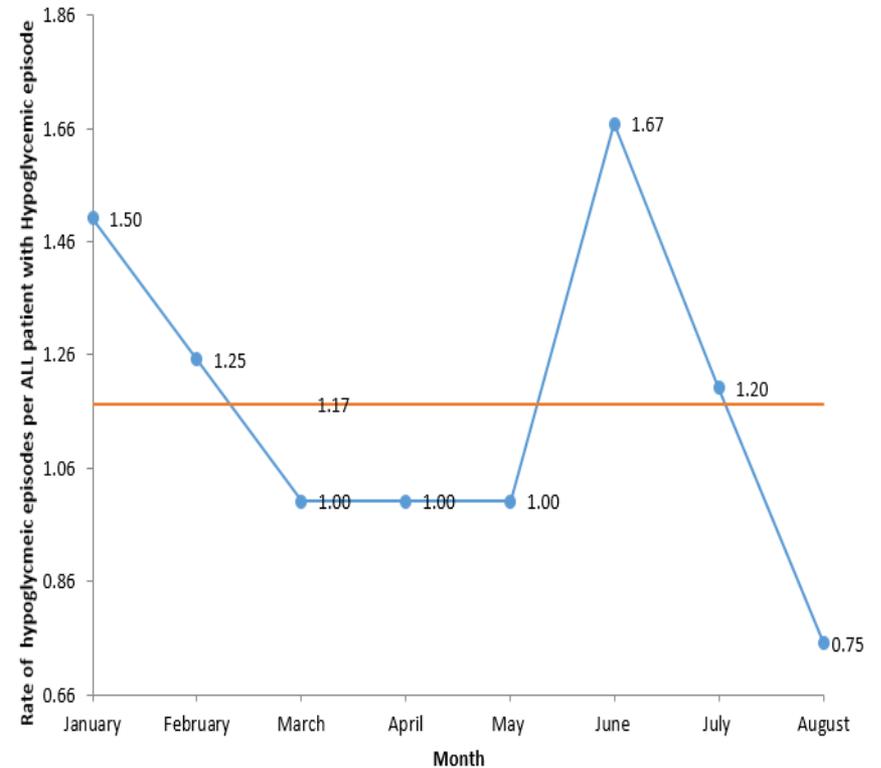
Hypoglycemia severity	Number of episodes	Percent	Cumulative %
60-69 md/dL	255	71.2	71.2
50-59 mg/dL	76	21.2	92.5
40-49 mg/dL	25	7.0	99.4
30-39 mg/dL	2	0.6	100.0
Total	358	100.0	

Optional Future Outcome Metrics

Charlotte and Tulsa - Hypoglycemic Episodes Per Glucose Level Drawn on ALL Patient- p Chart



Charlotte and Tulsa - Rate of Hypoglycemic Episodes per ALL Patient with Hypoglycemic Episode



Reducing Morning Hypoglycemia in Children Undergoing Treatment for ALL

AIM: By October, 2017, reduce morning hypoglycemia (blood sugar less than 70 mg/dl) in children on therapy for ALL at the Charlotte and Tulsa St. Jude affiliates by 50%.

INTERVENTIONS:

- Develop education tool and process for education
- Educate all staff on patient education process for hypoglycemia risks/prevention
- Develop data collection tools/plan to assess education process
- Determine measure of decreasing hypoglycemic episodes

TEAM:

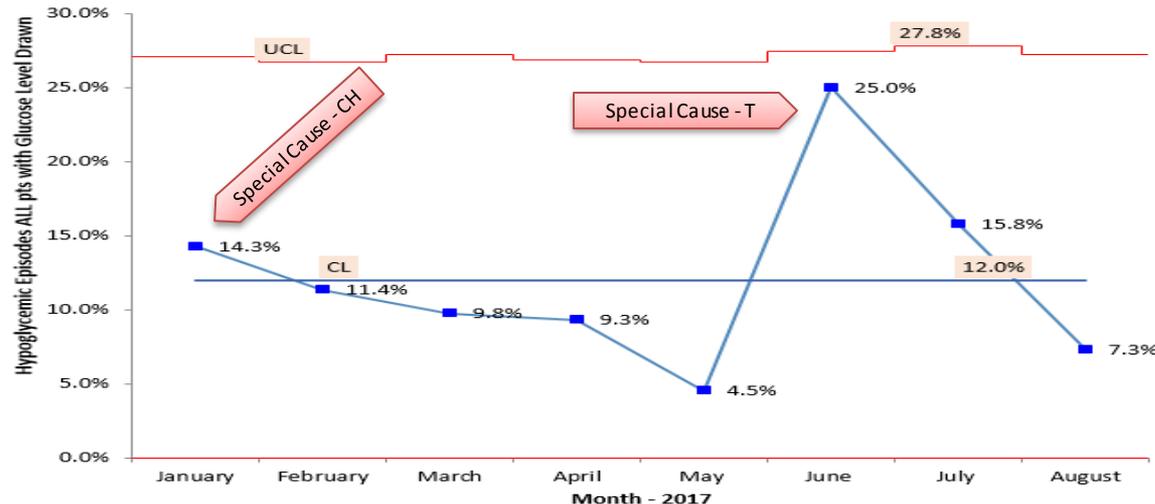
- Jennifer Morgan – Facilitator SJ
- Ashraf Mohamed – Leader MD T
- Christine Bolen – MD CH
- Patricia Rice – Nurse T
- Clinic Nurses
- Procedure Nurses/Coordinator
- CMA/Techs
- Patient Parents

PROJECT SPONSORS:

- Carolyn Russo

RESULTS:

Charlotte and Tulsa % Hypoglycemic Episodes Per ALL Patients with at least 1 Glucose Level Drawn Per Month - p Chart



CONCLUSIONS:

- Hypoglycemia episodes remain between 7-11%.
- Charlotte is at 90% documentation rate for hypoglycemia education.

NEXT STEPS:

- Tulsa to begin education process in October 2017
- Charlotte and Tulsa to complete the parent follow-up survey to assess knowledge of hypoglycemia
- Investigate the treatment plan more closely those patients who continue to have hypoglycemic episodes after the education process has begun.
- Consider additional metric outcomes
 - % hypoglycemia/# glucose blood draws
 - Rate of hypoglycemic episodes/#hypoglycemic patients