



TITLE

# Improving Glycemic Control on a General Medicine Floor

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# CONTACT

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# PROJECT TEAM

- **Michael Johnson, MD**
- **John Rees, RN**
- **Laurajo Ryan, Pharm D**
- **Felicia Lanmon**
- **Robert DeLosSantos**
- **Kathleen Hands, MD, Endocrine**
- **Rosa Garcia, R Pharm**





# “Tele”-Member

**Wayne Fisher, MS, PhD**



# BACKGROUND

- **Diabetes is present in at least 26% of hospitalized patients.**
- **Additional 12% of patients with hyperglycemia.**
- **Evidence shows glycemic control improves outcomes**
  - **Surg ICU patients**
  - **Post CABG patients**
  - **CAD, post MI patients**
- **Observation studies in general med patients**
  - **Hyperglycemia=Poor outcomes**
  - **RCT data lacking**



# WHAT IS THE TARGET GOAL?

- **Unclear**
- **Close to euglycemia without causing hypoglycemia**
- **80-110 may be too strict for general medicine patients**
- **ADA/ACE Recommends : 90-130 pre-prandial**



# TO ACCOMPLISH THIS GOAL

- **Insulin order sets/protocols should be initiated**
  - Basal insulin/premeal insulin
  - Discontinue Regular insulin sliding scale
- **Institutional support systems should be implemented**
  - Nursing education
  - Patient education
  - Dietary
  - Physician education



# BACKGROUND AT UHS

- **Sept 2007- Initial attempts**
  - EMR order set with detemir/aspart
  - No specific instructions on how to use
  - Glucose data was not monitored with this
  - RISS protocol still in place
- **March 2008- Team developed**
  - 8<sup>th</sup> floor nursing interested in glucose control
  - Physicians/Pharmacists passionate about the issue
  - Endocrine assistance





# AIM STATEMENT

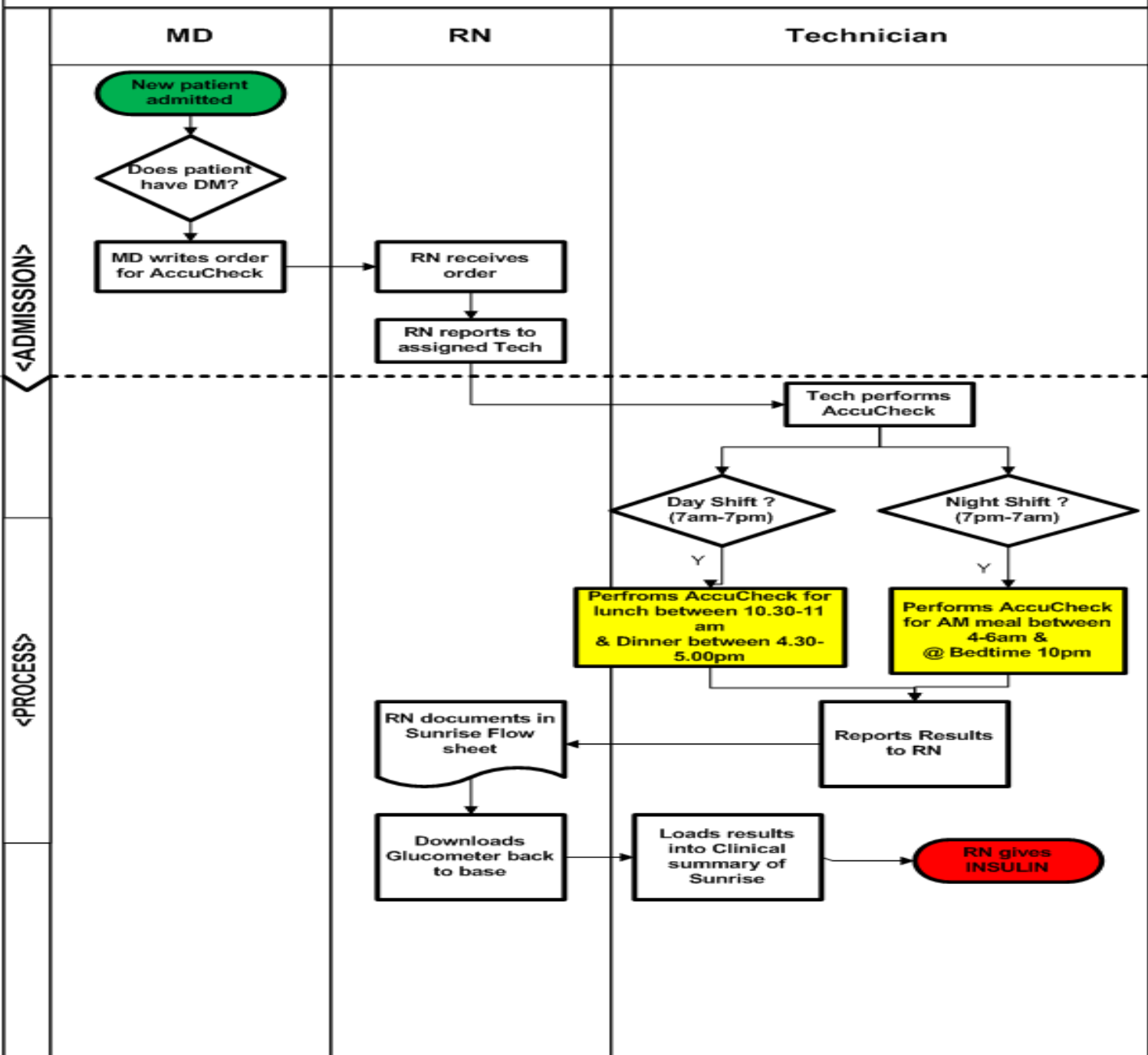
**To increase the percent of patients controlled with avg-day glucose 70-140 by 10 percent *without* increasing percent patients with hypoglycemic events by July 25, 2008.**



# DATA COLLECTION/MEASURES

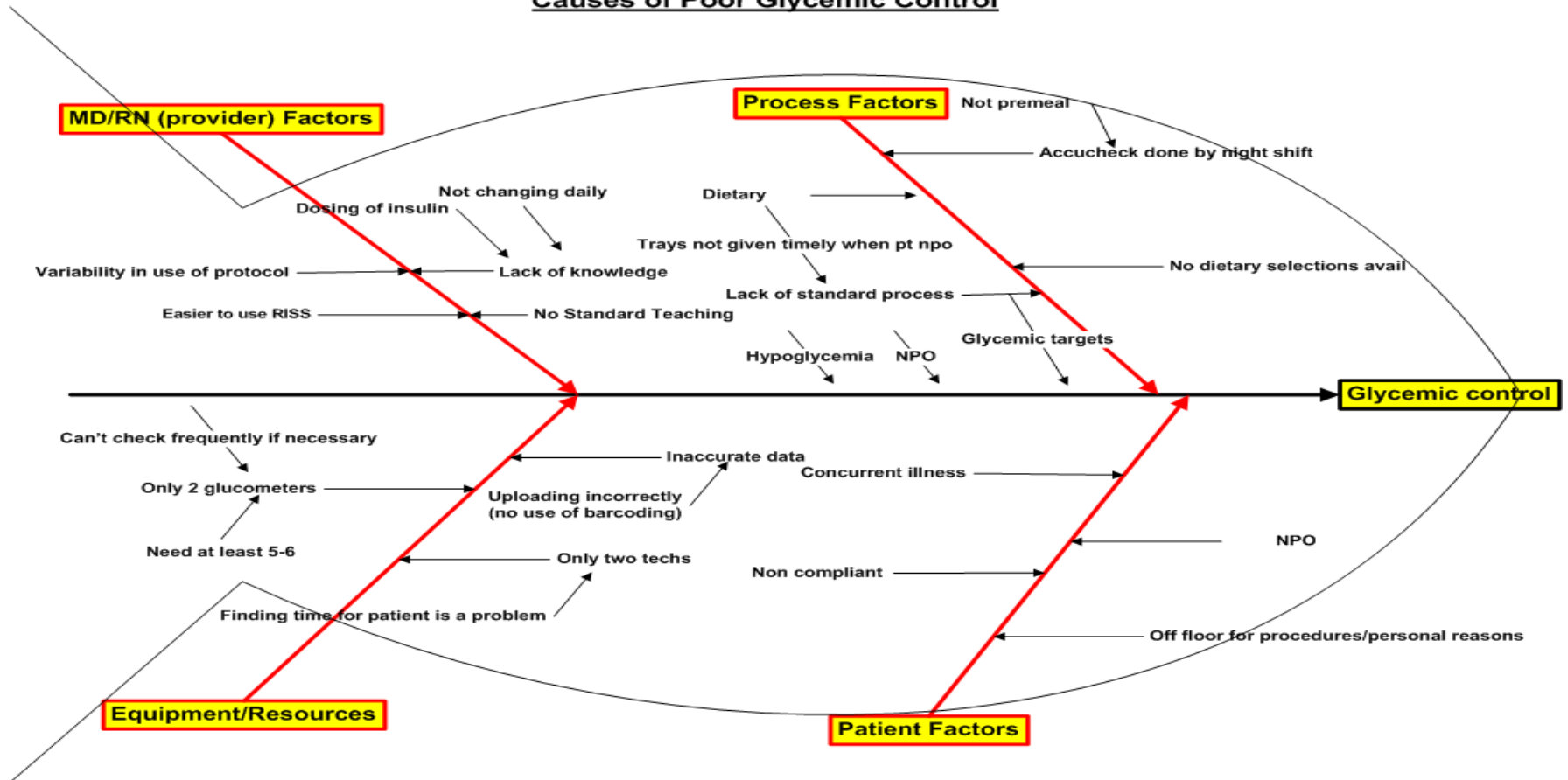
- All point of care glucose values  
(*Except if only one value for patient*)
- **Discrete data**
  - Number patients controlled
  - Number of patients with hypoglycemia
- **Variable data**
  - Distribution all glucose values

# Pre Intervention Flowchart



# CAUSE AND EFFECT

## Causes of Poor Glycemic Control



# INTERVENTIONS-PROTOCOL

University Hospital  
Protocol for the Management of Hyperglycemia for Non-ICU Patients  
(May 2008)

- Goals of insulin therapy:
  - Fasting BG  $\leq$ 140mg/dL
  - 2-hour post-prandial BG  $\leq$ 180 mg/dL
- Initiate basal + bolus (pre-meal) regimen
  - Total daily dose (TDD)—0.5 units per kg divided basal & bolus
  - $\frac{1}{2}$  TDD basal (detemir) divided AM & PM
  - $\frac{1}{2}$  TDD bolus (aspart) divided before each meal when food is in front of patient

\*\*\*EXAMPLE of INSULIN INITIATION\*\*\*

- 72kg patient X 0.5 units insulin = 36 units TDD
- 36 units TDD X  $\frac{1}{2}$  = 18 units (basal) + 2 = 9 units detemir QAM & 9 units QPM
- 36 units TDD X  $\frac{1}{2}$  = 18 units (bolus) + 3 = 6 units aspart pre-prandially

- Initial dose (0.5 units /kg/day) is starting point—titrate as needed
- Dosing regimen may be altered within order set
  - e.g., different doses for each administration time

\*\*\*Use caution in patients with acute renal failure or fulminant hepatic failure\*\*\*

- Consider starting dose of 0.25units/kg—monitor closely & titrate cautiously

- Insulin adjustments
- Maintain AM FBG 80-140 mg/dL
  - FBG  $>$  150 mg/dL—increase detemir 4 units (2 units QAM, 2 units QPM)
  - FBG  $>$  200 mg/dL—increase detemir 6 units (3 units QAM, 3 units QPM)
- Adjust pre-prandial bolus (aspart) insulin if:
  - Pre-prandial BG  $>$  140 mg/dL
  - 2-hr post-prandial BG  $>$  180 mg/dL

Sunrise default pre-meal dose correction (may be revised if needed at order entry)

\*\*\*EXAMPLE of INSULIN TITRATION\*\*\*

- Basal insulin = 18 units daily prescribed
- Prandial insulin = 18 units daily prescribed
  - Serum FBG 195 mg/dL
    - Increase detemir (basal) by 4 units to 22 units/day (11 units QAM & QPM)
  - Pre-meal insulin dose adjustments from previous day
    - 2 units in ADDITION to scheduled dose (6 units pre-breakfast) required
    - 1 unit in ADDITION to scheduled dose (6 units pre-lunch) required
    - 3 units in ADDITION to scheduled dose (6 units pre-supper) required
  - Increase SCHEDULED pre-meal insulin aspart doses to 8 units before each meal
    - 24 units total daily pre-meal insulin
  - Total daily basal and total daily pre-meals doses no longer equal
    - If the next day's FBG remains  $>$  150 mg/dL
      - Increase basal insulin to 24 units daily (12 units QAM, 12 units QPM)

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- If frequent correction doses required
  - Increase scheduled prandial insulin aspart to average dose pt has been receiving
  - Patient may require different doses at each meal
- With adjustments to basal/bolus insulin, attempt to maintain an approximate 50:50 basal to bolus ratio within new TDD
- \*\*\*Precautions\*\*\*
  - Avoid ordering different insulin with similar profiles
    - Basal insulins
      - Detemir, glargine, NPH or combination insulins (70/30, 75/25 or 50/50)
    - Prandial insulins
      - Aspart, lispro, regular (\*\*regular insulin should ONLY be used for continuous infusion, NOT for prandial or "sliding scale")



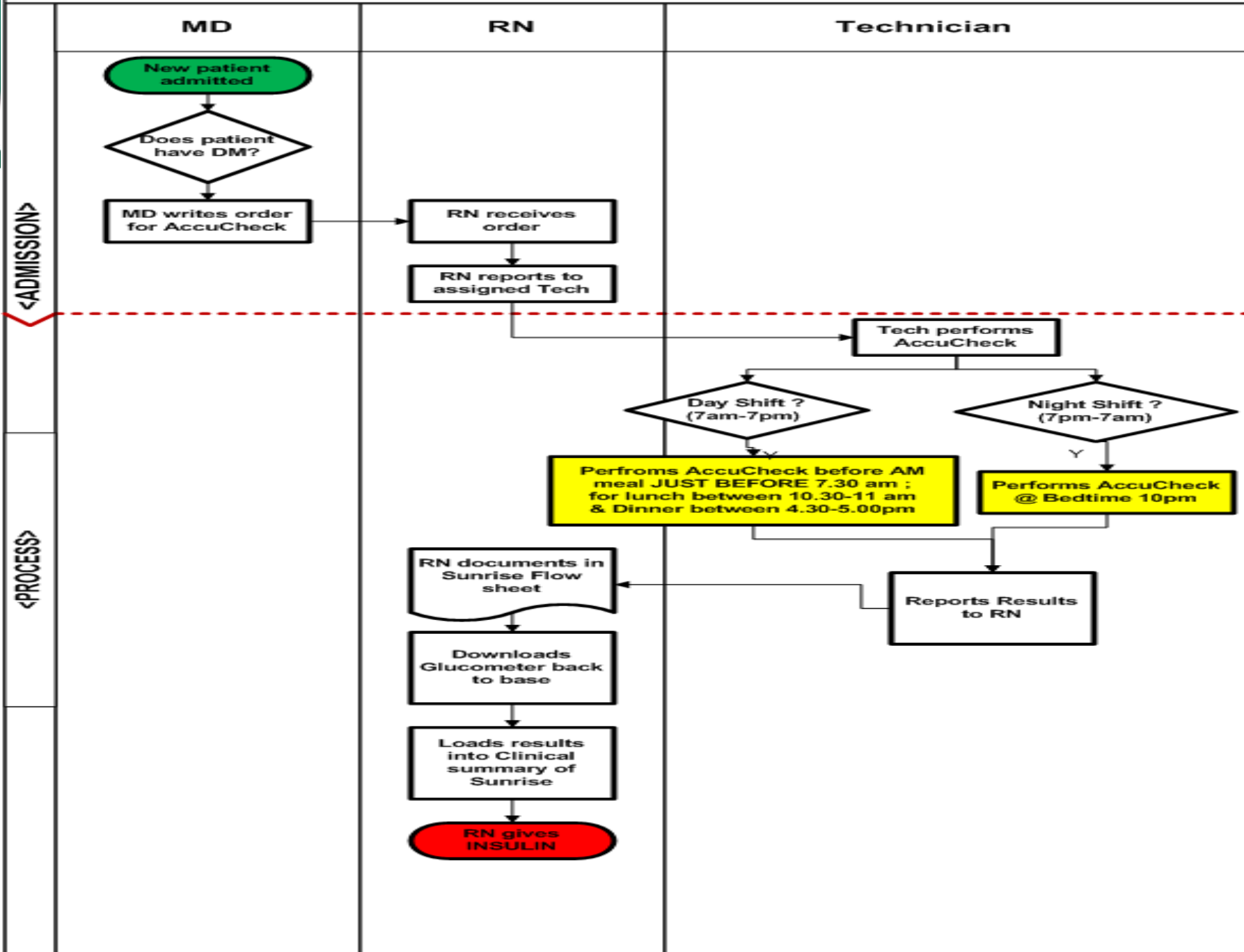
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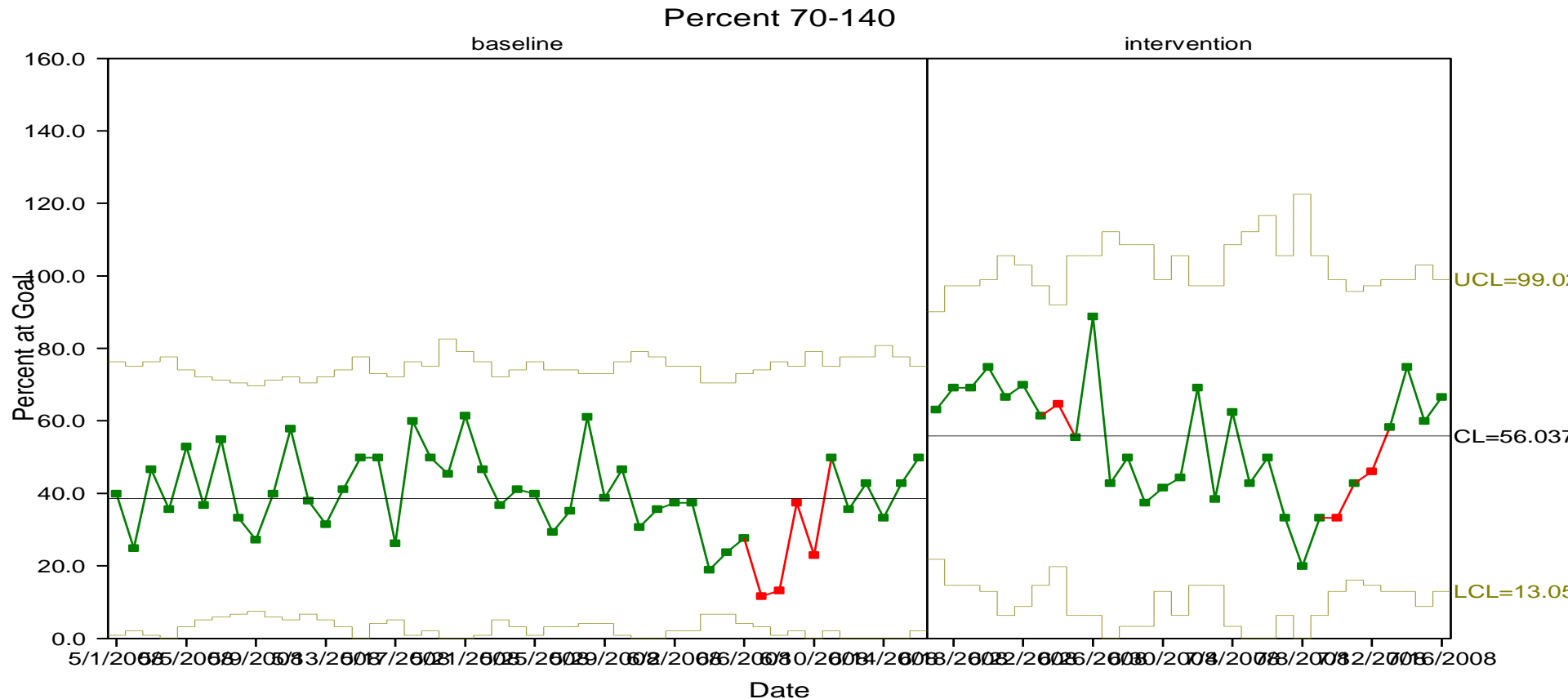
Educating for Quality Improvement & Patient Safety

# POST INTERVENTION FLOWCHART



# SPC CHART

## *percent controlled*



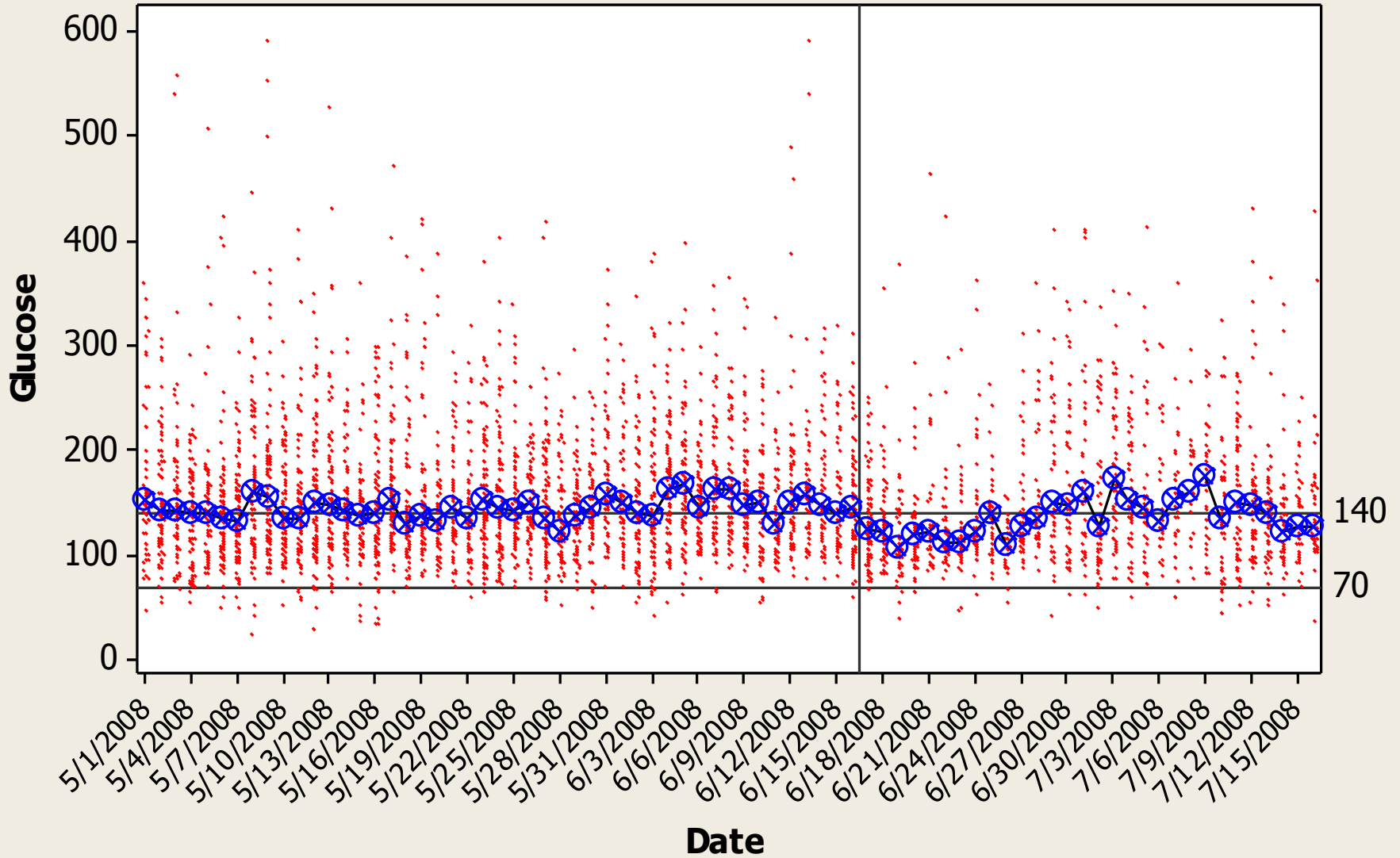




# Individual Value Plot of Glucose vs Date

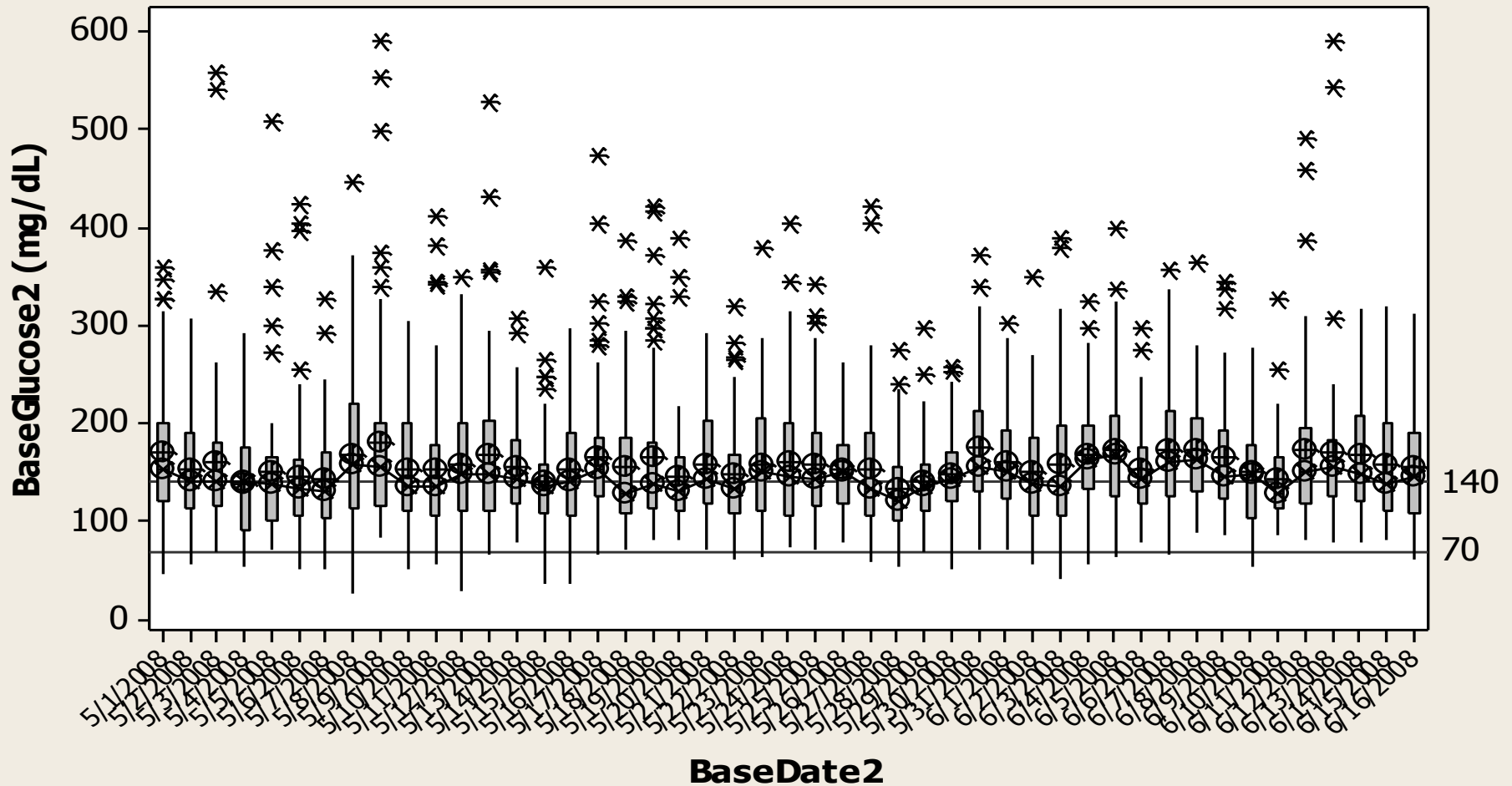
Baseline Period

Intervention Period



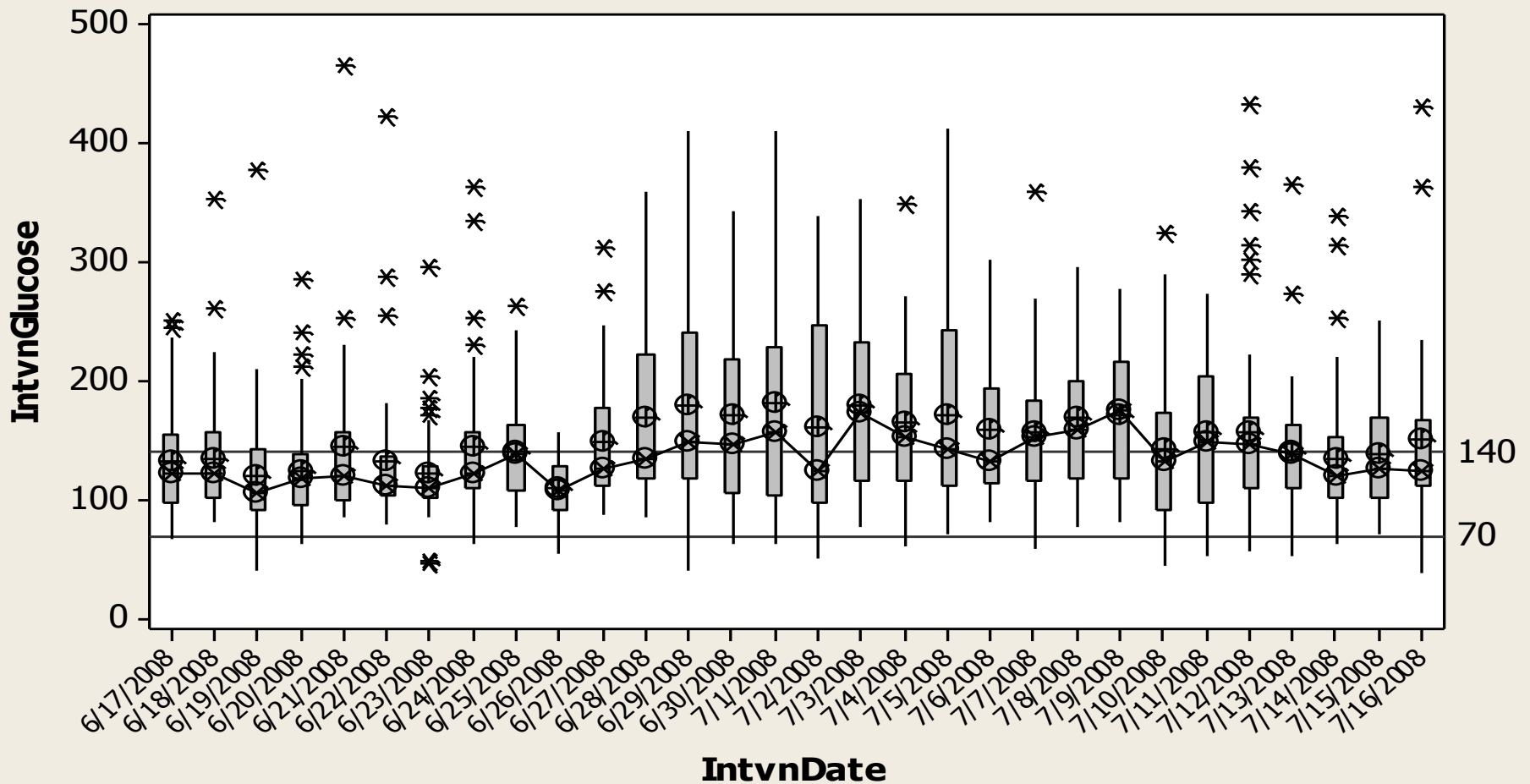
# BOX PLOT

Boxplot of BaseGlucose2 (mg/dL) vs BaseDate2



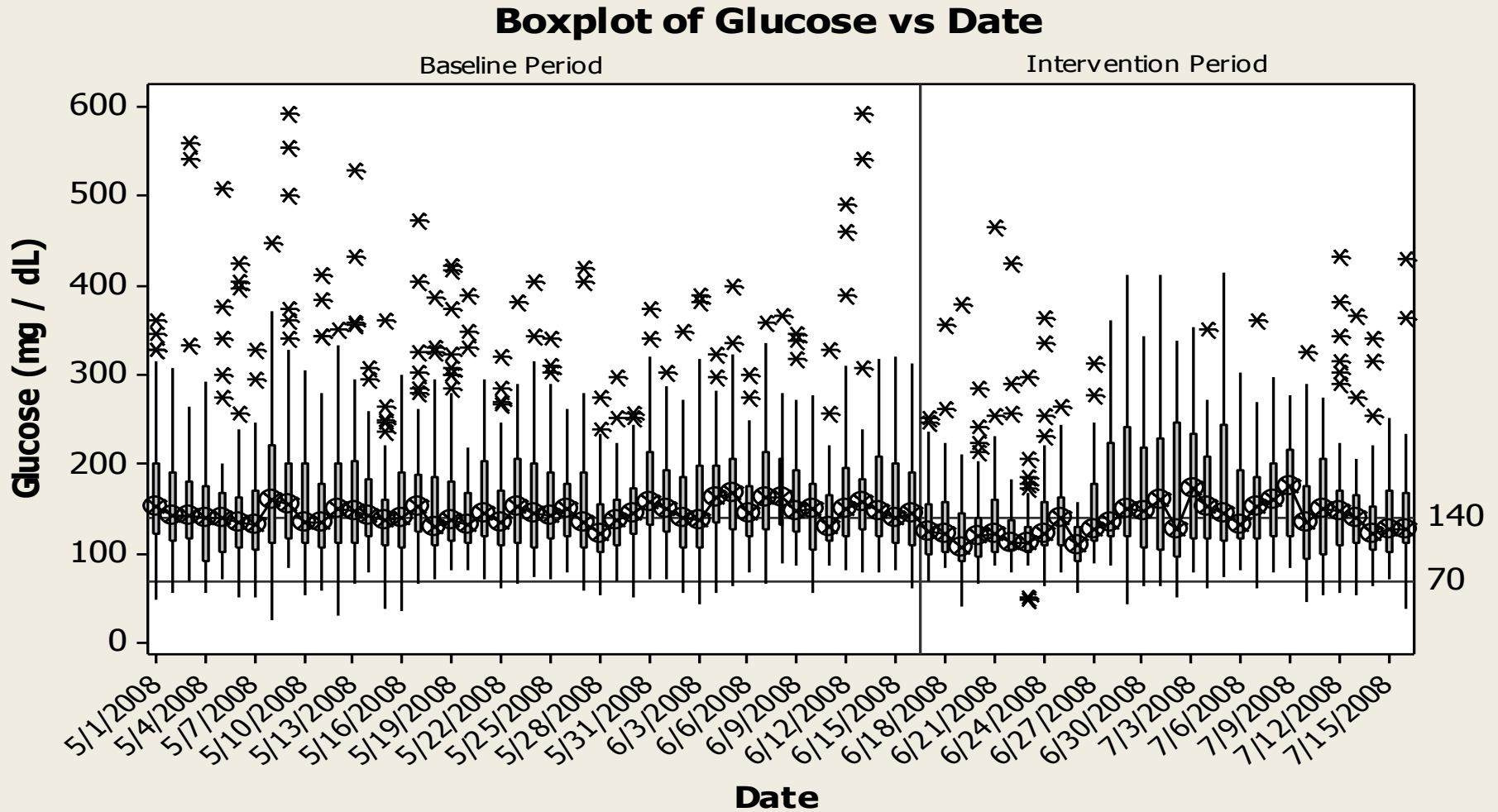
# BOX PLOT

## Boxplot of IntvnGlucose vs IntvnDate



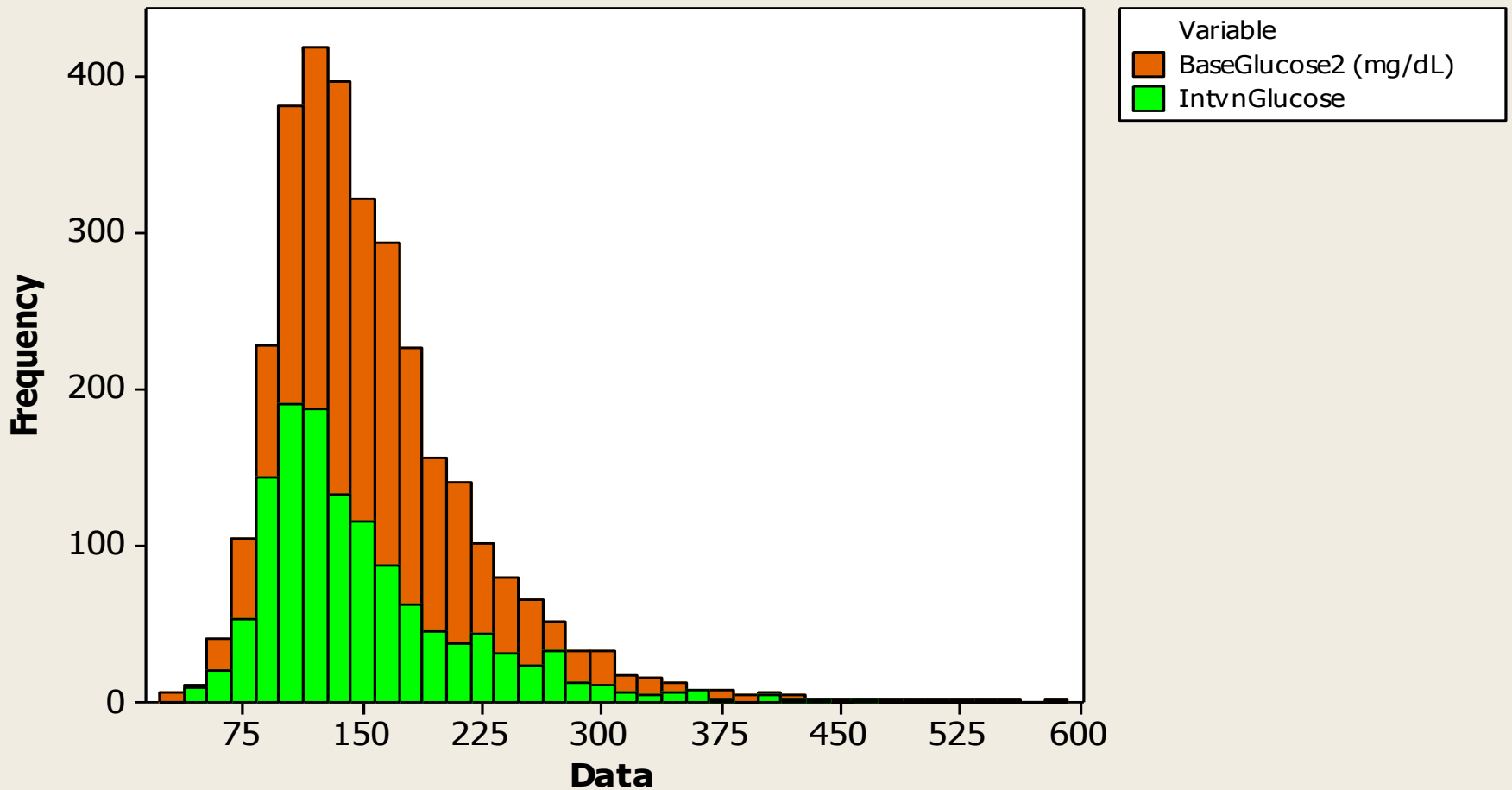


# BOX PLOT



# Overall Distribution

**Histogram of BaseGlucose2 (mg/dL), IntvnGlucose**





# LESSONS LEARNED

- **Overall increase in glucose control was obtained, with decline in early July.**
  - **New Housestaff**
  - **Vacations**
- **Slight increase in hypoglycemic episodes, but acceptable.**
  - **If trend continues will need to track severe hypoglycemia, symptomatic episodes.**



# FUTURE INTERVENTIONS

- **EMR implementation**
- **Education- Housestaff, Nurses**
- **Empower nurses to encourage change of insulin regimen daily**
- **Use of “real time” data for feedback**





# PERTINENT LITERATURE

- **ADA: Clement(2004) Management of Diabetes and hyperglycemia in hospitals. Diabetes Care 27, 553-591**
- **ACE/ADA task force Diabetes Care 2006;29:1955-62.**
- **Web: <http://glucometrics.med.yale.edu>  
[www.hospitalmedicine.org](http://www.hospitalmedicine.org)**



# QUESTIONS

