Management of hyperglycemia in the ward

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The magnitude of the problem
Diabetes in Libyan hospitals

- Prevalence of DM in Libya 16.4%
- DM accounts for 19-29% of all medical admissions.
- DM accounts for 22% of all ICU admissions
- 65% of females with MI has DM
- 31% of young males with MI has DM
- 9% of all diabetes-related admissions are because of DKA
- DKA mortality rate in Libya is 9.4-11.7%
Indications of hospital admission in diabetic patients

- **Acute complications:**
  - DKA or HHS
  - Hypoglycemia
- **Chronic complications:**
  - Renal complications (renal failure)
  - Vascular complications:
    - Coronary artery disease (CAD)
    - Cerebrovascular disease (CVA)
    - Peripheral vascular disease (diabetic foot)
- **Unrelated problems:**
  - Trauma
  - Surgery
  - Delivery
  - Respiratory infection
Why inpatient hyperglycemia is important?
1- Mortality

Total In-patient Mortality

Mortality (%)

- Normoglycemia: 1.7%
- Known Diabetes: 3.0%
- New Hyperglycemia: 16.0% *

P < 0.01

Umpierrez GE et al., J Clin Endocrinol Metab 87:978, 2002
2- Morbidity

• Hyperglycemia was associated with:
  – *Longer hospital staying*
  – *Higher incidence of infection.*
Possible mechanisms

• Low insulin secretion, increase insulin resistance, increase counter regulatory hormones
• Increase glucose, FFAs, ketones & lactate
• Increase IL-6, TNFs, NO
• Neutrophil dysfunction, increased catabolism, myocardial injury, endothelial dysfunction & thrombotic tendency.
More than 1 of every 10 health care dollars spent in the United States is attributable to diabetes\(^1\).

Direct costs of diabetes in 2002 totaled $91.9 billion\(^1\).

Inpatient care accounted for >$40 billion (44\%)\(^1\). - Increased by >30\% over 1997 DM inpatient expenditures\(^2\).

Health Care Expenditures for Diabetes, 2002\(^1\)*

- Drugs and Drug Delivery* $17,516
- Outpatient Care* $17,278
- Nursing Home and Hospice $14,421
- Hospital Inpatient Care* $40,337
- ED and Ambulance * $2,308

*Costs are presented in millions of dollars.
Potential Benefits of Improving Glucose Control in the Hospitals

- *Reduce mortality*
- *Reduce morbidity*
- *Reduce costs of care:*
  - Length of stay
  - Cost of inpatient complications
  - Fewer re-hospitalizations
  - Reduced extended care
In Reality

- Management of Hyperglycemia is often viewed as a secondary goal to the pressing demand of the acute care.
- Treatment is usually haphazard & in adequate.
- Most patients do not achieve optimal glucose control in the hospital setting.
How to manage Inpatient Hyperglycemia?
Glycemic Control in the Hospital Can Be Challenging

- Hyperglycemia
- Hypoglycemia
In-patients glycemic goals for non critically ill patients

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- **Preprandial** (< 140 mg/dl)
- **Postprandial** (< 180 mg/dl)

Subcutaneous insulin strategy

• Outside of the critical care or step-down unit

• Most hospitalized patients requiring insulin, receive subcutaneous therapy.
Protocols of S/Q insulin therapy

1. S/Q insulin sliding scale monotherapy

2. Correction dose therapy
Roller Coaster Effect of Insulin Sliding Scale

Glucose

Time

Insulin shot

No insulin given
1) S/Q Sliding Scales Monotherapy (should be abandoned)

- Disadvantages:
  - Dose based on only one reading every 6 hours
  - Retrograde management
  - No insulin given for normal glucose values
  - No basal insulin
  - Variables as meals, Wt., illness are not considered
  - Insulin given on fixed time not according to patient meal time
  - Increased risk of hypo & hyperglycemic episodes
“…sliding scale insulin regimens provide no benefit…”

Arch Intern Med 157:545, 1997
2- Correction dose therapy

• **Components of correction dose therapy:**
  – *Basal insulin*: long acting insulin
  – *Prandial insulin*: short acting before meals
  – *Supplemental doses*: short acting insulin S.O.S.

• **Frequent blood glucose monitoring and daily changes in scheduled insulin doses**
Inpatient Insulin Administration

- Basal + Nutritional + Correctional = Total daily insulin needs

- Long-acting insulin
  - Scheduled

- Rapid-acting insulin

References:
Basics of implementing in-patient intensive insulin therapy

Well-designed, standardized protocols should be maintained by hospitals

- Pharmacists, nurses, and physicians should receive formal training to administer IV insulin\(^2,3\)


Steps for Initiating correction dose therapy protocols

1. Expose the Problem
2. Create the Team
3. Establish a Plan
4. Implement
5. Evaluate
Summary

• Hyperglycemia is frequent in hospitalized patients with or without history of diabetes
• Hyperglycemia is a marker of poor outcome
• Improvement in the outcome has been shown by improved glycemic control
• For critically ill patients use IV strategy
• For non critical patients use S/Q strategy
• S/Q Insulin sliding scale is a history
When we will evaluate our situation and start moving toward modern approaches?
THANK YOU