Case Study: Medical and Social History

- A 60 years old female
- Important family history: Mother with T2DM
- High Blood Pressure and Hypercholesterolemia
- Obesity
- Type-2 Diabetes for 8 years. Hb 6.9% 4 months ago
- Other conditions: severe asthma, Obstructive Sleep Apnea Syndrome (OEAS).
### Case Study: Current Medications

- Enalapril 20 mg at breakfast
- Atorvastatin 40 mg at dinner
- Ipratropium
- Formoterol / Fluticasone 2 puffs twice daily
- Insulin Glargine 30 iu at bedtime
- Metformin 1000 mg bid

### Case Study: Chief Complaint and Problem List

- **Previous Hospitalizations**
  - Urinary sepsis three years ago
  - Frontal Meningioma two months ago
    - Start treatment with dexamethasone 4 mg bid
- **Current Hospitalization:**
  - Dyspnea, fever and cough.
  - Respiratory Infection and worsening asthma condition
Case Study: Physical Exam

- Height: 1.61 meters, weight: 80 kg, BMI: 31 Kg/m²
- Blood pressure: 160/70 mmHg
- Pulse: 80 beats per minute
- Respiratory rate: 18 breaths per minute
- Oxygen saturation: 89% while she was breathing ambient air.
- Normal Heart Sounds. No murmur.
- Breath sounds: inspiratory wheezes throughout the lung fields

Case Study: Lab

- Fasting glucose: 334 mg/dL
- HbA1c: 7.9%
- Total cholesterol: 207 mg/dL
- LDL: 112 mg/dL
- HDL: 74 mg/dL
- Triglycerides: 103 mg/dL
- Serum Creatinine: 0.89 mg/dl and eGFR: 70 ml/min
- Albumin/creatinine ratio: 102 mg/g
- ALT: 18 U/L – AST: 21 U/L
- Na+: 143 – K+: 4.6
Case Study: Diagnosis and Treatment

- Acute Asthma Exacerbation
- Community-acquired pneumonia
- Treatment:
  - Methylprednisolone 20 mg EV / 8 h
  - Levofloxacin 500 mg oral bid
  - Ceftriaxone 2 g EV / 24 h
  - Ipratropium Bromide
  - Budesonide
  - Formoterol

Three Important Questions

- Question 1: Why did metabolic control get worse?
- Question 2: What is your treatment during hospitalization?
- Question 3: What are your recommendations at discharge?
Question 1: Why did metabolic control get worse?

- Steroids Induced Hyperglycemia
- Patient started to take dexamethasone
- We need to reconsider diabetes treatment

Steroid Induced Hyperglycemia

- Unpredictable
- Low fasting BG
- High postprandial BG
- High BG in the evening
- Nocturnal and early morning hypoglycemia
- Infrequent KAD

![Graph showing insulin requirement with high a.m. dose of corticosteroids](Image)
Steroid Induced Hyperglycemia

- **Morning doses of Intermediate action Steroid:**
  - Postprandial hyperglycemia
  - Hyperglycemia in the evening
  - Normal Fasting Blood Glucose
  - High Risk of Nocturnal Hypoglycemia

- **Long action steroid or multiple doses**
  - Hyperglycemia during 24 hour
  - Postprandial hyperglycemia
  - Low risk of nocturnal hyperglycemia

Type 2 diabetes and steroid treatment

**General Guide**

- Set target for Capillary Blood Glucose (CBG)
- Consider increasing monitoring to 4 times daily
- Refresh diabetes education with patient
- If hyperglycemia on non-insulin therapies
  - Gliclazide – titrate to maximum of 320mg daily, with maximum 240mg in the morning
  - Metformin – titrate to maximum of 1g BD
  - Start NPH or NPL at breakfast (one dose of steroid) or long action insulin (multiple doses of steroids)
- If hyperglycemia on insulin therapies
  - If on evening once daily human insulin consider switch to morning dosing
  - If uncontrolled hyperglycemia or multiple daily dosing of steroid consider switch to basal analogue insulin (or alternative regimen) and involve diabetes team in hospital or community
  - Beware of nocturnal and early morning hypoglycaemia
Steroid Induced Hyperglycemia

THE BEST TREATMENT BY FAR IS INSULIN

Question 2: Hospital Treatment

- Remove oral agent
- Start Basal-Bolus-Correction strategy
  - 0.6 iu/Kg daily: 80 Kg ---- 48 ui
  - 30% Basal Insulin and 70% Rapid Insulin
  - Glargine 16 iu at bed time
  - Aspart Insulin 10 – 12 – 10 + correction
Question 2: Capillary Blood Glucose (mg/dl)

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<th>Dinner</th>
<th>Bedtime</th>
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<td>4ª</td>
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</tbody>
</table>

- Glargine 24 iu at breakfast
- Aspart Insulin 12 – 20 – 14 + C

Question 3: Transition to Home
Question 3: Treatment at discharge

**Basal Bolus Strategy**

- An increase in the lunch and evening meal short acting boluses may be appropriate.
- If on basal insulin consider switching to morning administration and increase dose in 2-4 unit increments (or by 10-20%) every 24-48 hours, in line with results of capillary blood glucose monitoring.
- Monitor closely for early morning hypoglycemia
- Diabetes teams should be involved should

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Case Study: Treatment at discharge

Patient discharged on decreasing dose of steroid
Prednisone 20 mg reducing 5 mg every week
Metformin 1 g twice
Glargine Insulin 24 iu at breakfast
Aspart Insulin reducing progressively
Huelva, Spain