

Diabetes management in elderly patients with cognitive impairment

Endorama Apr 12 2018

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Case 1 – CC/HPI: (from Admission H&P)

67 year old F with DM2, HTN, hypothyroidism, spinal stenosis and history of stroke who presents to the ED with altered mental status and hyperglycemia

- Sister had not heard from the patient that day and sent a friend to check on her.
- The patient was not able to answer the door but was heard inside, prompting EMS call
- On arrival, she was found down 4 hours after a fall, was confused
- Sister reported blood sugars have been >600 for past 3 days

ROS

- GEN: **+dizziness, weakness, headache**, no fever
- HEENT: denies congestion, eye redness, visual disturbance, sore throat, hearing loss
- PULM: **+ SOB** denies cough
- CV: **+ palpitations** denies chest pain, dyspnea on exertion, leg swelling
- ABD: **+ Abdominal pain, n/v**, no diarrhea, blood in stool
- GU: no dysuria, hematuria
- MSK: no joint swelling, arthralgias
- NEURO: **+ confusion**, denies seizures, syncope, light-headedness, headaches
- HEME: no bruising, adenopathy
- SKIN: no rash
- PSYCH: no depression

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Physical Exam

VS: BP 136/67, **P 114**, RR 30, SpO2 100%, Wt: 62 kg (146 lbs), BMI 23 kg/m²

General: well-nourished lady with red hair lying in bed, appears comfortable and no apparent distress

Eyes: No icterus

ENT: No nasal discharge, oropharynx pink and without exudate or erythema **+dry mucous membranes**

Cardiac: Regular rate and rhythm, no murmurs, 2+ peripheral pulses, no LE edema

Pulm: CTAB, no wheezes, no crackles, normal effort

Abd: **+ L sided tenderness, scar on center of abdomen from umbilicus down.** not visibly distended, no rebound, +normoactive bowel sounds

GU: No CVA tenderness or suprapubic tenderness

MSK: no joint effusions or major deformities

Skin: **+hypopigmented patches consistent with vitiligo**

Neuro: **AAO x 3, though does not always answer questions appropriately. Will shout inappropriate answers to questions. Per sister, this is near patient's baseline. Slurred speech with is residual from past CVA. Residual L sided weakness**

Lymphatic: No significant cervical or supraclavicular LAD

Extremities: Warm, not diaphoretic, no cyanosis/clubbing

Labs

63	
9/10/2016	
1243	
BASIC & COMPREHENSIVE	
Glucose, Ser/Plasma ▲	748 * ▲
Sodium	130 ▼
Potassium, Ser/Plasma	6.0 * ▲
Chloride	83 ▼
Carbon Dioxide	<5 * ▼
Anion Gap	Unable to calc... * ▼
BUN	33 ▲
Creatinine	1.8 ▲
GFR Estimate (Calc)	28 * ▼
Calcium	10.0
Inorganic Phosphate	6.6 ▲
Magnesium	2.2
Total Protein	8.4 ▲
Albumin	4.4
Bilirubin, Total	0.4
Bilirubin, Conjugated	0.2
Bilirubin, Unconju...	0.2
Alk Phos, Serum	192 ▲
AST (SGOT)	32
ALT (SGPT)	31
CK	92
Gamma Glutamyl T-Pep	
Beta-Hydroxybutyrate	>9.00 * ▲
Ammonia	
Lipase	
Lactic Acid ▲	6.5 ▲

What do you think of these labs and her presentation?

How did we get here?

Were there missed clues?

Admitted for mild DKA one year prior

Glucose, Ser/Plasma	222	▲
Sodium	135	
Potassium, Ser/Plasma	4.3	
Chloride	98	
Carbon Dioxide	16	▼
Anion Gap	21	▲
BUN	28	▲
Creatinine	1.6	▲
GFR Estimate (Calc)	32 *	▼
Calcium	11.0	▲
Inorganic Phosphate	2.7	
Magnesium	2.0	
Total Protein		
Albumin		
Bilirubin, Total		
Bilirubin, Conjugated		
Bilirubin, Unconju...		
Alk Phos, Serum		
AST (SGOT)		
ALT (SGPT)		
CK	120	
Gamma Glutamyl T-Pep		
Beta-Hydroxybutyrate	0.78	▲

- Presented to the ED for chest heaviness, fatigue, SOB
- Found to have mild DKA in the setting of missing a few doses of insulin due to feeling unwell and being distracted by house guests
- A1c 12.6%
- Symptoms improved rapidly on an insulin gtt

Discharge plan:

- Resume home regimen:
 - glargine 30 qHS
 - aspart 15 TID with meals
- No endocrine consult but met with CDE on day of discharge
- PCP follow up arranged

What is know about DKA in the elderly?

- Retrospective study (Australia between 1986-1999)
- 312 hospital admissions for DKA (pH < 7.30) and/or HHS (serum osm >330 Osm/L)
- Evaluated mortality rates by age:

Age group (years)	DKA (<i>n</i> = 171)	DKA-HHS (<i>n</i> = 94)	HHS (<i>n</i> = 47)	All diabetic emergencies (<i>n</i> = 312)
<35	0/99 (0%)	0/35 (0%)	0/0 (0%)	0/134 (0%)
35-55	1/56 (1.8%)	0/24 (0%)	0/5 (0%)	1/85 (1.2%)
>55	1/16 (6.3%)	5/35 (14.3%)	8/42 (19%)	14/93 (15%)
All ages	2/171 (1.2%)	5/94 (5.3%)	8/47 (17%)	15/312 (4.8%)

- Age was an independent predictor of mortality
- Infection (PNA and urosepsis), were leading causes of death

What is know about DKA in the elderly?

- Retrospective Study 1987-1990, 3 community teaching hospitals in Milwaukee, WI
- N = 220 admissions in 150 patients
- 27 admissions in 25 patients ≥ 65 years
- 193 admissions in 125 patients < 65 years
 - similar histories of diabetes mellitus between older and younger patients, but older patients:
 - were **less likely to be on insulin** (55.6% vs 80.2%, $P = 0.004$)
 - **less likely to have had a prior episode of DKA** (8.0% vs 51.4%, $P = 0.001$)
 - **more likely to have had renal disease** (51.8% vs 21.2%, $P = 0.001$)

What is know about DKA in the elderly?

TABLE 2. HOSPITAL COURSE OF ELDERLY VS NON-ELDERLY ADULT EPISODES OF DIABETIC KETOACIDOSIS AT THREE COMMUNITY HOSPITALS

Characteristics	Age ≥65 years	Age <65 years	P Value*	
Numbers of admissions	27	193		
Admission laboratory data:				
pH	7.19 ± 0.16	7.16 ± 0.15	NS	
HCO ₃ (mg/dL)	10.7 ± 4.2	10.6 ± 4.8	NS	
Serum glucose (mg/dL)	735 ± 268	649 ± 254	NS	
Serum ketones	1:22 ± 25	1:26 ± 30	NS	
Urine ketones	1:56 ± 24	1:69 ± 21	NS	
Admitted to ICU	59.3%	63.4%	NS	
Febrile >101 or hypothermic on admission	18.5%	18.3%	NS	
IV vs SC insulin** (number of cases)	21 vs 6	145 vs 45	NS	
Units of insulin required to bring blood glucose to ≤300 mg/dL	69.1 ± 63.2	44.9 ± 62.2	0.06	
Episodes of Diabetic Ketoacidosis				
	Age	Number	Deaths	Percent
Hours until blood glucose <300 mg/dL	18–29	55	1	2
Change in blood glucose in first 6 hours of hospitalization	30–39	60	0	0
Hypoglycemic complication rate	40–49	30	1	3
Average length of hospital stay (days)	50–59	33	1	3
Mortality rate***	60–69	25	2	8
	70–79	11	3	27
	≥80	6	2	33

* Comparisons of characteristics were made using student's t test.

** Route of insulin administration after bolus insulin treatment.

*** Mortality rate calculated per admission.

DKA Admissions are associated with high mortality in the elderly

- Symptoms of DKA may be less specific in the elderly
- DKA may be the presenting sign of an occult infection is a common trigger
- Mortality is much higher overall and increases with age, likely due to higher burden of chronic disease and severe infections

Past Medical History

- **PMH**

- R basal ganglia/occipital lobe stroke (2011)
- Diabetes
- HTN
- Spinal Stenosis
- Hypothyroidism
- Anemia

- **PSH**

- C-section
- GSW

- **Social Hx**

- Retired music producer
- Lives at home alone, with home health care coming for 4 hrs, 3 days per week.
- ADLs: Has trouble with ADLs (bathing, cooking)
- Tobacco: quit 20+ years ago
- No EtOH or other drugs

- **Family Hx**

- Mother – Abnormal TFTs
- Multiple family members with abnormal thyroid function on mother's side

- **Medications**

- **Insulin glargine 30 Units daily**
- **Insulin aspart 15 Units tidcc**
- Clopidogrel 75 mg daily
- Enalapril 5 mg daily
- HCTZ 25 mg daily
- Metoprolol 25 mg bid
- Simvastatin 40 mg qHS
- Omega 3/Vit B12/Pyridoxine daily
- **LT4 112 mcg daily**
- Gabapentin 300 tid
- Famotidine 20 daily
- Citalopram
- Cyclobenzaprine PRN
- Hydrocodone-acetaminophen PRN

- **Allergies:**

- Morphine, meperidine

Several indicators that she is high risk:

- Living situation / ADLS
- Polypharmacy
- Specific clues to suggest T1DM
 - Multiple autoimmune phenomena (vitiligo, autoimmune thyroid disease, pernicious anemia)
 - Relatively thin body habitus
 - Development DKA in the absence of other triggers (e.g. infection, ischemia) with missing a few doses of insulin

Current Hospital Course Continued

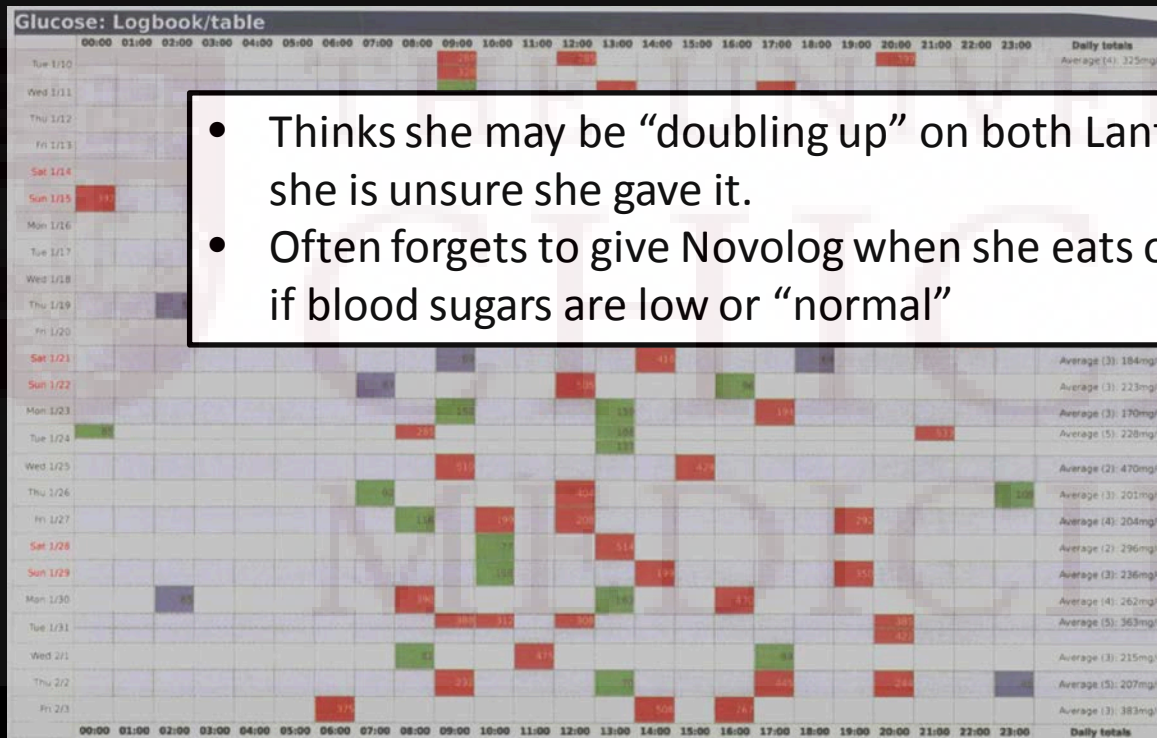
- Endocrinology consulted
- Insulin was titrated to glargine 16 units daily and aspart 8 units tidcc + 1:50 >150 on discharge to rehab

09/15 0700 - 09/16 0659										09/16 0700 - 09/17 0659					
0854	0951	1309	1317	1319	1754	1759	2131	2349	0426	0816	0819	0907	1251	1418	
Graphs cannot display in the current view															
	75	325			217		91	151			119		140		POC Glucose
										154					Serum Glucose
20			8	4		10				16		8		1	insulin aspart (Units) insulin glargine Soln (Units)

- Extensive diabetes education regarding Type 1 diabetes diagnosis and she is resolved to improve management

She comes to see you in clinic

- GAD 65 returns highly positive **262 nmol/L**



- Thinks she may be “doubling up” on both Lantus and Novolog if she is unsure she gave it.
- Often forgets to give Novolog when she eats or will skip altogether if blood sugars are low or “normal”

Definitions:

- Dementia:
 - decline in at least **two cognitive domains** that is severe enough to interfere with daily activities
- Mild cognitive impairment
 - modest cognitive impairment with ability considered state
 - Increased risk of dementia
 - Increased mortality

1. **Recent memory** - ability to learn and recall new information
2. **Language** - comprehension or expression
3. **Visuospatial ability** - comprehension and effective manipulation of nonverbal, graphic or geographic information
4. **Executive function** - ability to plan, perform abstract reasoning, solve problems, **focus despite distractions** and shift focus when appropriate

Challenges with aging

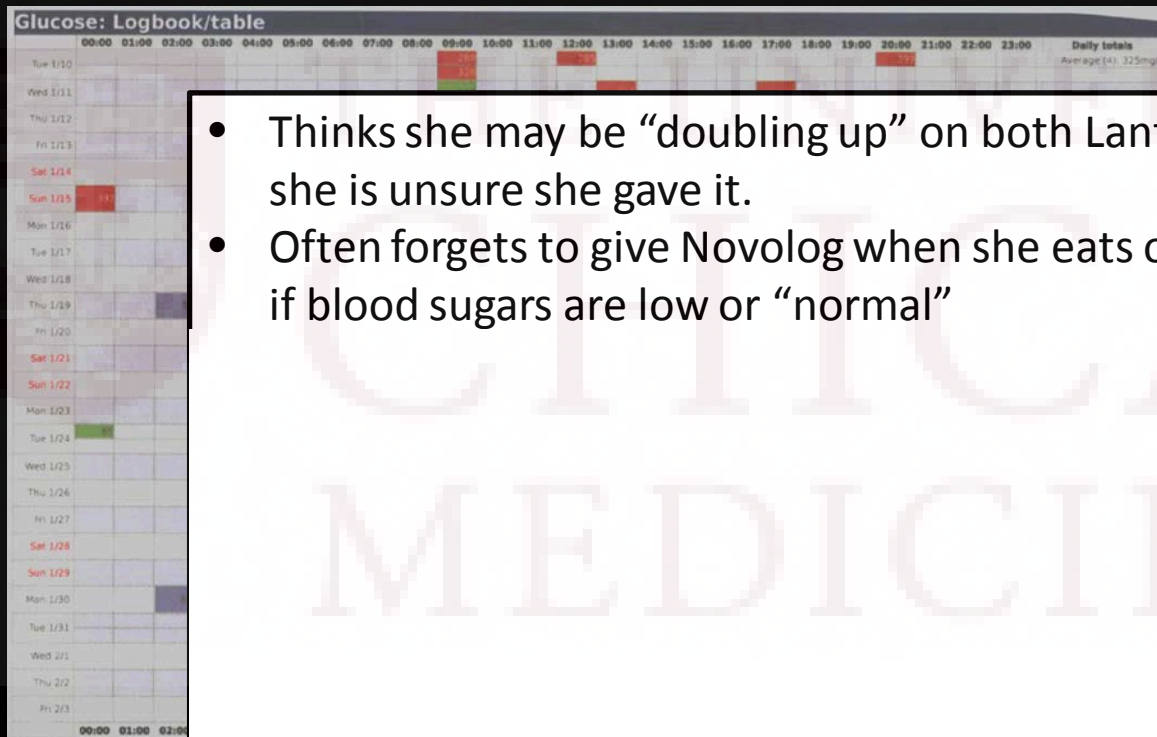
- Physical frailty (muscle strength, neuropathy, impaired vision, hearing loss)
- Impaired Nutrition
 - Impaired appetite, taste
 - Dental problems
 - Food availability – preparation, grocery shopping, cost
 - Impaired vision, hearing loss
- Cognitive impairment and/or depression

Working with patients with diabetes and dementia

- **Multidisciplinary** team
 - CDE, PT, OT, Home nurse, Podiatry, Mental Health
- **Support system** at home:
 - Family and Friends
 - Home care services
 - Long-term care
- **Assistive Devices and Technology**
 - Insulin pens, pens with dose tracking technology
 - CGM with remote monitoring
 - Recording devices and alarms
 - Large-print instructions/talking meter
 - GPS tracking

Clinic visit continued

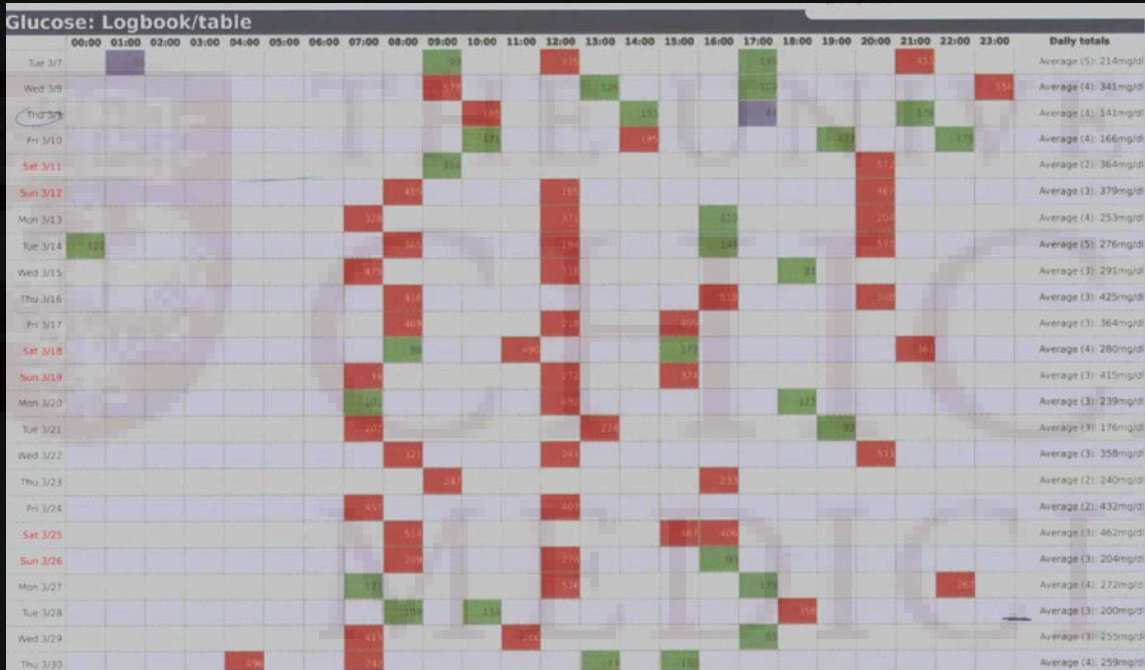
- GAD 65 returns highly positive **262 nmol/L**



Mean 280; SD 152 mg/dL

- Thinks she may be “doubling up” on both Lantus and Novolog if she is unsure she gave it.
- Often forgets to give Novolog when she eats or will skip altogether if blood sugars are low or “normal”

Patient Update:



Mean 290; SD 156 mg/dL

A1c 11.4%

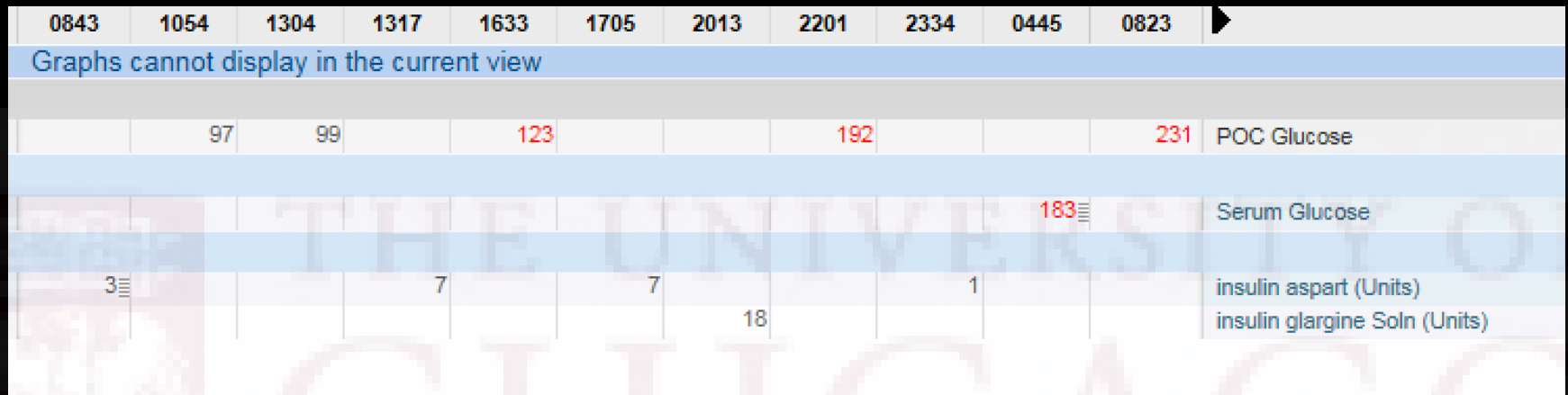
Hypoglycemia 2%

- Family Meeting with son and sister who resolve to help, but ultimately do not follow through
- Patient continues to **adamantly** decline assisted living, *“I’d rather be dead than in one of those places”*

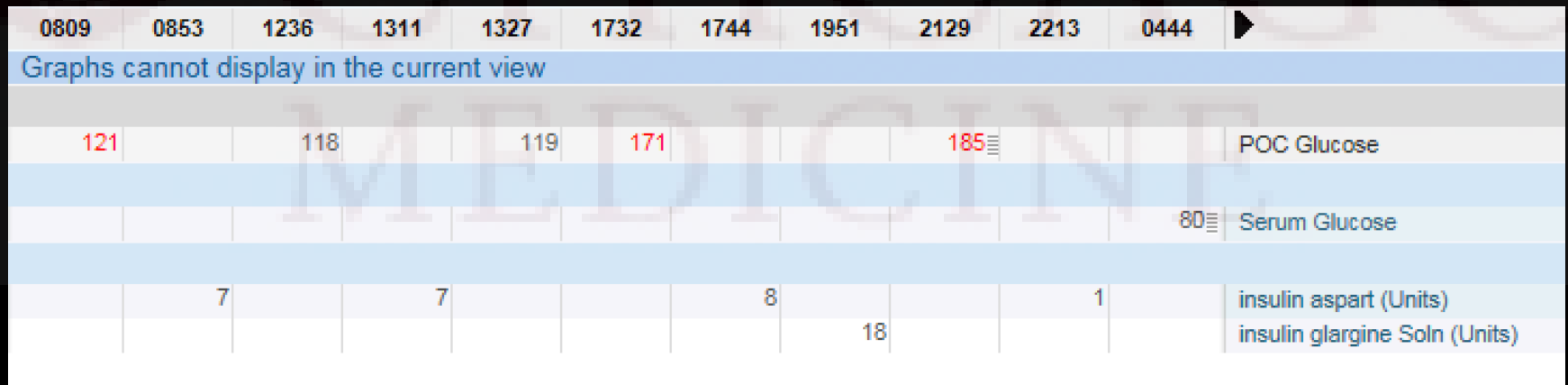
What else can we do for her?

Blood glucose during admission is reasonably well-controlled

7/2017



12/2017



Lost homemaker during admission and stint at rehab (left AMA)

Update: February 2018

- New homemaker – not as involved as prior but able to help with IADLs
- Old homemaker checks on her on weekends
- Friend (retired nurse), helping with care and they are considering moving in together
- **Voice recorder** to log insulin administration
- Long-acting insulin changed to midday so that it is administered when homemaker is present to facilitate adherence
- Working on **consistent carbohydrate diet** to reduce fluctuations in blood glucose
- New technology?
 - **InPen**
 - **Libre**

New technologies – Insulin Delivery

- **InPen (Companion Medical)**
 - Bluetooth enabled insulin pen that interfaces with smart phone app to track insulin deliver and calculate dose
 - Reminders to dose insulin
 - Temperature sensor to alert use to heat exposure
 - Sensor detects needle priming versus air shot
 - Can share data with providers
- **Regular pen + RapidCalc app**



- Cost \$799 → \$549 with discount card
- Pen, Insulin cartridges, Jazz meter (which talks to the pen), smart phone App

