Establishing an Infrastructure for a Virtual Clinic for the Management of Patients with Type 1 Diabetes

Amir Tirosh, MD PhD
Institute of Endocrinology
Sheba Medical Center

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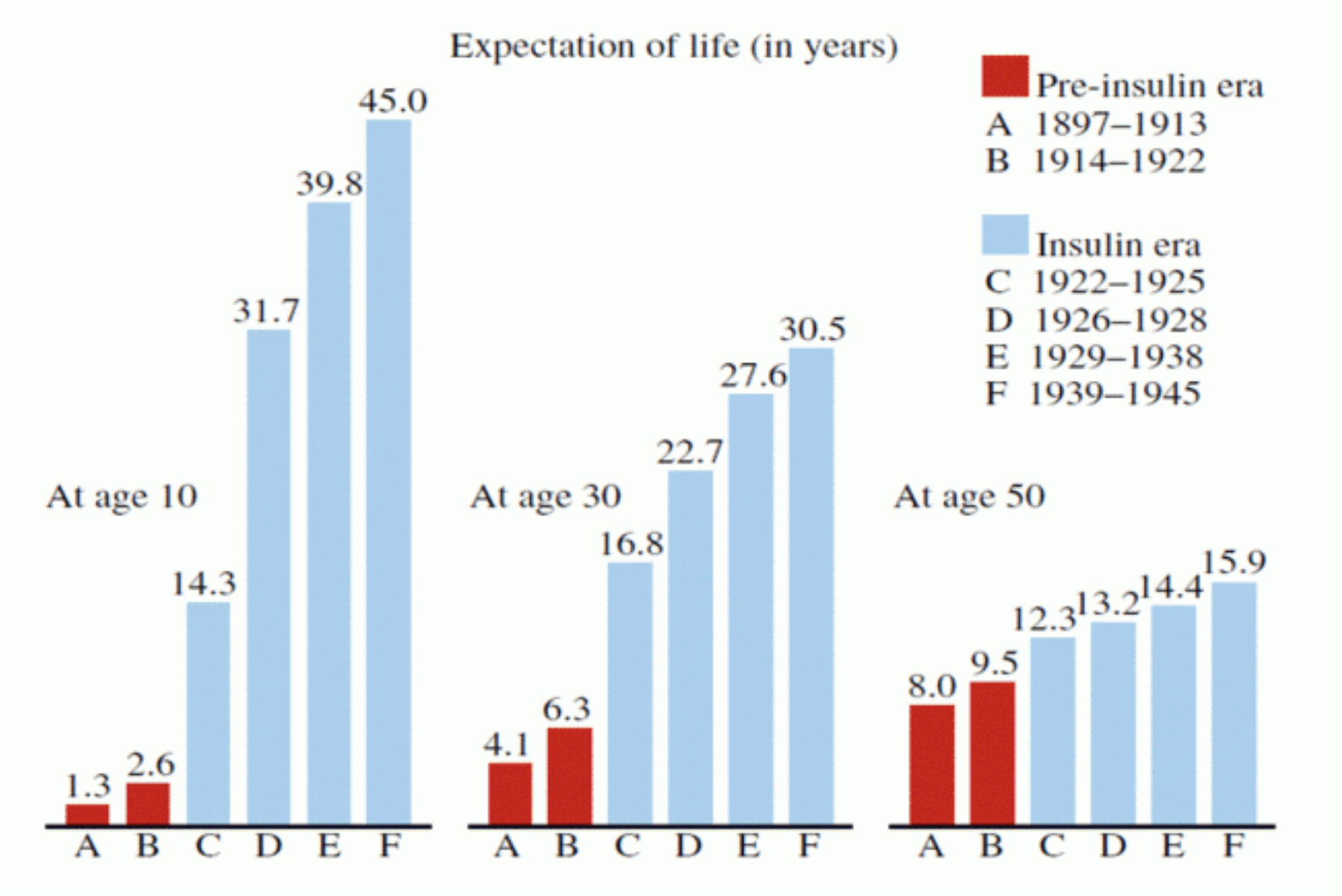
Initiating insulin therapy in the 1920s…

Before **After**

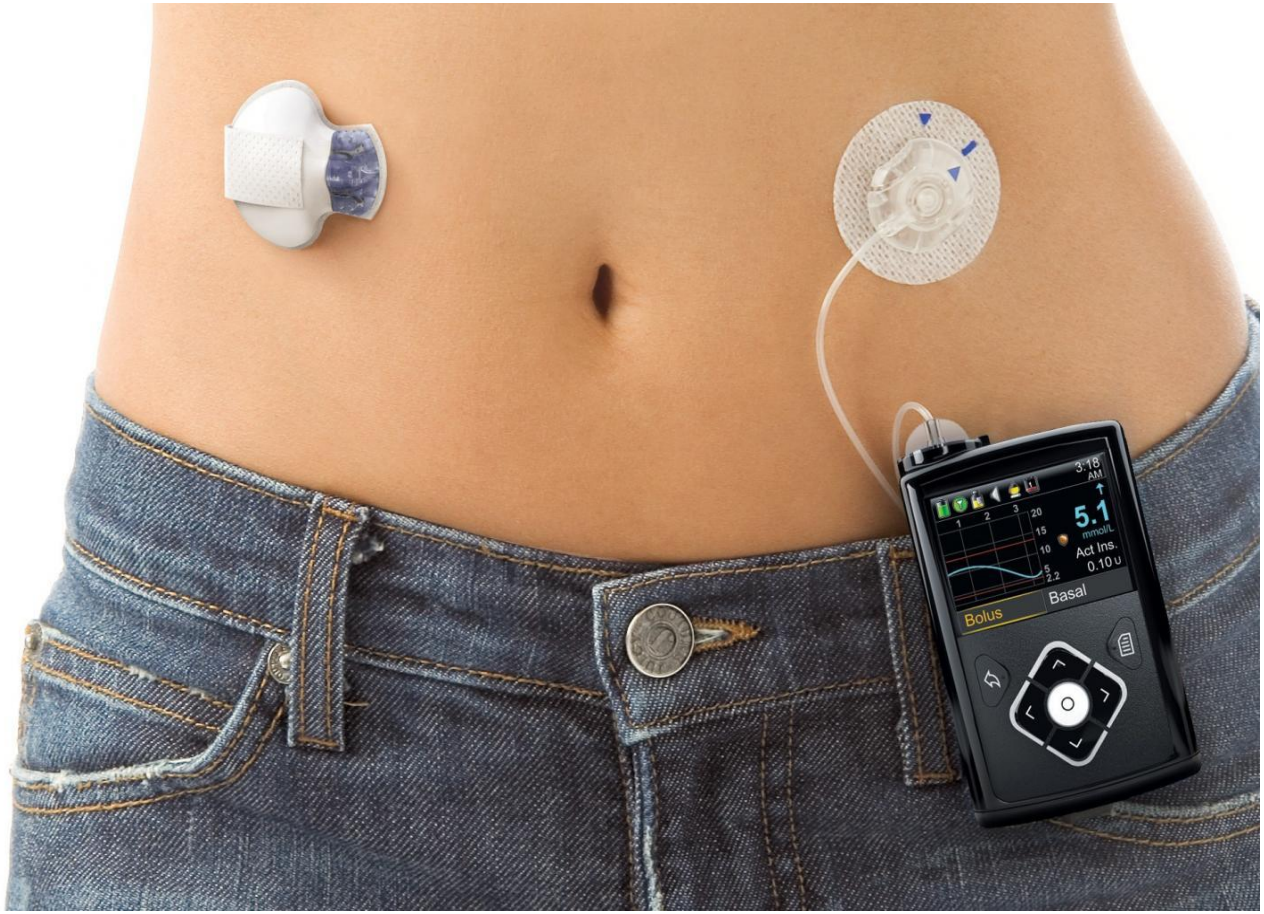


Dublin JI, 1951: Life expectancy by age of diagnosis

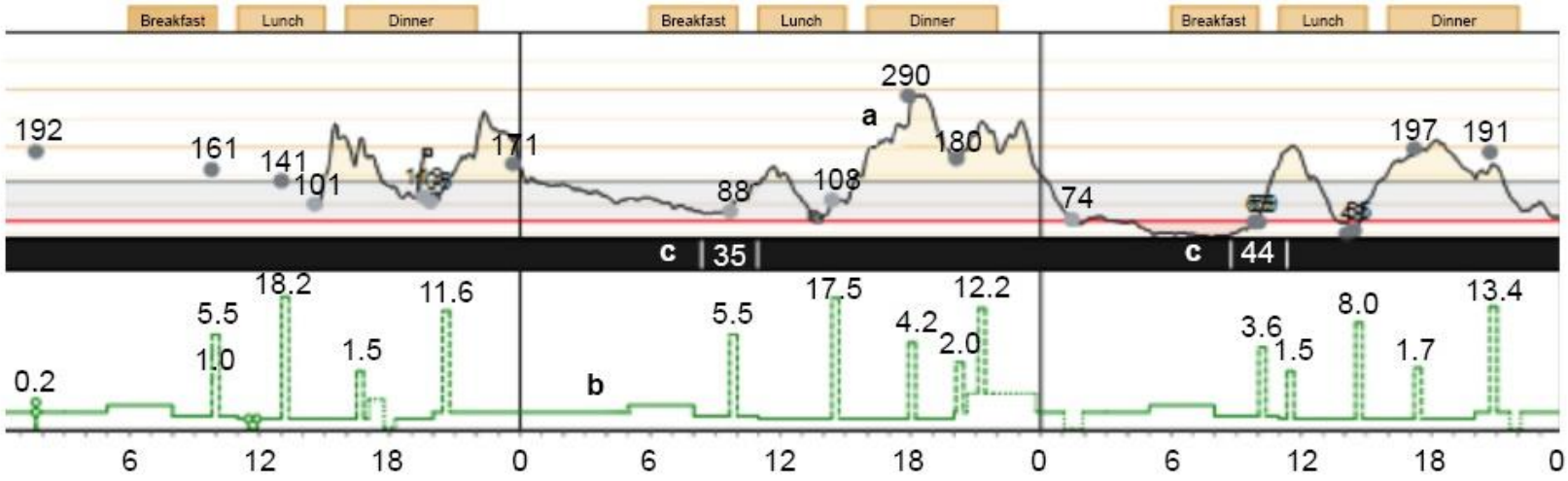
1963 - Dr. Arnold Kadish designed the first insulin pump to be worn as a backpack

First glucometer 1968

Hybrid closed-loop system - 2017



The amount of data collected at a single day using a glucose sensor and a pump…



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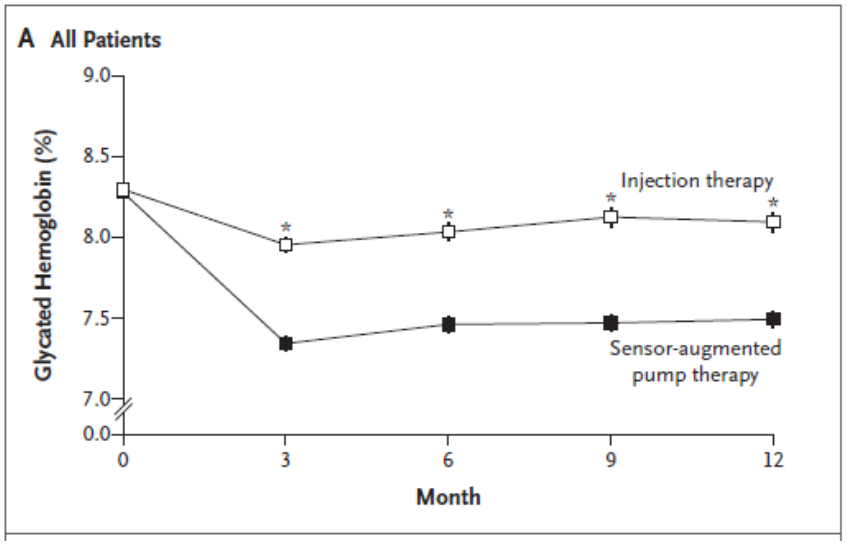
Effectiveness of Sensor-Augmented Insulin-Pump Therapy in Type 1 Diabetes

Richard M. Bergenstal, M.D., William V. Tamborlane, M.D., Andrew Ahmann, M.D., John B. Buse, M.D., Ph.D., George Dailey, M.D., Stephen N. Davis, M.D., Carol Joyce, M.D., Tim Peoples, M.A., Bruce A. Perkins, M.D., M.P.H., John B. Welsh, M.D., Ph.D., Steven M. Willi, M.D., and Michael A. Wood, M.D., for the STAR 3 Study Group*



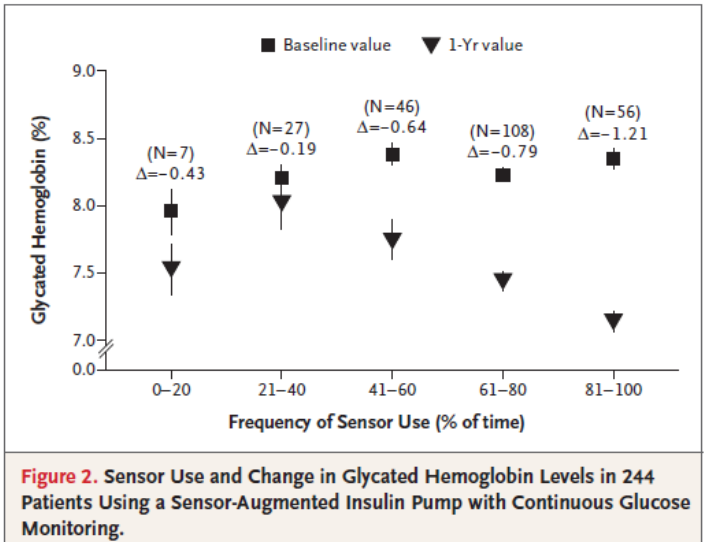
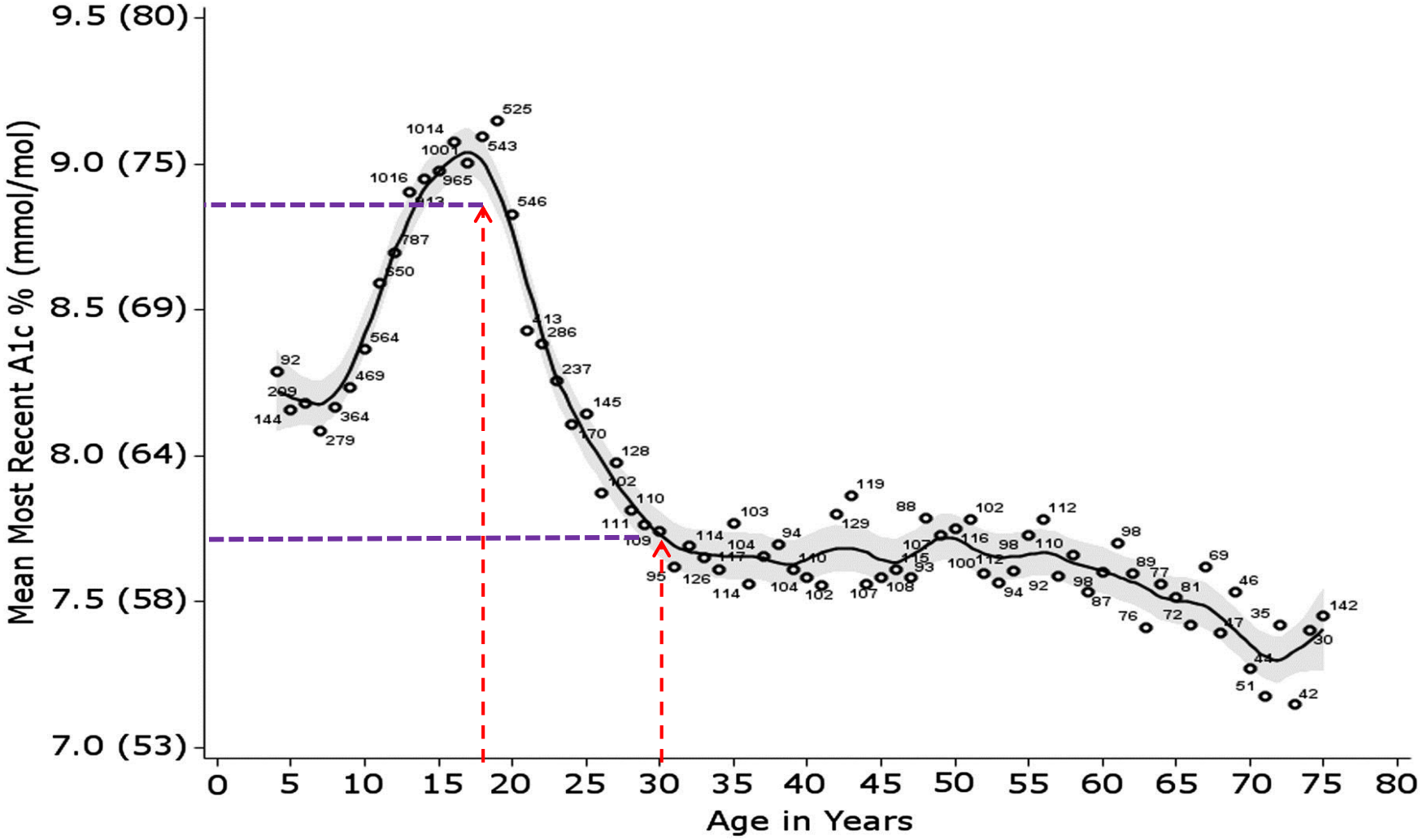


Figure 2. Sensor Use and Change in Glycated Hemoglobin Levels in 244 Patients Using a Sensor-Augmented Insulin Pump with Continuous Glucose Monitoring.

In patients with inadequately controlled T1DM, sensor augmented pump therapy resulted in significant improvement in A1c, as compared with injection therapy.

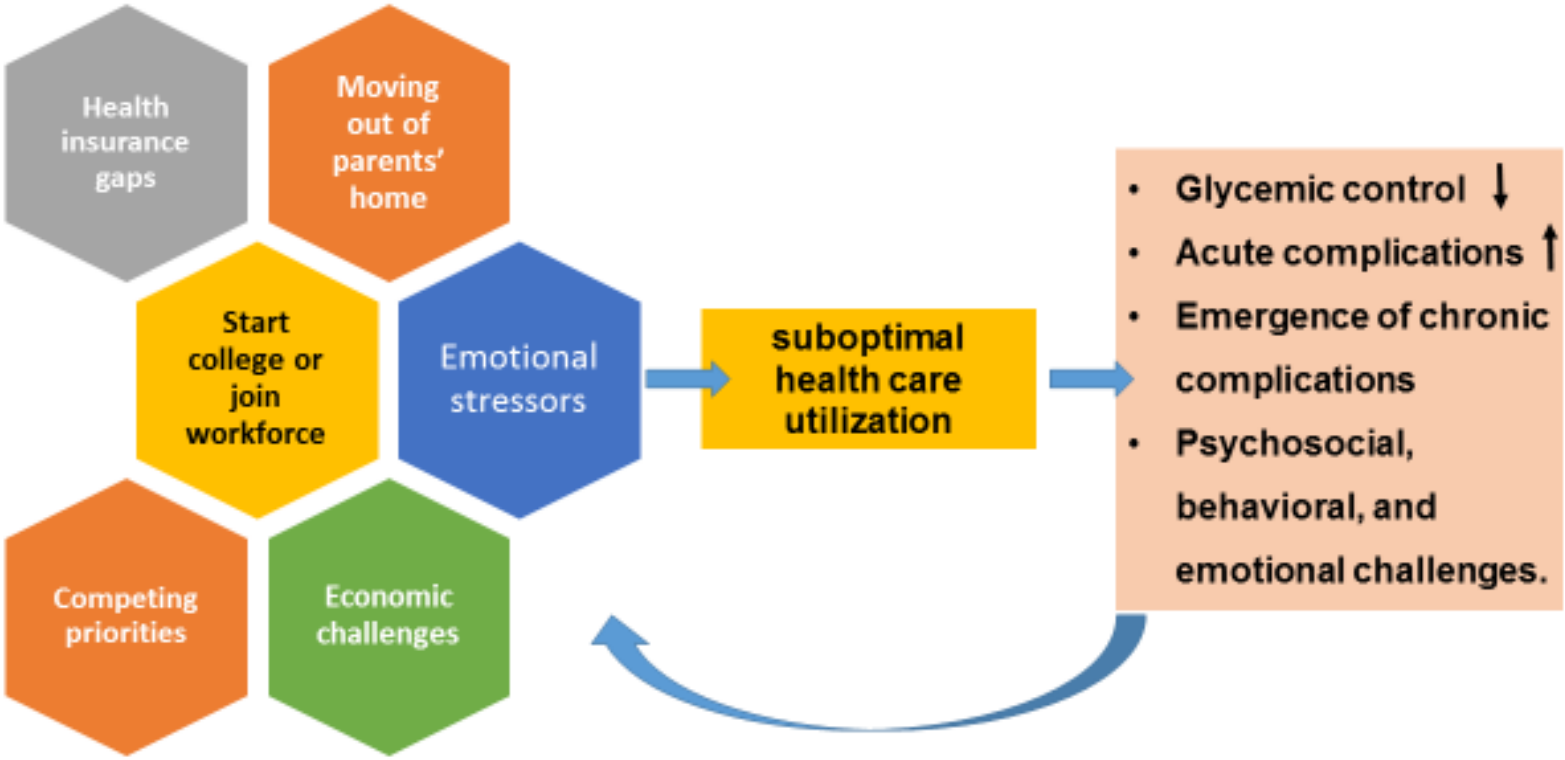
Mean HbA1c levels by age.



Diane K. Wherrett et al. Dia Care 2015;38:1975-1985

American Diabetes Association.

The process of transitioning from child to adult services is often associated with a deterioration in health of adolescents with chronic conditions



The unmet needs:

1. There is lack of specialized clinics for adults patients with T1DM in the community.
2. Advanced technologies are rapidly introduced into the market – lack of expertise among health care providers.
3. Electronic data (insulin pumps, CGMs) is ‘hand delivered’ to the clinic by patients while most adjustments to insulin regimens could be done online/remotely.

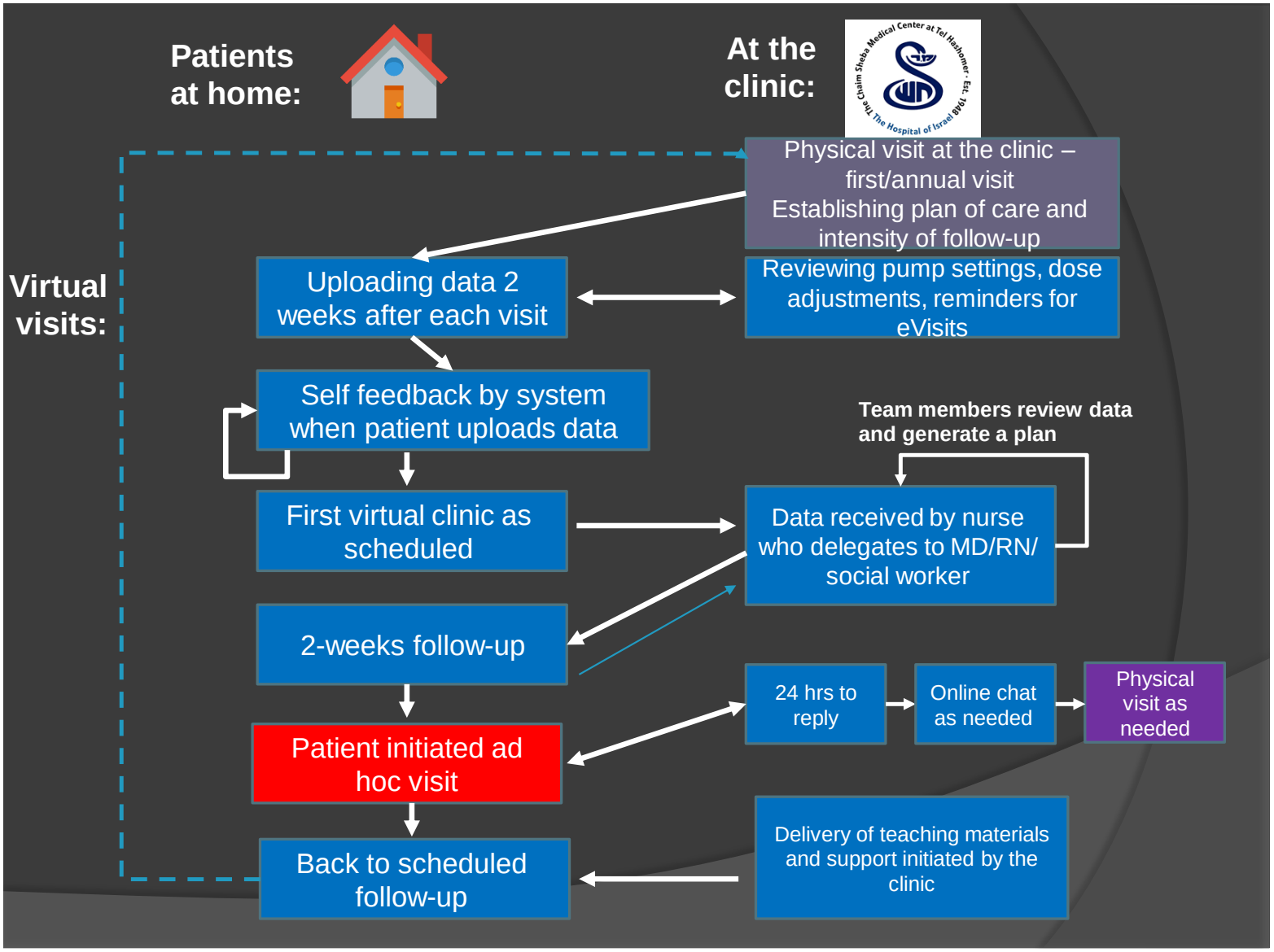
A virtual clinic for advanced technologies for T1DM patients

The Vision: A leading multidisciplinary virtual clinic for patients with T1DM, promoting an efficient clinical care, teaching and research in type 1 diabetes

Goals:

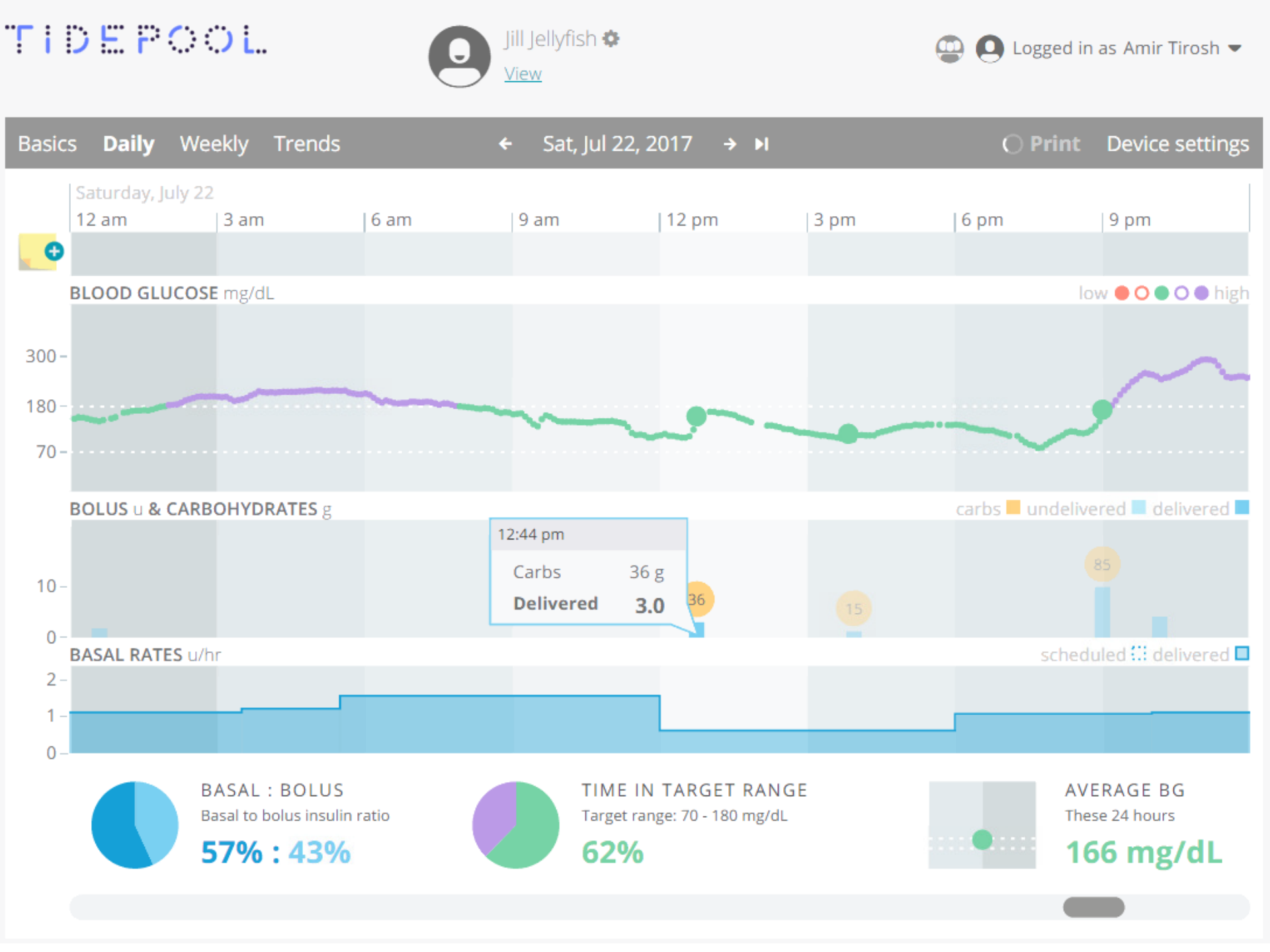
1. **Delivering excellent clinical care for patients (nationwide and international) using a digital/virtual methodologies.**
2. **Improving ongoing follow-up and 'just-in-time' resources for patients with T1DM.**
3. **Providing most medical care at home – saving time and resources for patients.**
4. **Improving quality of life.**
5. **Training and teaching health care teams at all aspects of care in T1DM.**
6. **Using the rapidly growing database to promote R&D.**

A model for virtual clinic for T1DM - Sheba




TIDEPOOL
Jill Jellyfish
View
Logged in as Amir Tirosh
Basics
Daily
Weekly
Trends
Oct 30, 2017 - Nov 13, 2017
Device settings
BG distribution
BGM
CGM
3%
above 300 mg/dL
27%
between 180 - 300 mg/dL
64%
between 70 - 180 mg/dL
4%
between 55 - 70 mg/dL
2%
below 55 mg/dL
Avg daily carbs
55 g
Insulin ratio
Basal
64%
28.0 U
Bolus
36%
15.6 U
Avg total daily dose
43.6 U
BG readings
Avg per day
2
Total: 24
Meter 0 (0%)
Manual 24 (100%)
Calibrations 34
Below 55 mg/dL 0 (0%)
Above 300 mg/dL 0 (0%)
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Oct 30
Nov 1
Nov 3
2
Bolusing
Avg per day
5
Total: 69
Calculator 33 (48%)
Correction 12 (17%)
Override 4 (6%)
Extended 4 (6%)
Interrupted 2 (3%)
Underride 0 (0%)
Infusion site changes
3 days
3 days
3 days
4 days
2 days


TIDEPOOL
Jill Jellyfish
View
Logged in as Amir Tirosh
Basics
Daily
Weekly
Trends
Sat, Jul 22, 2017
Print
Device settings
Saturday, July 22
12 am
3 am
6 am
9 am
12 pm
3 pm
6 pm
9 pm
BLOOD GLUCOSE mg/dL
low
high
300
180
70
BOLUS u & CARBOHYDRATES g
carbs
undelivered
delivered
10
0
36
15
85
BASAL RATES u/hr
scheduled
delivered
2
1
0
BASAL : BOLUS
Basal to bolus insulin ratio
57% : 43%
TIME IN TARGET RANGE
Target range: 70 - 180 mg/dL
62%
AVERAGE BG
These 24 hours
166 mg/dL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BLOOD GLUCOSE mg/dL
low
high
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70
BOLUS u & CARBOHYDRATES g
carbs
undelivered
delivered
12:44 pm
Carbs 36 g
Delivered 3.0
10
0
BASAL RATES u/hr
scheduled
delivered
2
1
0
BASAL : BOLUS
Basal to bolus insulin ratio
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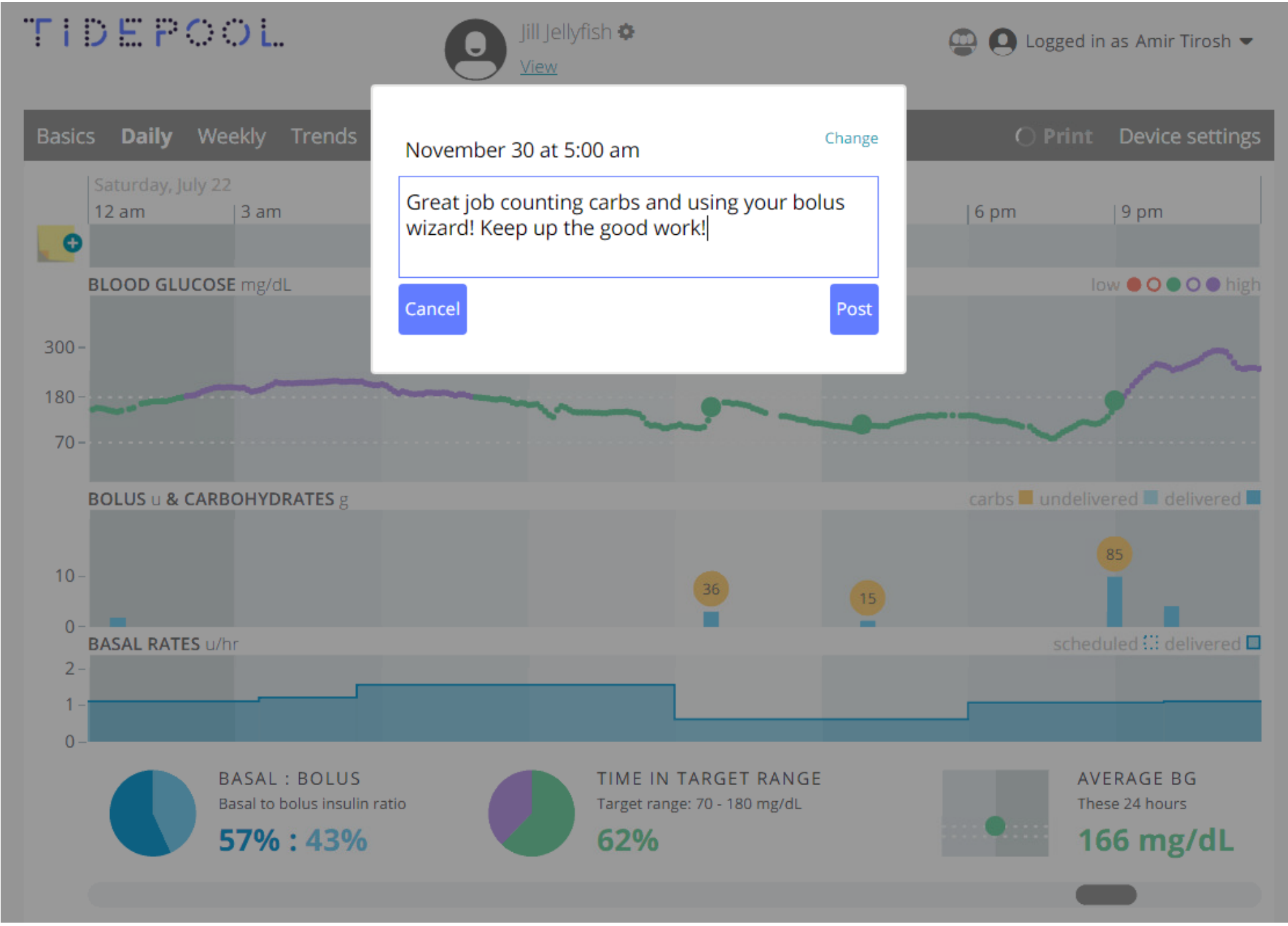
TIDEPOOL
Jill Jellyfish
View
Logged in as Amir Tirosh
Basics
Daily
Weekly
Trends
Print
Device settings
November 30 at 5:00 am
Change
Great job counting carbs and using your bolus wizard! Keep up the good work!
Cancel
Post
Saturday, July 22
12 am
3 am
6 pm
9 pm
BLOOD GLUCOSE mg/dL
low
high
300
180
70
BOLUS u & CARBOHYDRATES g
carbs
undelivered
delivered
10
0
36
15
85
BASAL RATES u/hr
scheduled
delivered
2
1
0
BASAL : BOLUS
Basal to bolus insulin ratio
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Plan

- A pilot of 10 patients begins in December 2018.
- About 100 patients will be enrolled during the first year.
- All electronic data will be collected and analyzed.
- Subjects will fill specific questionnaires to assess patient reported outcomes, quality of life and satisfaction.

The research aspects

- Creating a database of all patients joining the virtual clinic.
- Measuring the effects of virtual care on:
  - Metabolic outcomes: HbA1c, ‘time in range’, rate of hypoglycemia, etc.
  - Patient reported outcomes and quality of life
  - Patient satisfaction
- Outcome measures will be collected at baseline, 3 and 12 months of the intervention.

Thank you


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