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Ensuring timely access and adequate capacity for an endocrinology clinic

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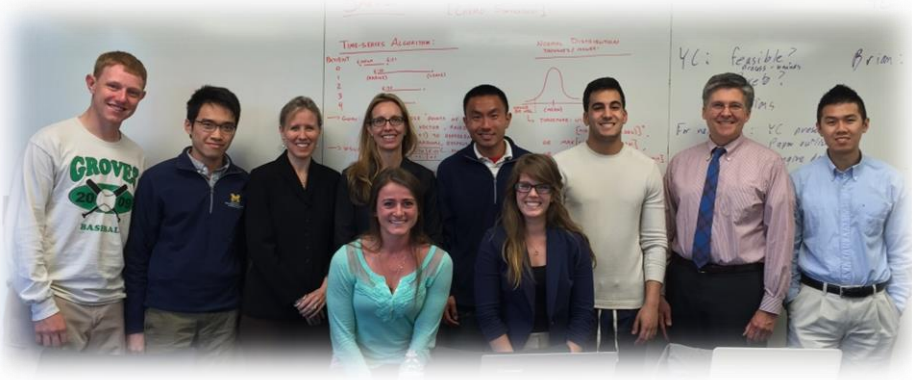

Faculty and Staff

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Background

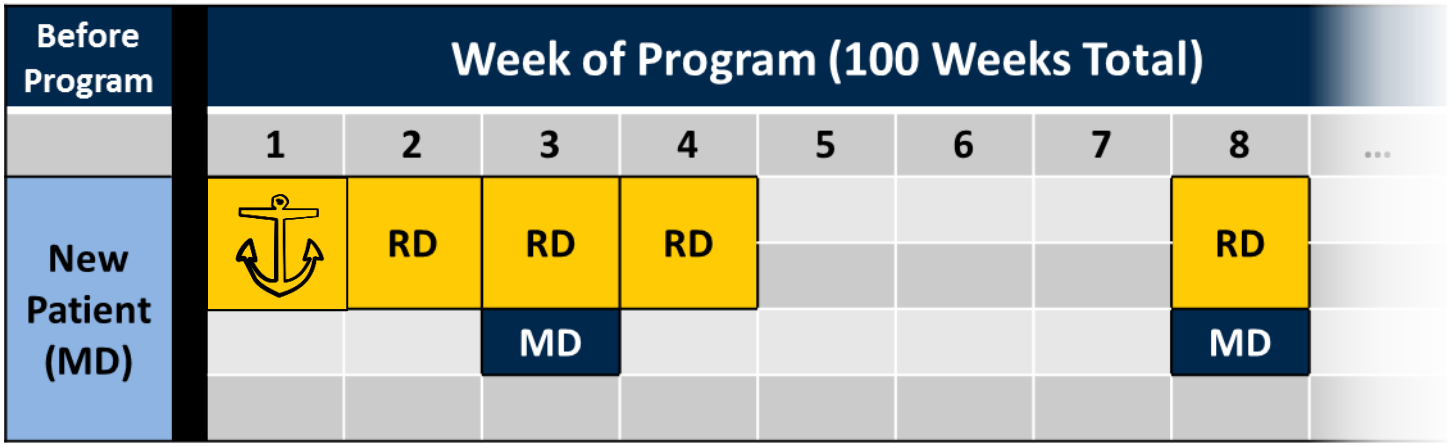
- 14.5% of US adults moderately or severely obese (NHANES 2011 – 2012)
- High risk of chronic diseases
  - Type 2 diabetes, hypertension, coronary artery disease
- High cost
  - $245 billion for diagnosed diabetes (ADA 2012)
  - 1 of 5 health care dollars attributed to diabetes

Weight Management Program

- 2-year program designed by Amy Rothberg, MD
- Promote weight reduction
- Support behavioral change
- Basic eligibility
  - BMI $\geq$ 32 kg/m^2 with 1 or more comorbidities
  - BMI $\geq$ 35 kg/m^2

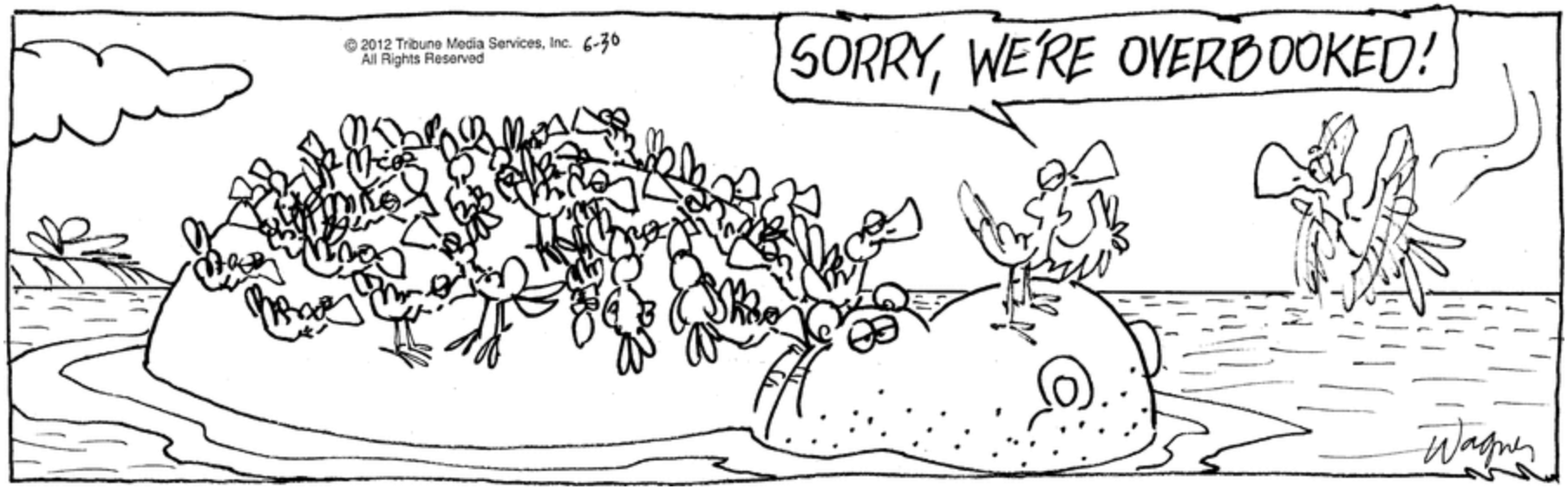
Program protocol

- Regimented visits to Registered Dietitian (RD) and MD
- Strict visit schedule for effectiveness



What's the problem?

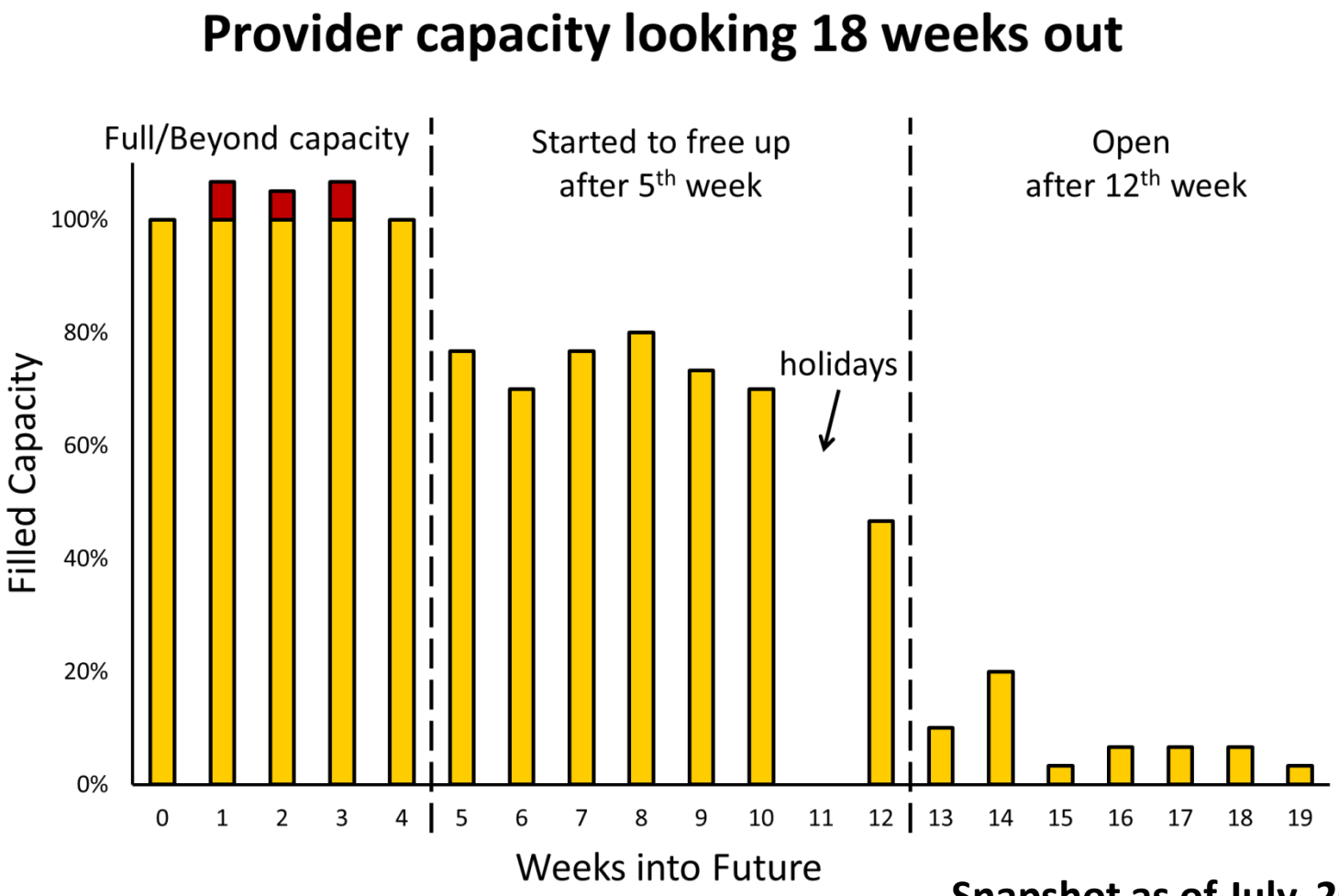
- Provider overbooked by non-program patients
- Patients not seen according to protocol



Unified data storage

- Data: 2 spreadsheets **daily**
- Build MySQL-based database
- Store information about appointments in rolling horizon basis
- Compare views of appointments from one day to another

What we learned from clinic data

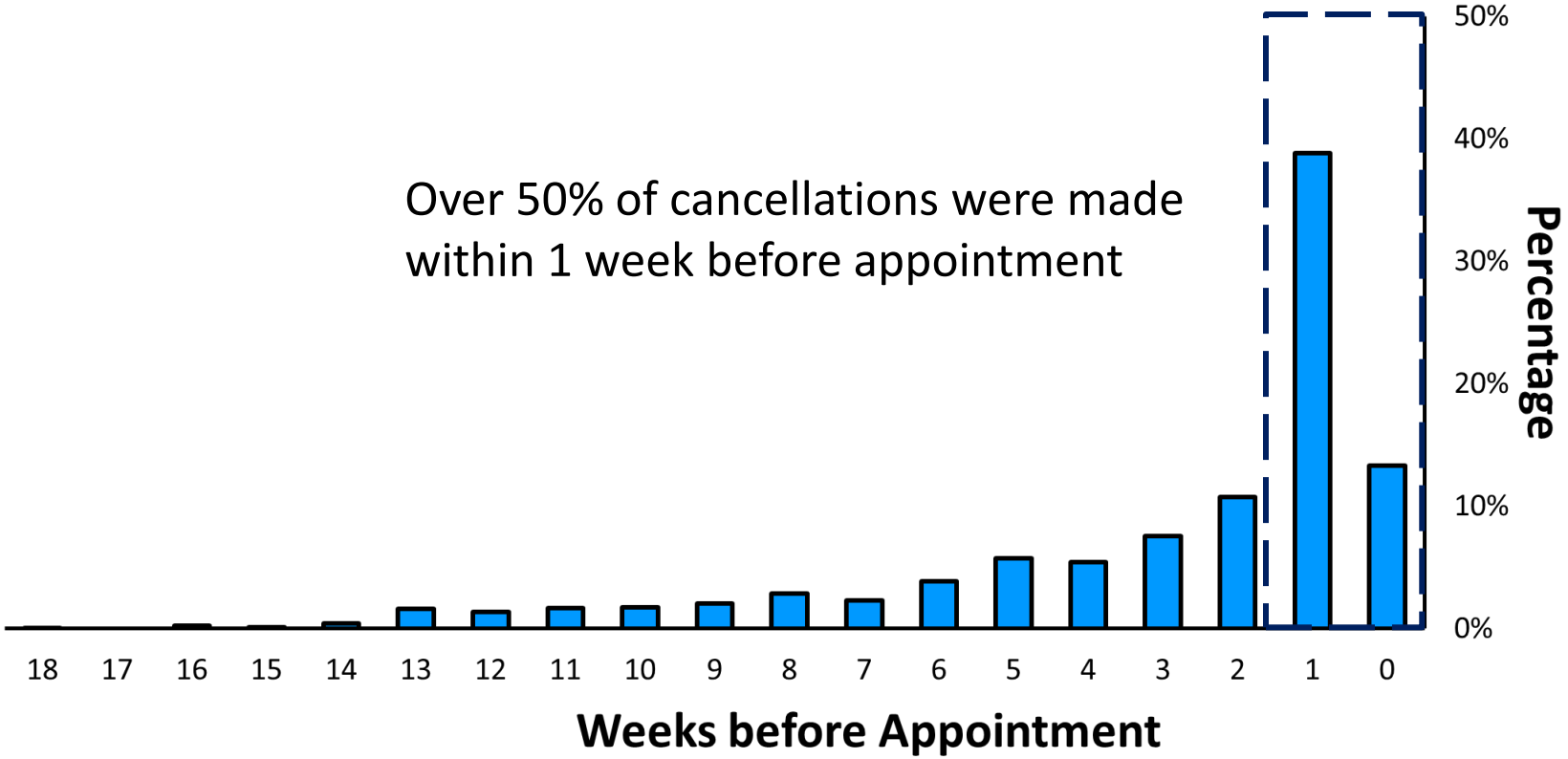


Snapshot as of July, 2015

What we learned from clinic data

How long before an appointment are cancellations made?

N = 1,514



Study objectives

- Increase patient access to the program
- Ensure capacity for program (time-sensitive) patients
- Improve patient adherence to the program

Our approach

The **OPT** solution package:

1. **Optimization**
   Recommend plan of new patient (NP) intake
2. **Policy**
   Develop standard operating procedures for handling program patients
3. **Training**
   Provide training to sites

Challenges in implementing change

- Equity
  - How about the current program patients?
- Culture
  - Resistance to change
  - How do we ensure improvement?

> "It may be hard for an egg to turn into a bird: it would be a jolly sight harder for it to learn to fly while remaining an egg." – C.S. Lewis

Greenfield opportunity

- Program implementation in primary care sites
- No current program patients

Our approach

The **OPT** solution package:

1. **Optimization**
   Recommend plan of new patient (NP) intake
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   Develop standard operating procedures for handling program patients
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   Provide training to sites

Optimization model

Sets/Parameters

$\boldsymbol{P}$	patients
$\boldsymbol{W}$	weeks in planning horizon
$\boldsymbol{W^S \subset W}$	starting weeks
$\boldsymbol{V_s \subset W}$	weeks patient is expected to visit the clinic if patient has started in week *s*
$\boldsymbol{N^W}$	maximum number of weeks between NP and program start

Optimization model

VARIABLES

$x_{p,s} \in \{0, 1\}$ if patient *p* has NP assessment visit in week *s*

$y_{p,s} \in \{0, 1\}$ if patient *p* starts program in week *s*

u_w capacity utilization in week *w*

CONSTRAINTS

$\sum_{s \in W^S} x_{p,s} = 1 \; \forall p \in P$ Every patient should have one NP visit

$\sum_{s \in W^S} y_{p,s} = 1 \; \forall p \in P$ Every patient should start program once

$\sum_{p \in P} \left(x_{p,w} + \sum_{s \in W^S : w \in V_s} y_{p,s} \right) = u_w \; \forall w \in W$ Number of patients in each week

$0 \leq \sum_{s \in W^S} s y_{p,s} - \sum_{s \in W^S} s x_{p,s} \leq N^W \; \forall p \in P$ Timing between program start and NP

Scheduling Policy

- Change process of scheduling appointments
- Book N-months ahead
- Proactive reminder of upcoming appointments
  - After Visit Summary

Scheduling Policy

- Rescheduling
  - Last-minute emergency
- Cancellation
  - Different reasons for cancellation
  - Capture cancellations without notification
    - *6% canceled via online portal (91/1,514)
- Withdrawal

Training

- On-site training before program implementation
- Documentation of scheduling process
- Regular site visits

Summary

- Implementable, independent solution package
- Collaborative effort from management to executions
- Consistent implementation

Ongoing work

- Incorporate uncertainty in model
- Refine policy for handling uncertainty
- Provide training to schedulers at sites
- Create adaptive solution packages

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Thank you!

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