

uchealth



Optimizing Capacity in Health Systems through Analytics

Becker's Virtual Conference: January 20th, 2021

Speakers



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Summary of today's session

- Introduction to UCHealth
- Covid has highlighted the need for sophisticated capacity management methods
- Optimizing capacity is a difficult math problem
- EHRs are not built to solve capacity management
- Summarizing the impact of deploying these methods at UCHealth
- Q & A

UCHealth – Who We Are

- \$5.0 billion in revenue
- 12 hospitals
- 1,987 inpatient hospital beds
- Over 6,000 affiliated or employed providers
- 25,000 employees
- 136,115 admissions and OBS visits
- 12,686 babies delivered
- 85,075 surgeries
- 506,094 emergency room visits
- 3,883,870 clinic visits



Yampa Valley Medical Center
Steamboat Springs



Poudre Valley Hospital
Fort Collins



Medical Center of the Rockies
Loveland



Longs Peak Hospital
Longmont



Broomfield Hospital
Broomfield



Greeley Hospital
Greeley



University of Colorado Hospital
Aurora



Highlands Ranch Hospital
Highlands Ranch



Memorial Hospital North
Colorado Springs



Memorial Hospital Central
Colorado Springs



Grandview Hospital
Colorado Springs



Pikes Peak Regional Hospital
Woodland Park

UCHealth IT - By the Numbers

1 enterprise EHR, including 12 hospitals, 950+ ambulatory clinics, and 6,000+ providers

277 independent clinics on the UCHealth EHR, with 400+ providers

3 independent hospitals on the UCHealth IT platforms (one additional in process)

6.9M total unique patients with 2.0M active unique patients (encounters within last 24 months)

11,675 concurrent EHR users

30,000 email accounts

715 total FTEs, with 467 EHR-focused and 40 physician and nursing informaticists

\$134M operating budget (2.81% of net revenue)

48,000 devices supported

1,024,000 patients with My Health Connection (patient portal)

409,000 UCHealth Mobile users

\$20M capital budget



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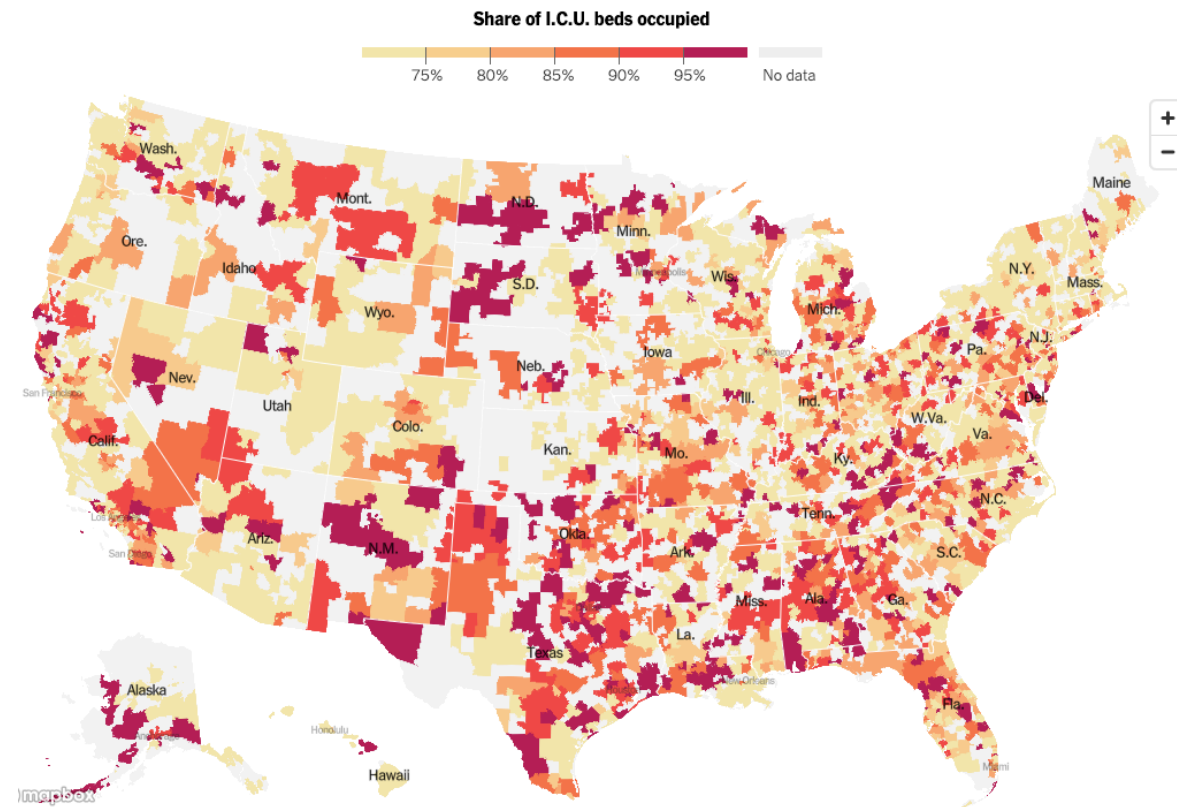
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Covid has highlighted the need for sophisticated capacity management methods

The New York Times

'There's No Place for Them to Go': I.C.U. Beds Near Capacity Across U.S.

By Lauren Leatherby, John Keefe, Lucy Tompkins, Charlie Smart and Matthew Conlen Dec. 9, 2020

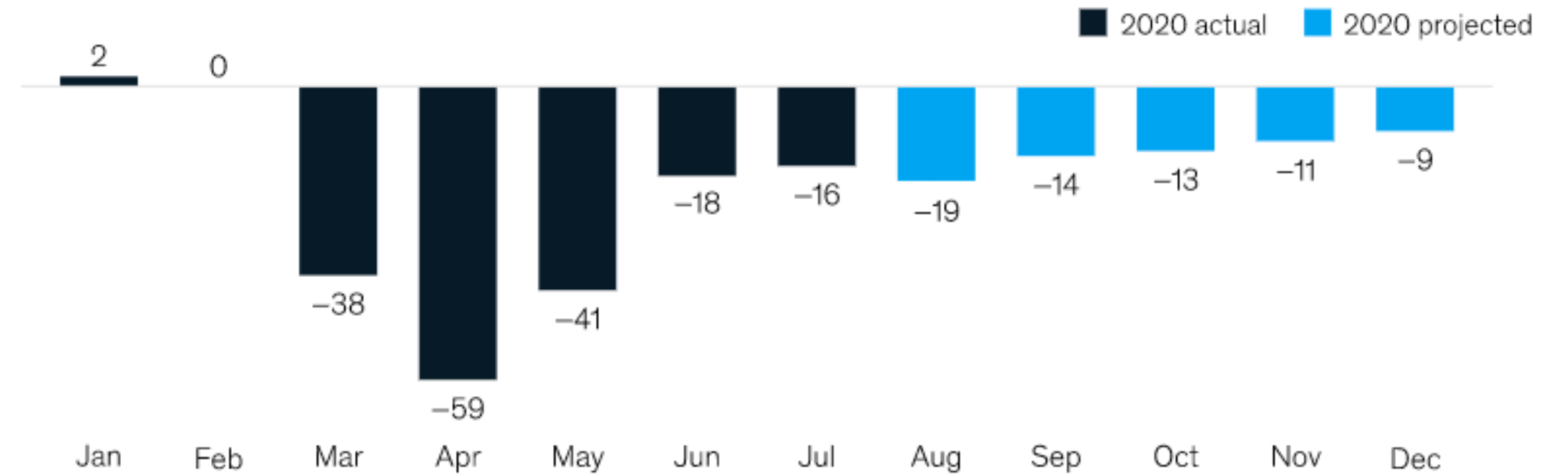


Source: New York Times analysis of U.S. Department of Health and Human Services data. Note: Shows 7-day average patient count by hospital service area.

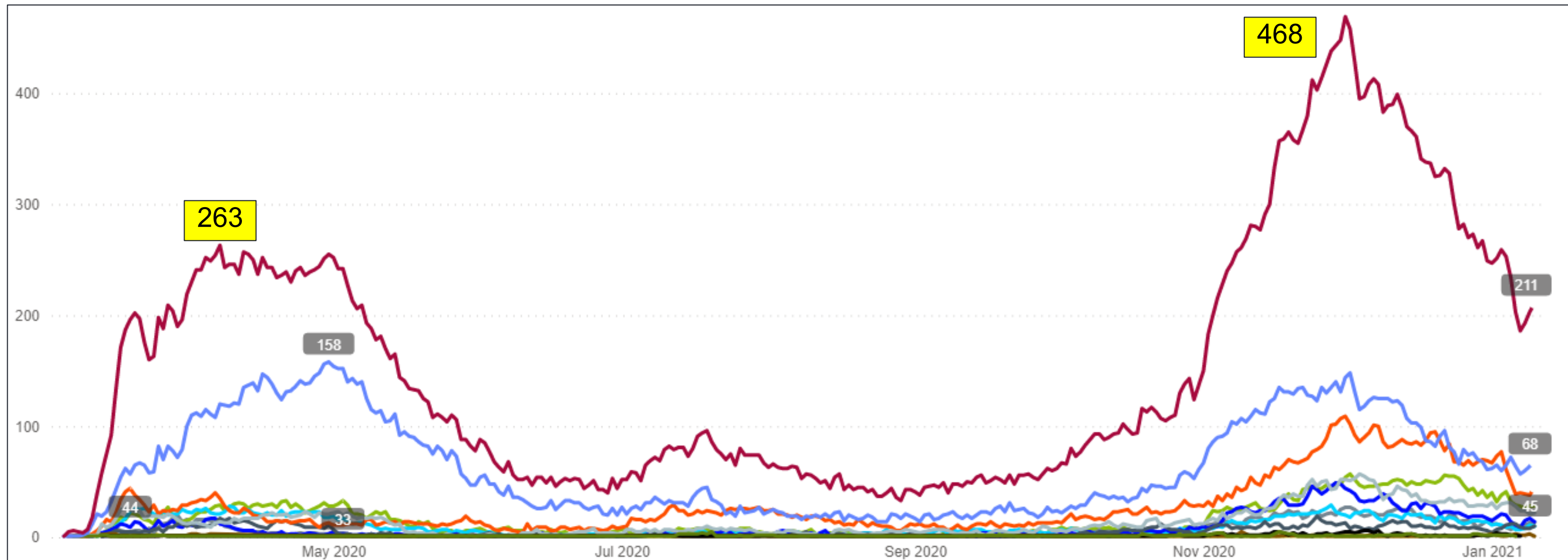
On average, US hospitals saw a ~35% decrease in OR volumes from March–July and expect to remain below baseline for the rest of 2020.

Completed OR cases (inpatient and outpatient) for 2020 compared with 2019 baseline

% of 2019 volume^{1,2}

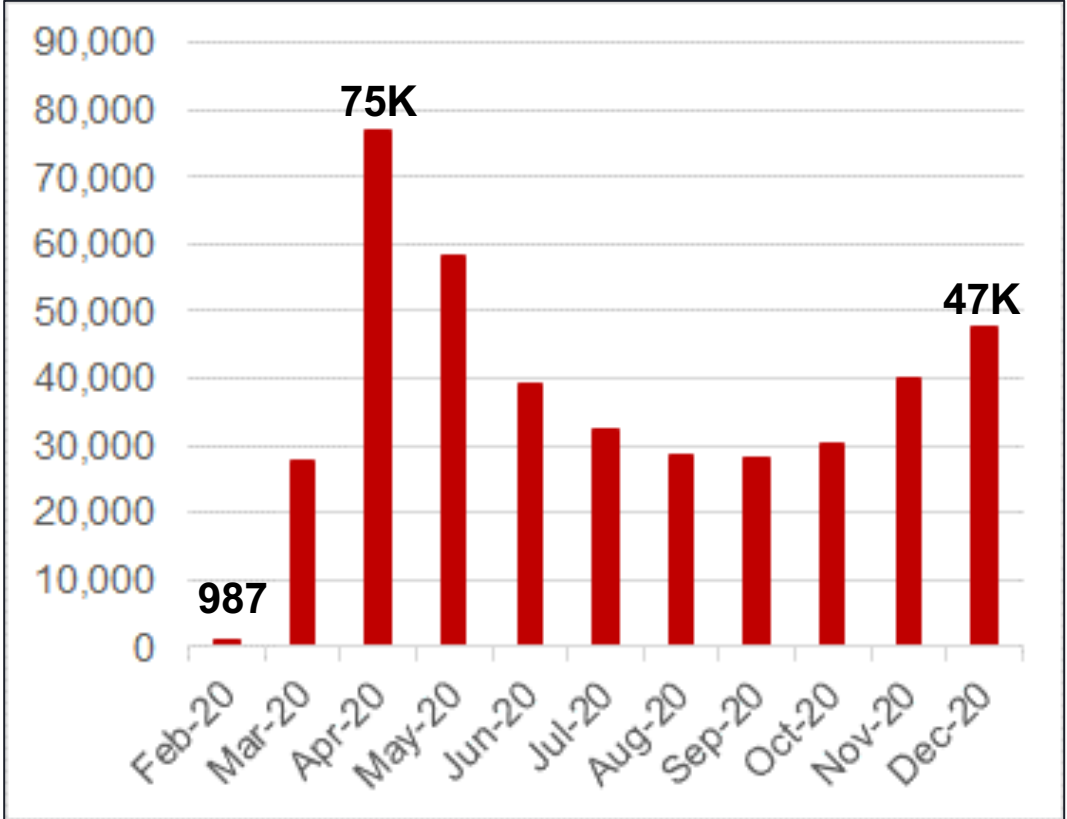


UCHealth COVID Trend – COVID+ and Rule Out Census



Virtual Care

Total Virtual Visits



Total virtual visits include Primary Care, Specialty Care, and Urgent Care; excludes Community Connect

47,620 virtual visits in December
7,600 virtual urgent care visits for “Coronavirus Concern” since March 2020



Pulse Oximeter



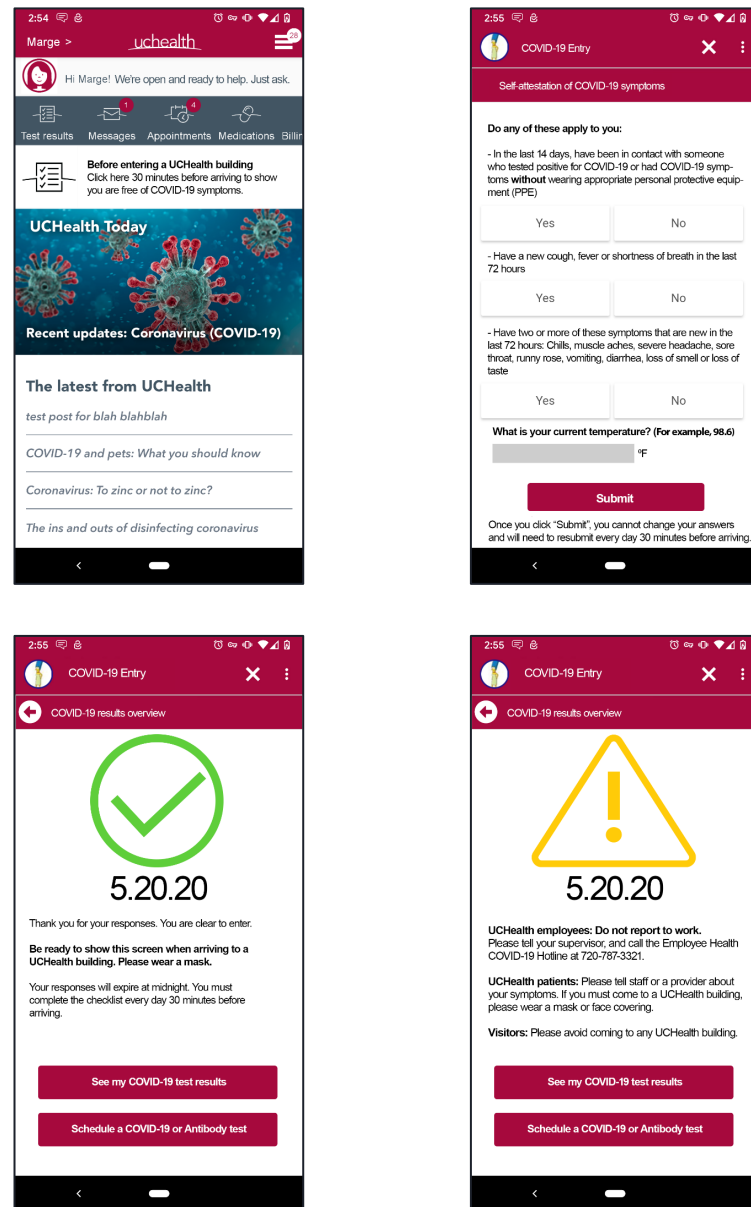
Biometric wearable & hub

- For COVID Remote Patient Monitoring (RPM), a wearable vital sign monitoring device is placed on high-risk patients discharging from the inpatient or emergency department settings. At time of discharge, prior to going home, a staff member enrolls the patient for RPM, places the wearable device, and RPM monitoring begins. RPM allows for vital sign monitoring with real-time data transmission to the Virtual Health Center (VHC). This data is monitored 24 hours, 7 days for a duration of 5 to 8 days by the VHC staff. Built-in escalation protocols to a nurse and/or attending physician are enacted as needed.

280+ discharged COVID patients monitored at home using wearables

Additional COVID Response Initiatives

Symptom Screening Tool



COVID-19 Testing

450,000 COVID-19 PCR tests performed
56,000 COVID-19 antibody tests performed

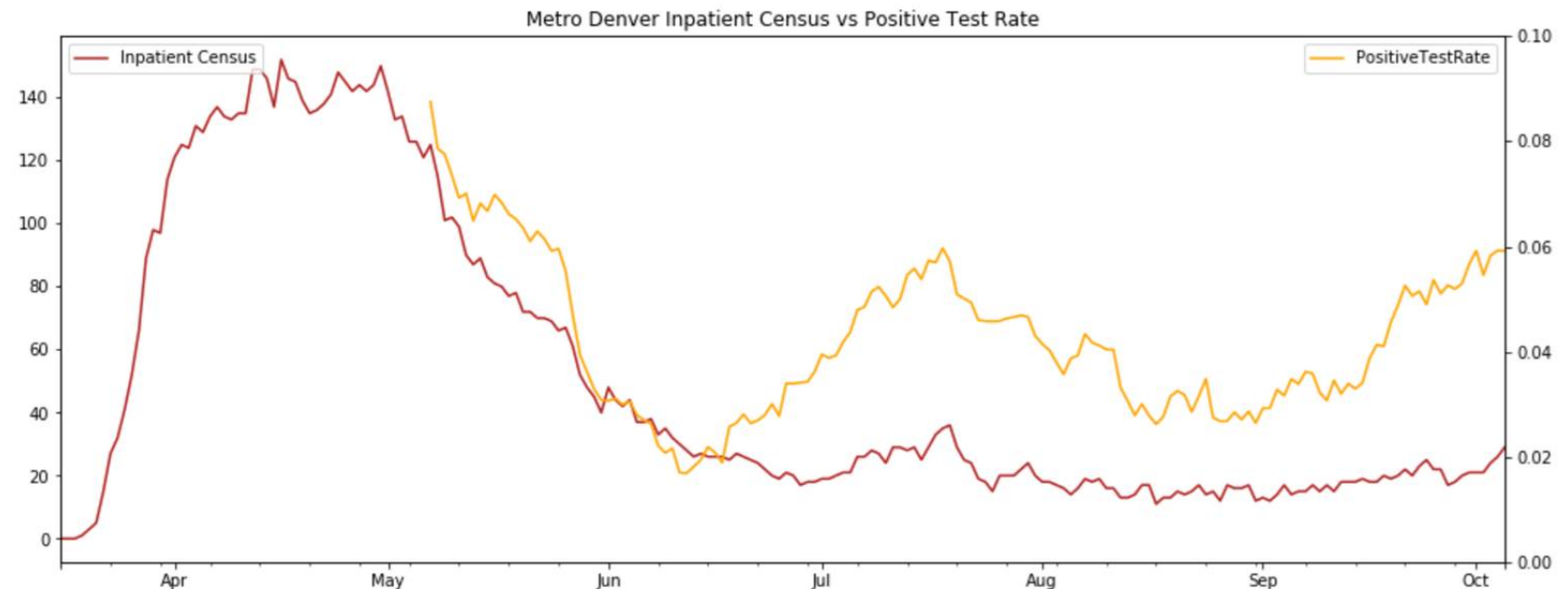


COVID-19 Vaccines

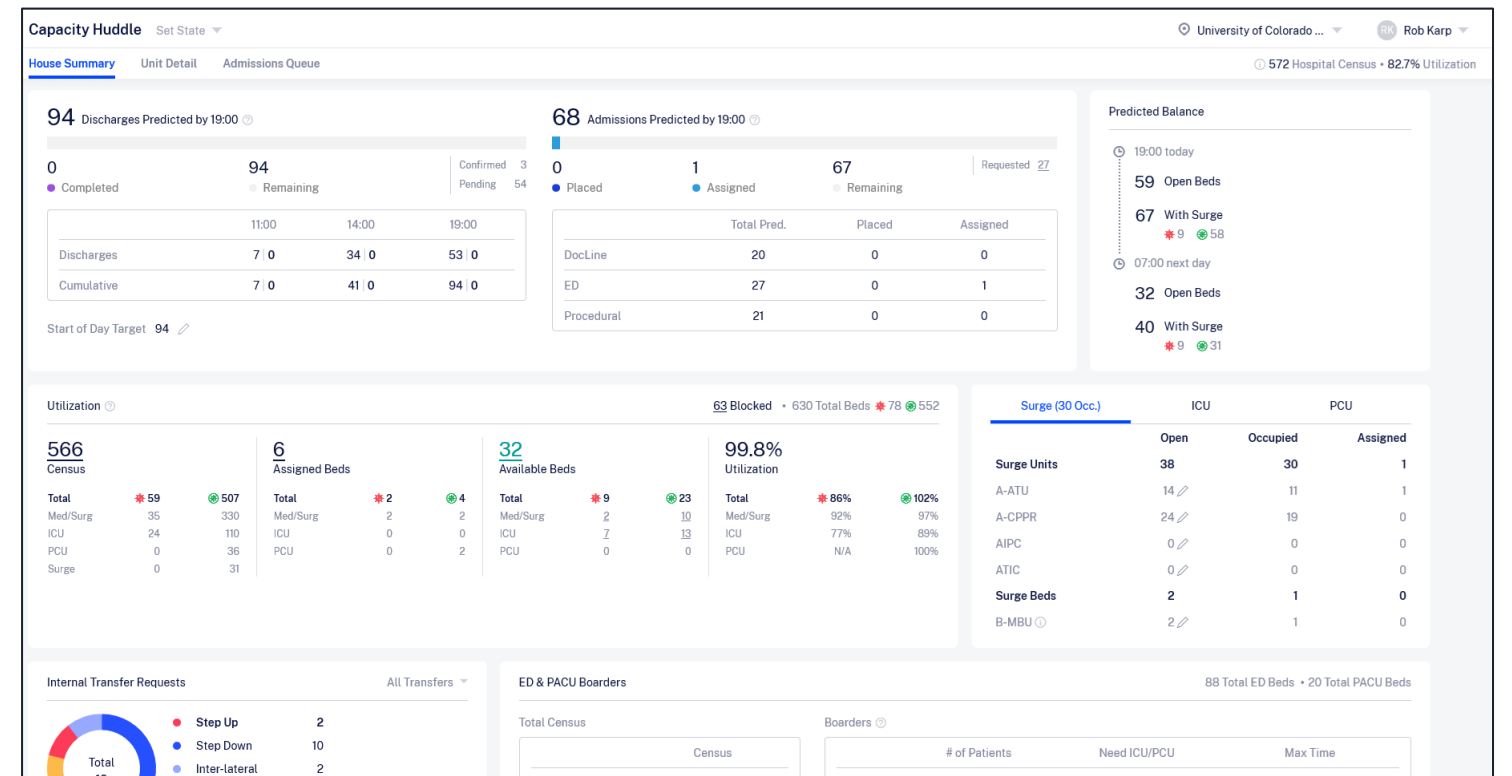


50,000 vaccines administered

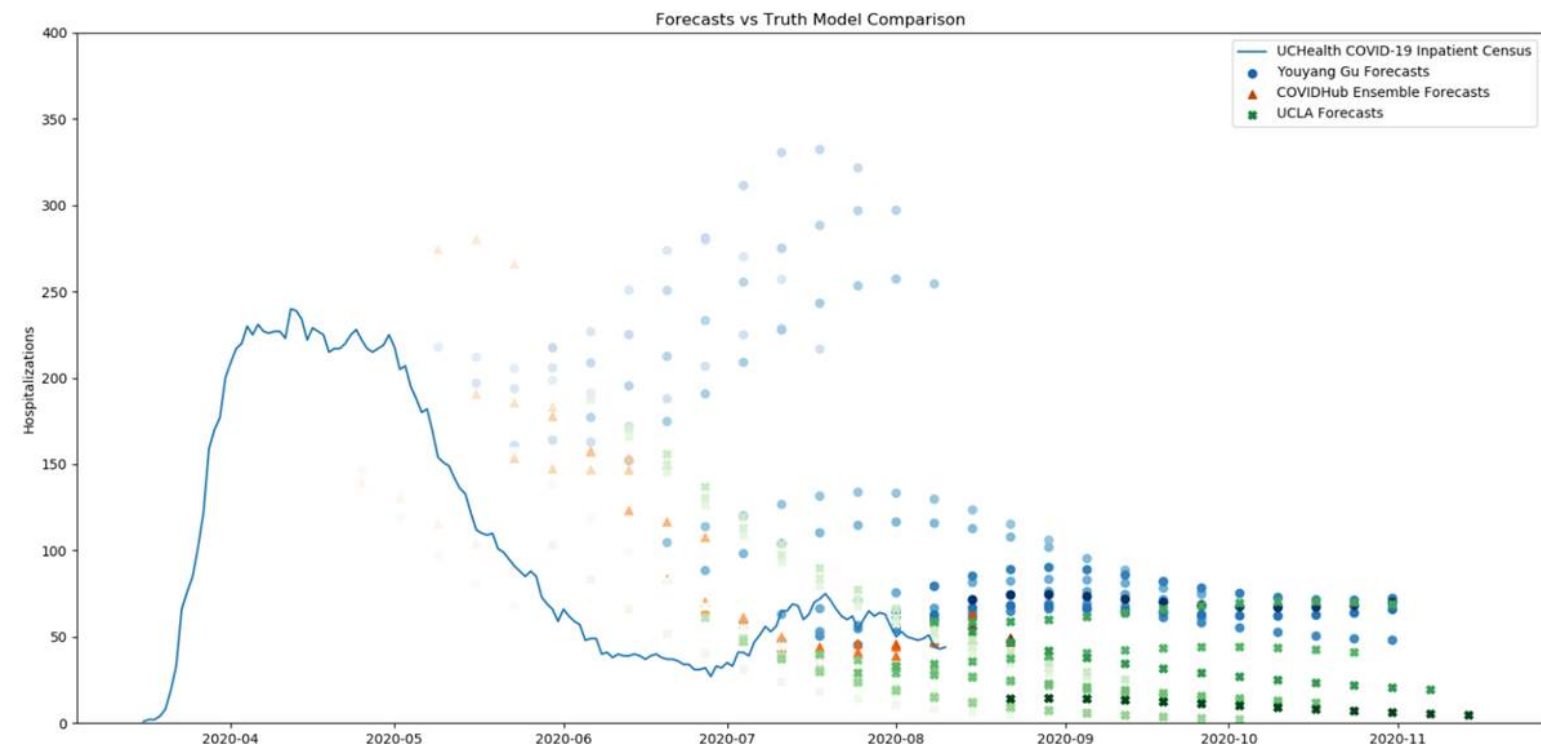
Operational Intelligence



Hospital Census Prediction using Positivity Rate



iQueue - Daily Capacity Huddle



Long-term Hospital Census Prediction (aggregated models)

COVID Vaccine Clinic Scheduling

Forward looking schedule fill rates (Booked/Available)

Location Abbr	Tue 01/12	Wed 01/13	Thu 01/14	Fri 01/15	Sat 01/16	Mon 01/18	Tue 01/19	Thu 01/21	Fri 01/22	Sat 01/23
AMC	54%	34%	36%	53%	5%	5%	3%	2%	2%	65%
GH	37%	35%								
MAC	67%	46%		100%	76%	5%	2%	2%	3%	
MCR	38%	33%								
MHN	50%	43%	9%							
PVH	66%	30%	37%	100%	100%	100%	100%	98%	59%	
YVMC		100%		100%						

COVID Vaccine Clinic Availability

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LeanTaaS: Unlock capacity through data science and prescriptive analytics

<p>300+ Leading Hospitals</p>	<p>50% Of the 10 Largest Health Systems</p>	<p>100+ Health System</p>	<p>60% Of the US News & Report Honor Roll</p>
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- 300+ Hospitals
- Current Products:
 - iQueue for Operating Rooms*
 - iQueue for Infusion Centers*
 - iQueue for Inpatient Beds*



Partial list of Customers



Raised more than \$250 MM to build the *iQueue* suite of products

Capacity optimization methods have been deployed in many industries



Fleet Management



Highway HOV Lanes



Airline Yield Management



Staffing Airport Security

Capacity optimization methods apply to several hospital assets too



OR Block Utilization



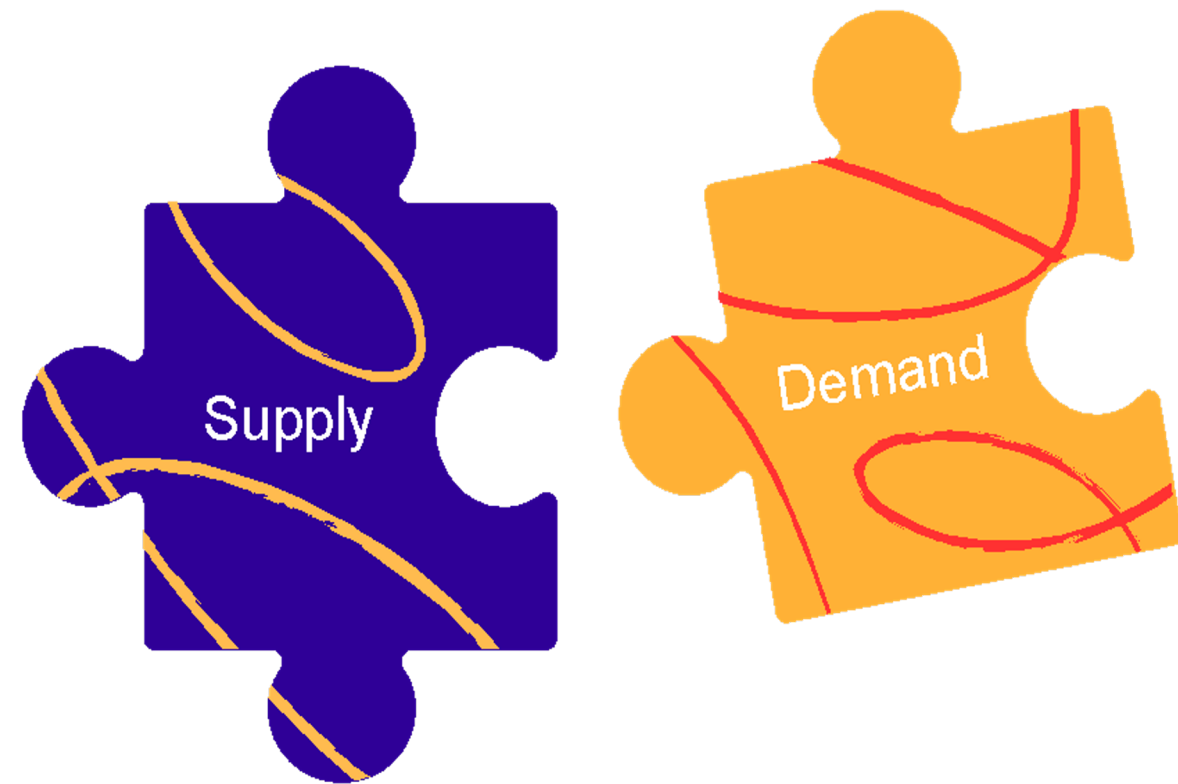
Inpatient Bed Utilization



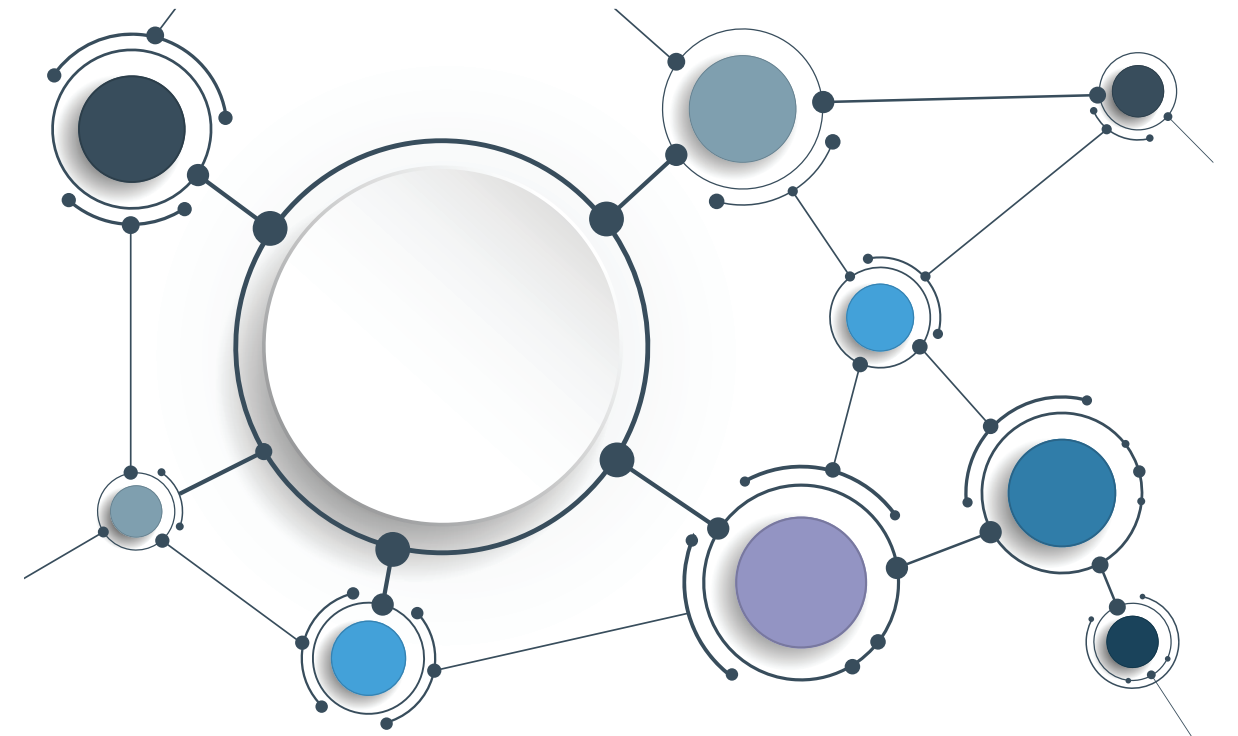
Infusion Chair Utilization

Two fundamental concepts in optimizing capacity

Matching



Linking



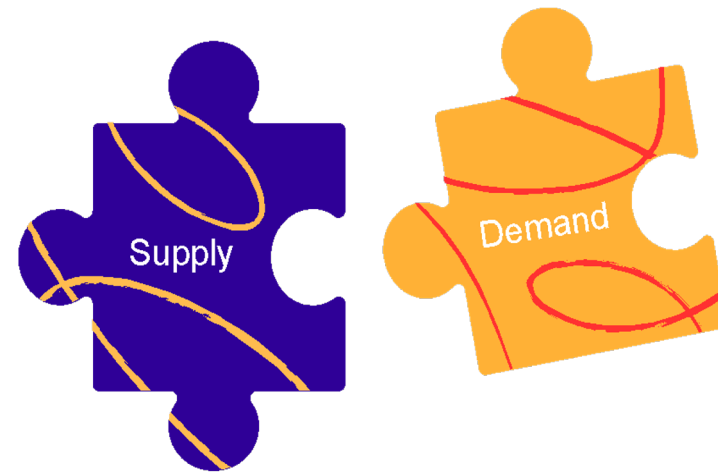
Matching the Supply and Demand patterns is a critical requirement

Supply Side (Capacity)

Staff: Availability of the right staff member with the right skills

Equipment: Availability of the necessary equipment (Robot, Pump, Imaging Machine, etc.)

Facilities: Availability of the right type of room (OR, Procedure, Examination room, etc.)



Demand Side (Patients)

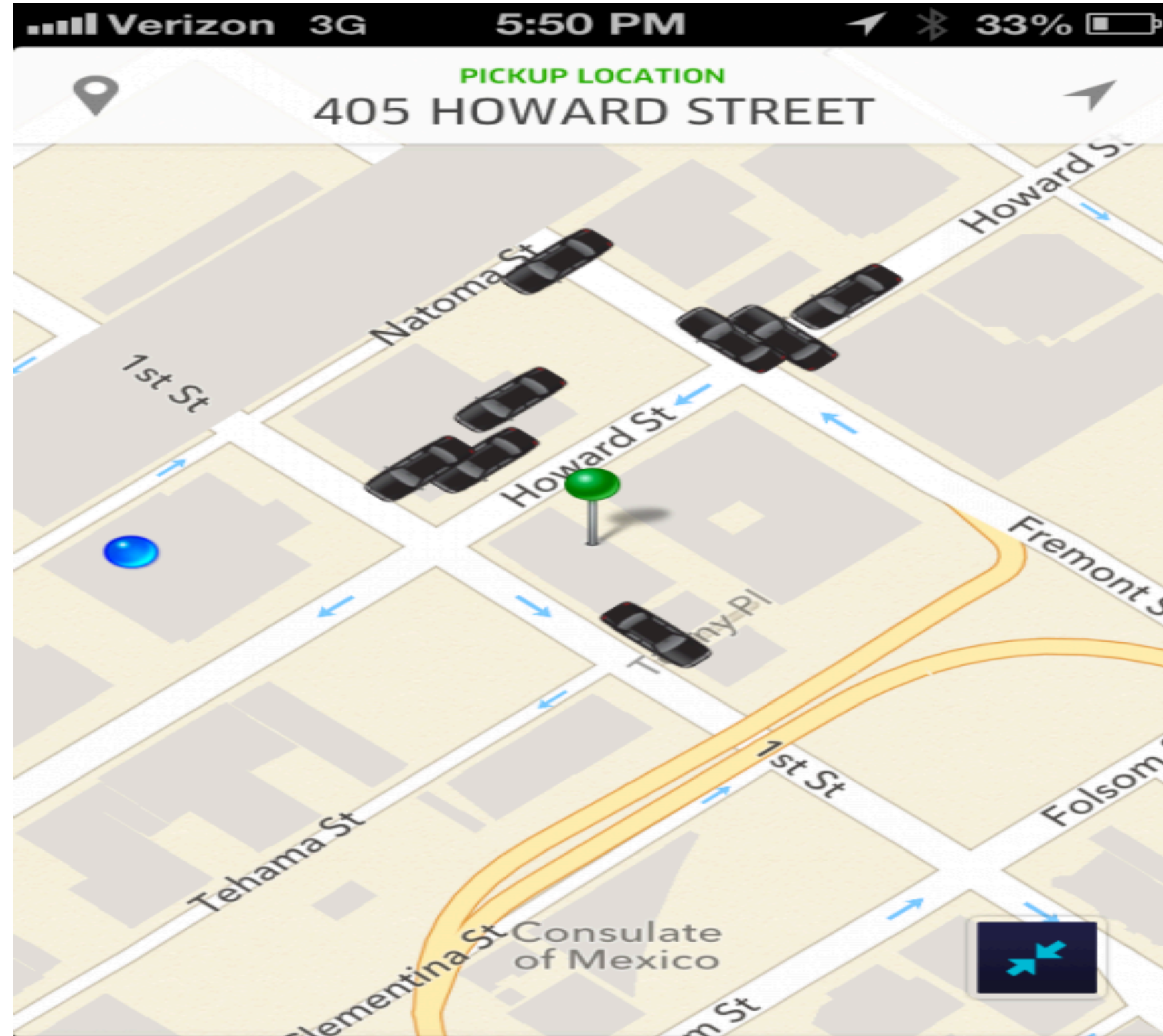
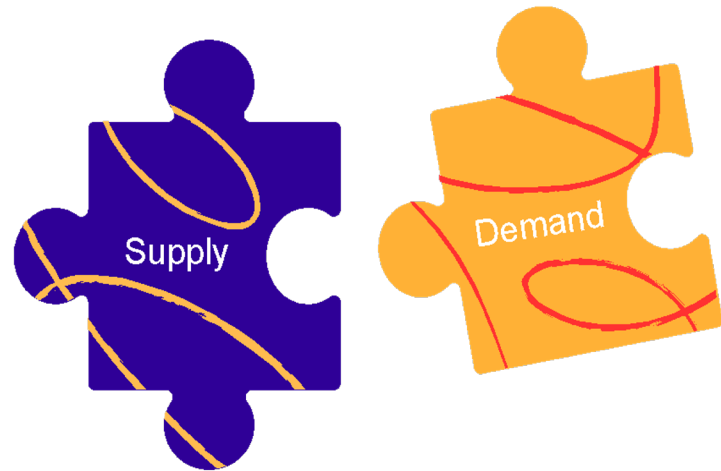
Volume: Number of incoming patients seeking treatment

Mix: Type of treatment needed by each patient

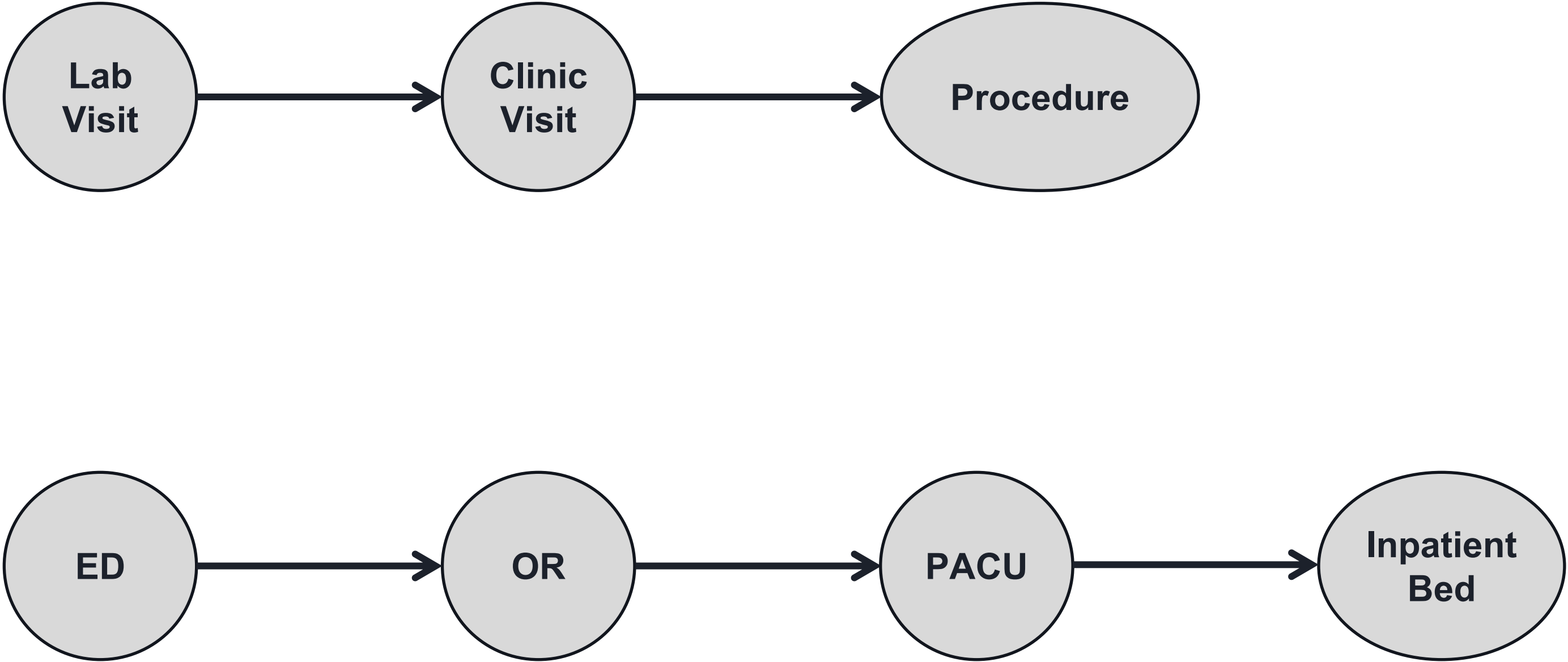
Timing: Arrival time (including delays) of incoming patients

Duration: Expected length of treatment for each patient

Real-world example of excellent “matching” of Supply and Demand



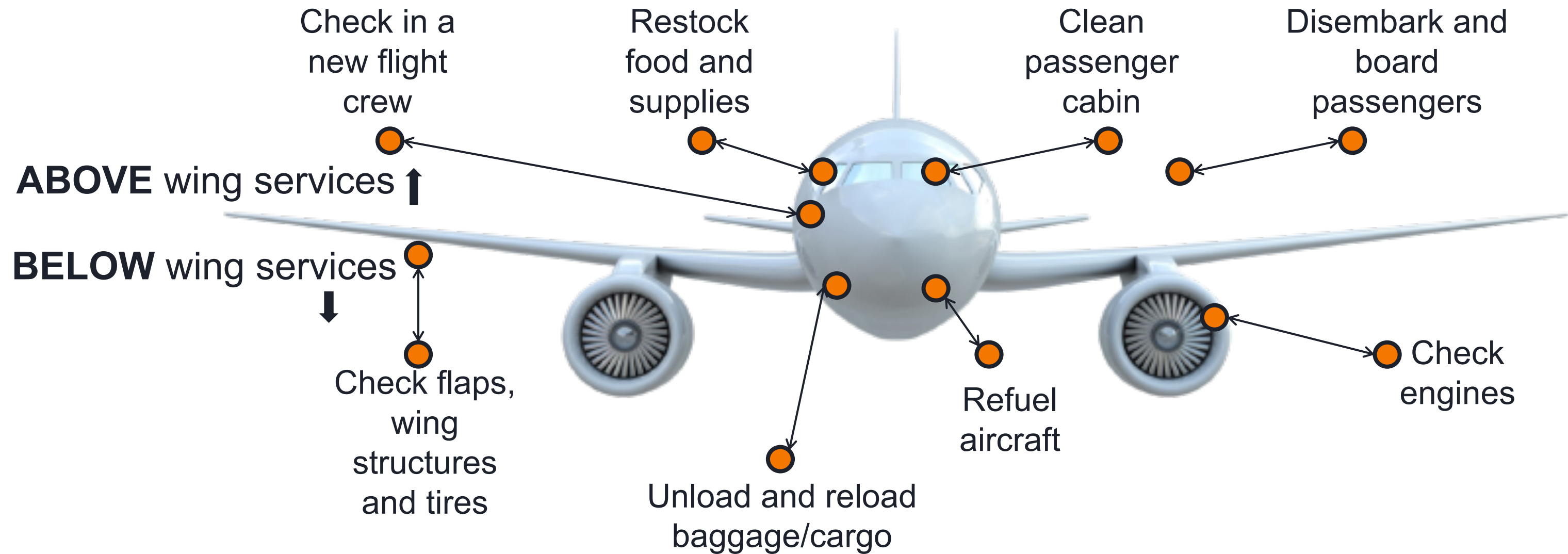
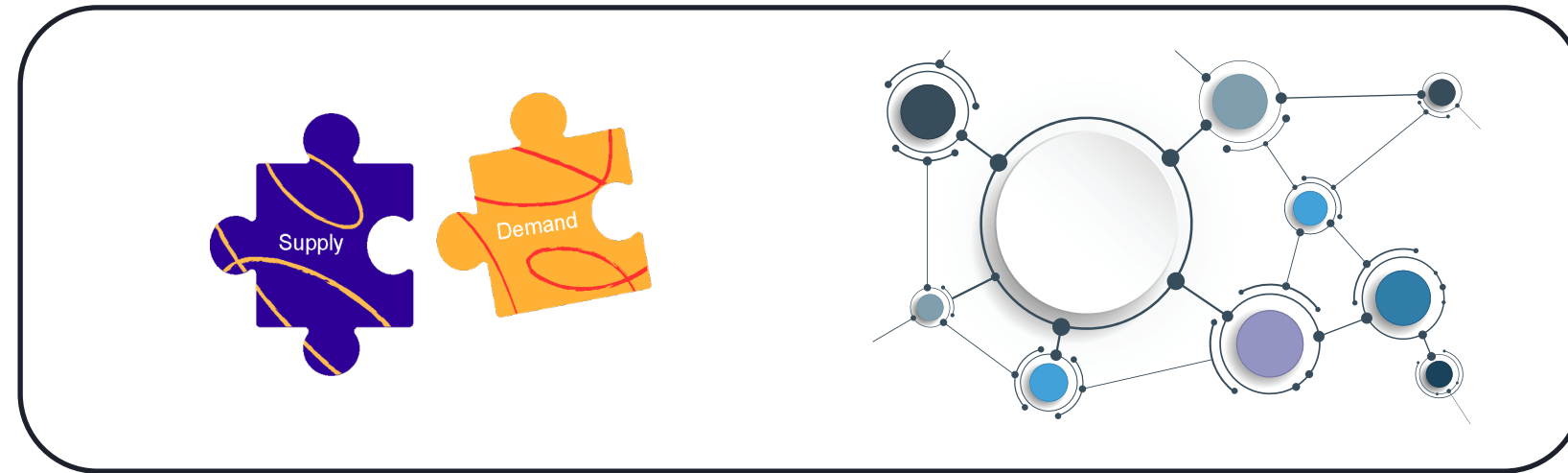
A patient's journey typically involves multiple touch points



Real-world example of excellent “linking” of individual services



Real-world example of solving BOTH matching and linking

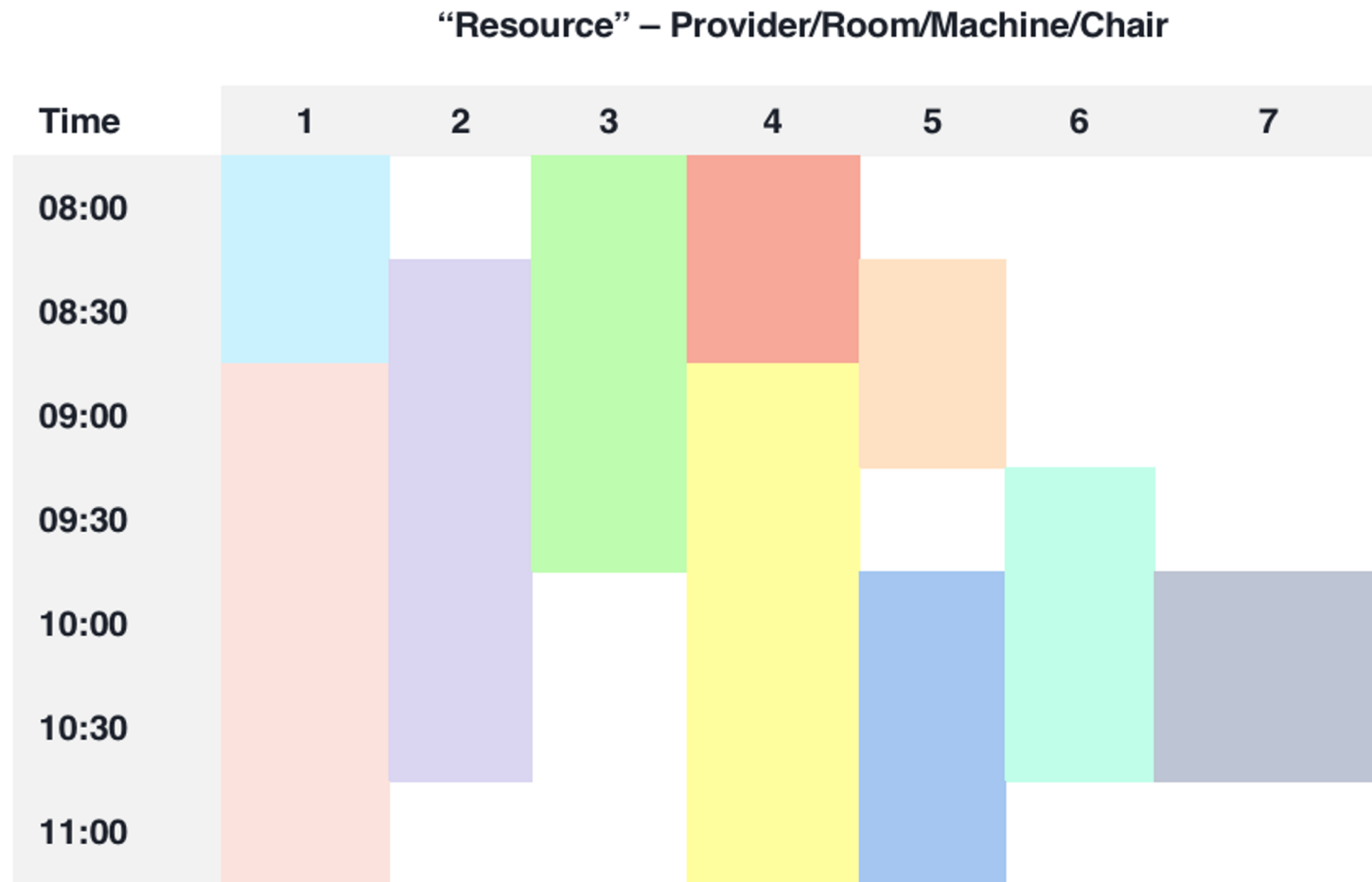


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EHRs are not built to solve capacity management (1 of 2)

1.



“**Grid-based scheduling**” works for tennis courts and conference rooms but not for medical appointments which are much more random

2.



“**First-come-first-served**” is mathematically flawed – **no** matching of the supply and demand patterns

EHRs are not built to solve capacity management (2 of 2)

3.



EHRs do not use **probability theory** or **simulation algorithms** to account for delays, overbooking, cancelations and add-ons

4.

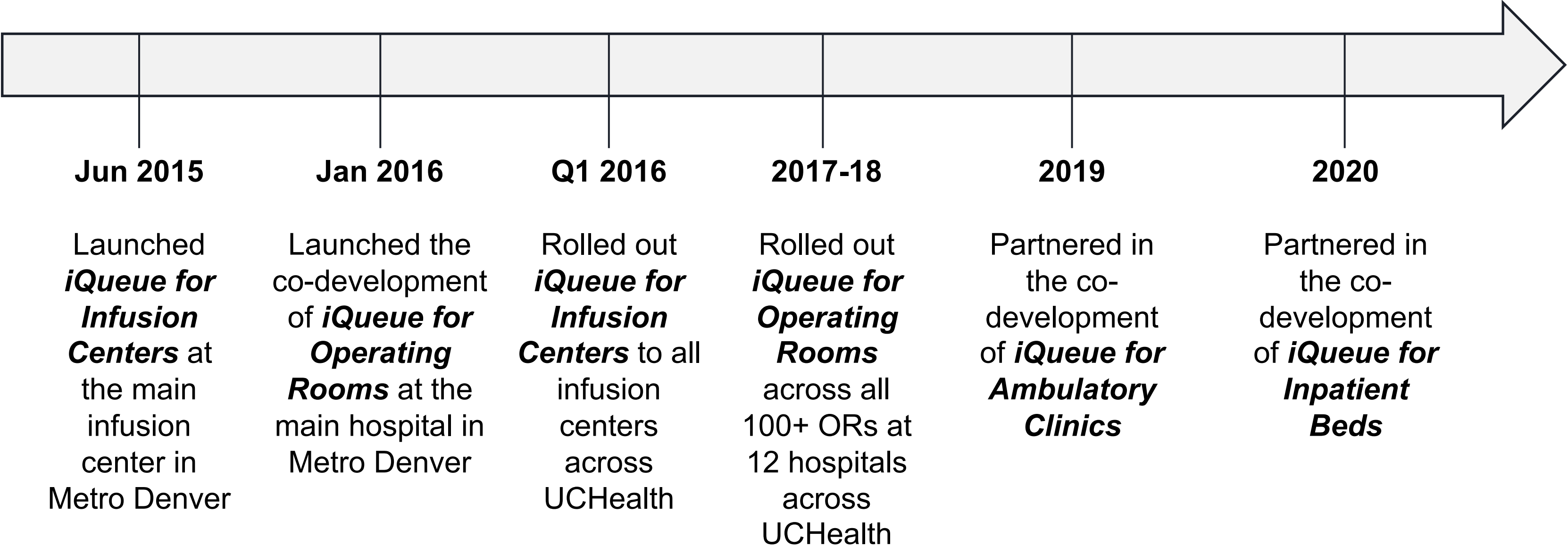


Dashboards and Reports **aren't enough**. It takes constraint-based optimization methods, machine learning, artificial intelligence and simulation algorithms to solve the problem

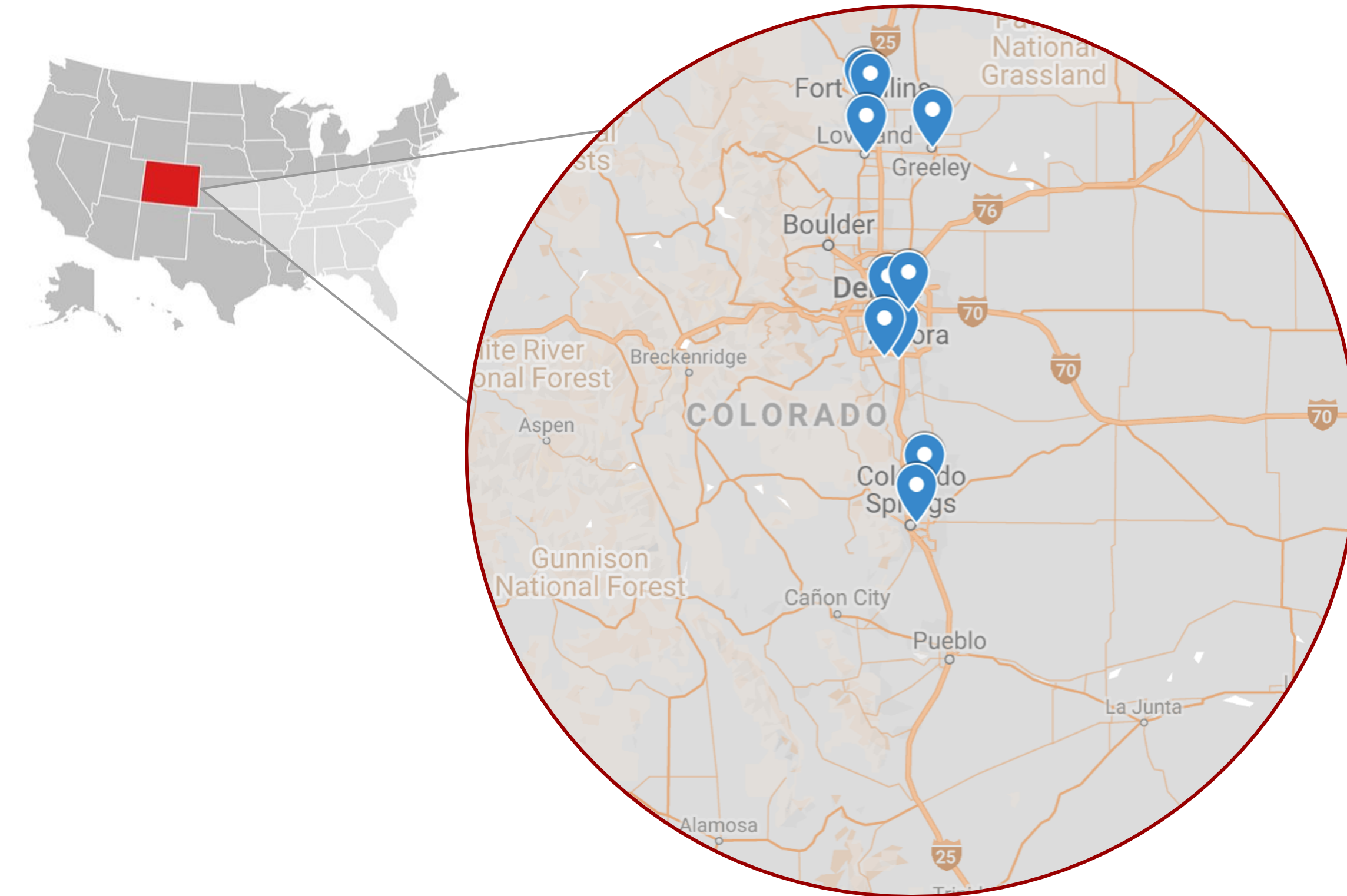
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Applying these concepts at UCHealth



iQueue for Infusion Centers has been deployed across all of UCHealth



Total Chairs on iQueue: 236

Northern Sites:

- Poudre Valley: 14 chairs
- Harmony: 29 chairs
- Loveland: 22 chairs
- Greeley: 19 chairs

Metro Denver Sites:

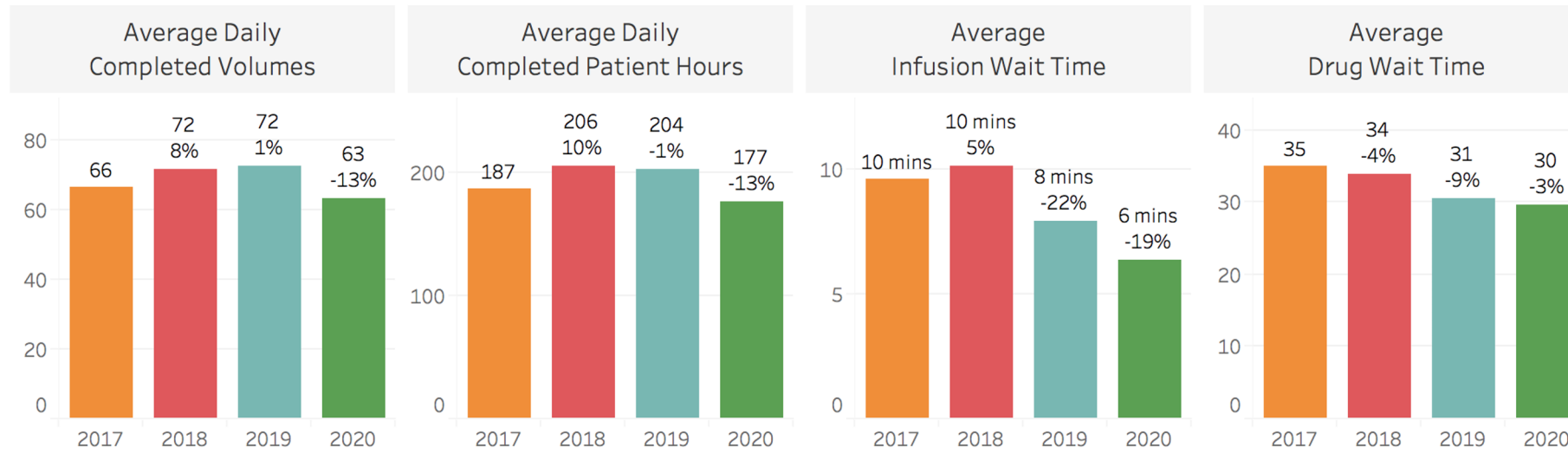
- AMC CCIC: 38 chairs
- AMC OIC: 18 chairs
- AMC BIC: 14 chairs
- Lone Tree: 11 chairs
- Highlands Ranch: 14 chairs
- Cherry Creek: 16 chairs

Southern Sites:

- MHN Oncology: 14 chairs
- MHC Oncology: 19 chairs
- MHC OIC: 8 chairs

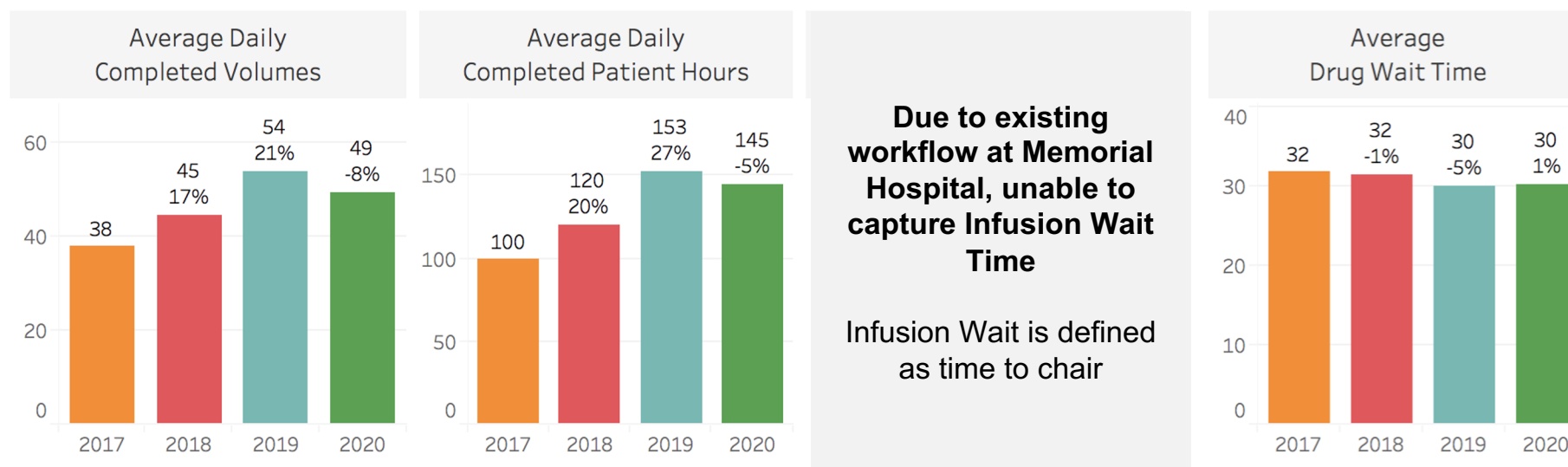
Impact has been sustained over several years

AMC Cancer Center Infusion



Cancer Center at Anschutz Medical Campus has experienced an **overall decrease in their wait times** despite the **increase in infusion volumes**, year-over-year



Memorial Hospital Oncology (MHC & MHN)









Oncology infusion centers at Memorial Hospital have also been able to **decrease their wait times** even as the centers overall experienced **double-digit growth in volume** (excluding COVID period).

iQueue for Operating Rooms has been deployed at all 127 ORs across UCHealth





Northern Colorado
(35 ORs)

 Medical Center of the Rockies (14 ORs) Loveland	 Poudre Valley Hospital (13 ORs) Fort Collins
 Greeley Hospital (4 ORs) Greeley	 Yampa Valley Medical Center (4 ORs) Steamboat Springs

Metro Denver
(66 ORs)

 University of Colorado Hospital (38 ORs) Aurora	 Highlands Ranch Hospital (8 ORs) Highlands Ranch
 Longs Peak Hospital (7 ORs) Longmont	 Inverness Surgery Center (6 ORs) Englewood
 Cherry Creek North Surgery Center (4 ORs) Denver	 Broomfield Hospital (3 ORs) Broomfield

Colorado Springs
(26 ORs)

 Memorial Hospital Central (13 ORs) Colorado Springs	 Memorial Hospital North (8 ORs) Colorado Springs
 Grandview Hospital (3 ORs) Colorado Springs	 Pikes Peak Regional Hospital (2 ORs) Woodland Park

OR utilization has improved by creating an active “marketplace”

598k

Requested Minutes*

1,013K

Released Minutes

225K

Transferred Minutes

28 Days

Request Proactivity

22 Days

Release Proactivity

26 Days

Transfer Proactivity

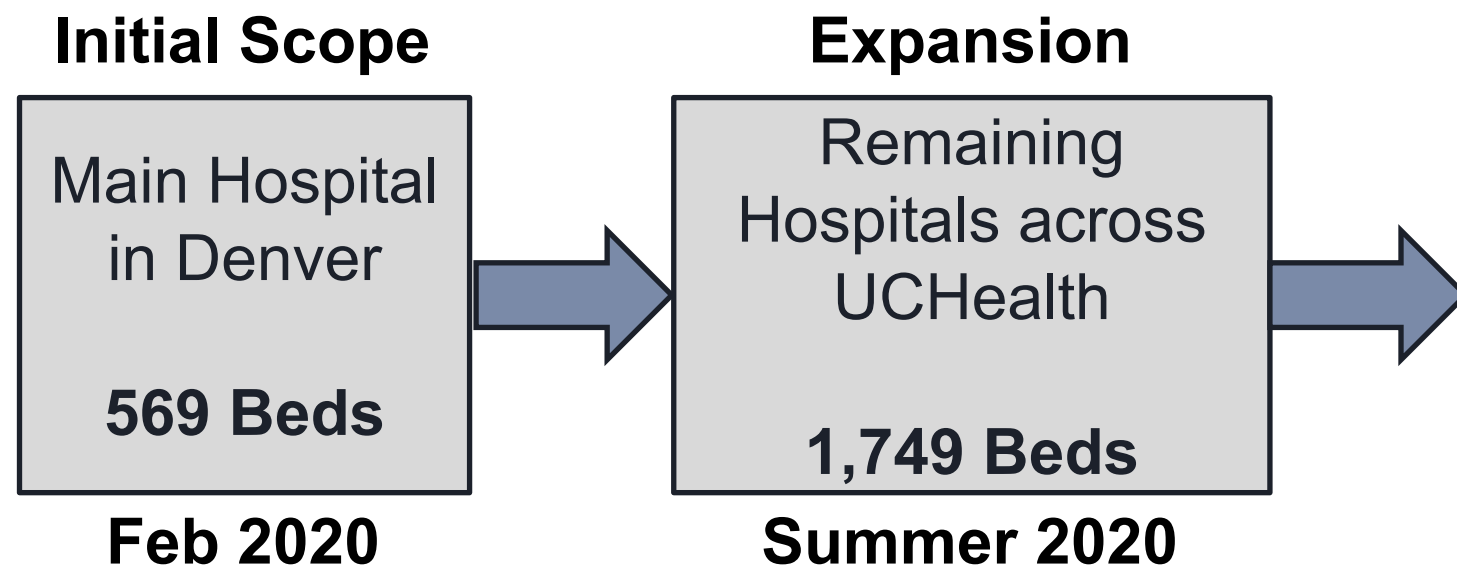
58%

Request Fill Rate

17%

Release Fill Rate

Early progress on our deployment of *iQueue for Inpatient Beds* is encouraging



Indicators of success

1. *iQueue for Inpatient Beds* is the sole source of truth for capacity planning (no more Excel spreadsheets multiple times each day)
2. Quality of capacity decision making has improved from 60% to nearly 100%
3. Prediction accuracy is >40% better than prior models
4. 113 active users of the application (16% on mobile)
5. ED and Inpatient Units get real-time data and accurate predictions to make **proactive** decisions well in advance of the need

Working on building a discharge prediction capability to reduce discharge-related delays



Available on Amazon

Limited number of complimentary copies available - email us at bhctm@leantaas.com