ReHAP
Rehabilitation and Healthcare Analytics Platform
Team

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JHHCG

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Sr Software Engineer, TIC

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JHU

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JHU

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Managing Director, TIC
Problem: JHBMC

400 patients

240 OT or PT sessions needed

140 PT/OT sessions delivered

Demand supply gap
Problem: Other Institutions

Cleveland Clinic

Beaumont Hospitals

GBMC

Bayada® Home Health Care

CEDARS-SINAI®

MedStar Health

Demand

1/OT sessions
Projected Growth in Demand for PT & OT

Number of PT&OT jobs (US Dept. of Labor)

- 2012: 317,400
- 2022: 423,700
1. Hire to Increase the Number of Therapists
Solution

1. Hire to Increase the Number of Therapists

Estimated cost of providing therapy services to in-hospital patients:
- $24.8 billion in 2015
- $28.6 billion in 2020
- $32.3 billion in 2025
Solution

2. Don’t hire more therapists. Decrease therapy (PT/OT) treatments for in-hospital patients
2. Don’t hire more therapists. Decrease therapy (PT/OT) treatments for in-hospital patients

- Decreased function
- More post acute care
- Reduced throughput
- Poor Outcomes
- Readmissions
- Increased length of hospital stay
3. Use evidence to prioritize - Provide PT/OT services to patients who truly need it.

and

Increase efficiency of therapy staff by informing them of these high priority patients in real time.
Therapists’ Time Saved

20 mins/therapy/day
15 to 20 therapists

5 to 7 hrs therapy time per day

1.5 hrs of therapy coordinator/scheduling time/day

8 hrs/day (1 FTE)
$50,000 to 80,000/year
Projected Savings: U.S. Acute Care Hospitals

Estimated savings if in-hospital therapy services are optimized by using ReHAP
Problem: Increasing demand for PT/OT services

Solution: 1. System to prioritize patient
2. Direct therapist to prioritized patients

Opportunity: $ 536 million, 1.3 billion
Problem: Increasing demand for PT/OT services

Solution: 1. System to prioritize patient
2. Direct therapist to prioritized patients

- Requirements
- Develop a prototype
- Deploy clinically

- Develop MVP
- Deploy – non JHM
- Commercialize

Opportunity: $536 million, 1.3 billion
Status Summary

Problem: Increasing demand for PT/OT services

Solution: 1. System to prioritize patient
2. Direct therapist to prioritized patients

- Requirements
- Develop a prototype
- Deploy clinically

- Develop MVP
- Deploy – non JHM
- Commercialize

Opportunity: $536 million, 1.3 billion
ReHAP Prototype
Written in MATLAB, on data extracted from therapy scheduling system at JHBMC
prioritization variables
Controls to add/change weight of “prioritization variables”

THERAPY CASELOAD MX

status at
12-03-15 at 10:09 AM

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>PT flag</th>
<th>Days to do</th>
<th>Level of mobility</th>
<th>Assigned therapist</th>
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<td>Med-BRGY</td>
<td>2</td>
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<td>C****</td>
<td>NCCU</td>
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<td>PAPERI, LINDA</td>
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<tr>
<td>C****</td>
<td>MedB</td>
<td>2</td>
<td>1</td>
<td>D.4. Staff FCRH</td>
<td>LANG, ALLISON</td>
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<td>B****</td>
<td>MedB</td>
<td>2</td>
<td>1</td>
<td>P.8. Transferred to chair</td>
<td>TBA</td>
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<tr>
<td>B****</td>
<td>MedB</td>
<td>2</td>
<td>1</td>
<td>F.8. Transferred to chair</td>
<td>TBA</td>
</tr>
<tr>
<td>P****</td>
<td>MedA</td>
<td>2</td>
<td>1</td>
<td>I.8. Walked 25 or more</td>
<td>TBA</td>
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<tr>
<td>N****</td>
<td>NCCU</td>
<td>3</td>
<td>1</td>
<td>N.N.</td>
<td>MEARS, FIN</td>
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<tr>
<td>A****</td>
<td>MedB</td>
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<tr>
<td>C****</td>
<td>MedA</td>
<td>2</td>
<td>1</td>
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<tr>
<td>X****</td>
<td>PCU</td>
<td>3</td>
<td>2</td>
<td>D.4. Staff FCRH</td>
<td>TBA</td>
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<tr>
<td>K****</td>
<td>MedA</td>
<td>6</td>
<td>2</td>
<td>F.8. Transferred to chair</td>
<td>TBA</td>
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<tr>
<td>E****</td>
<td>MedA</td>
<td>2</td>
<td>2</td>
<td>F.2. Throat in bed</td>
<td>TBA</td>
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<tr>
<td>G****</td>
<td>MedA</td>
<td>6</td>
<td>2</td>
<td>J.10. Walked 250 or more</td>
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<tr>
<td>C****</td>
<td>BWU</td>
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<td>TBA</td>
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</table>

PAPERI, LINDA
FARRAR, KARIN
LOREZ, TINA
LANG, ALLISON
PAKRATIPURAN, ROBEN
VOOKE, SCOTT
RUND, JENNY
LEON, LEAH
DAWANG, RAYMUND
DAGHAKHATIPURAN JESSICA
DGANDATO, JUDE
VAUGHNLEY, RENEE
BERNARD, MARY JO
BUTLER, CASSANDRA
CHRISTENSEN, LYNETH

Total Th sessions provided today : 3
prioritization variables

Controls to add/change weight of “prioritization variables”

Name & location of high priority patients
prioritization variables

Controls to add/change weight of “prioritization variables”

Name & location of high priority patients

Therapists available to see these patients
ReHAP MVP Basic Aims

✓ Web-based tool
✓ ReHAP “Priority List” on every therapists’ laptop
✓ Connect to live EMR (EPIC) data
  ✓ Auto refresh every 5 min
✓ Modes for PT, OT, Manager, Physician
✓ Instance of application to be deployable on-site
✓ Simple and seamless to use
Technical Approach: MVP Design

Secure Rails app instance on client hospital’s infrastructure

- Enterprise Service Bus (ESB)
- Communicates mutually interacting software applications
- Web services API (RESTful)

Client Hospital system’s secure EMR

Epic

POSTgreSQL

HTTPS
Technical Approach: ESB Overview

- Enterprise Service Bus (ESB)
- Communicates mutually interacting software applications
- Web Services API (RESTful)
- Working with Web Services team
Patients highest priority for PT eval today

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>M. Polo</td>
<td>SICU</td>
</tr>
<tr>
<td>J. Hopkins</td>
<td>PCU</td>
</tr>
<tr>
<td>T. Swift</td>
<td>6W</td>
</tr>
<tr>
<td>K. Bryant</td>
<td>NCCU</td>
</tr>
<tr>
<td>B. Knowles</td>
<td>Ortho</td>
</tr>
<tr>
<td>Z. Deschanel</td>
<td>BWU</td>
</tr>
</tbody>
</table>

Order of Highest Priority

less impaired —— more impaired

Covering therapist

Yesterday/Today

TBA

Patients needing therapy

<table>
<thead>
<tr>
<th>SICU</th>
<th>PCU</th>
<th>6W</th>
<th>NCCU</th>
<th>Ortho</th>
<th>BWU</th>
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<tbody>
<tr>
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<td>6L</td>
<td>8L</td>
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<td></td>
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</tr>
<tr>
<td>1M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8H</td>
<td>6H</td>
<td>6H</td>
<td></td>
<td>1L</td>
<td></td>
</tr>
<tr>
<td>1M</td>
<td>1H</td>
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<td></td>
<td>1H</td>
</tr>
<tr>
<td>7H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Caseload per therapist

Kelly D.
Current Unit Med: Re Tx: 3
Current Unit Obs: New evals: 3

Chris G.
Current Unit Obs: Re Tx: 3
Current Unit Ortho: New evals: 4

Ann E.
Current Unit Ortho: Re Tx: 4
Current Unit Ortho: New evals: 4

Tae E.
Current Unit Ortho: Re Tx: 4
Current Unit Ortho: New evals: 4
Inpatient Therapist Utilization Manager

Patients highest priority for PT eval today

Order of Highest Priority

Patient Name | Unit | Order of Highest Priority
---|---|---
M. Polo | SICU | 1
J. Hopkins | PCU | 2
T. Swift | 6W | 3
K. Bryant | NCCU | 4
B. Knowles | Ortho | 5
Z. Deschanel | BWU | 6

Covering therapist

Yesterday/Today

- TBA
- TAB
- TBA
- TBA
- TBA

Patients needing therapy

<table>
<thead>
<tr>
<th>SICU</th>
<th>PCU</th>
<th>6W</th>
<th>NCCU</th>
<th>Ortho</th>
<th>BWU</th>
</tr>
</thead>
<tbody>
<tr>
<td>6L</td>
<td>6L</td>
<td>8L</td>
<td>1M</td>
<td>1L</td>
<td>7H</td>
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<td>6H</td>
<td>6H</td>
<td>1M</td>
<td>1H</td>
<td>1H</td>
</tr>
</tbody>
</table>

Caseload per therapist

- Kelly D. Current Unit Med
- Chris G. Current Unit Obs
- Ann E. Current Unit Ortho
- Tae E. Current Unit Ortho

- Re Tx: 3
- New evals: 3

- Re Tx: 3
- New evals: 4
Inpatient Therapist Utilization Manager

10/30/2015  4:00 PM  
PATIENTS HIGHEST PRIORITY FOR PT EVAL TODAY

<table>
<thead>
<tr>
<th>Patient Name</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>N. Prom</td>
<td>Med B</td>
</tr>
<tr>
<td>K. Tan</td>
<td>NCCU</td>
</tr>
<tr>
<td>M. Mayo</td>
<td>Sx floor</td>
</tr>
<tr>
<td>S. Kat</td>
<td>NSU</td>
</tr>
<tr>
<td>T. Mock</td>
<td>PCU</td>
</tr>
<tr>
<td>L. Zach</td>
<td>Med A</td>
</tr>
</tbody>
</table>

Order of Highest Priority

- less impaired
- more impaired

Covering therapist

- Mat K
- Sota P
- TBA
- TBA
- TBA

Patients needing therapy

- SICU
- PCU
- 6W
- NCCU
- Ortho
- BWU

Caseload per therapist

- Kelly D.
  - Current Unit: Med A
  - Re Tx: 4
  - New evals: 4

- Chris G.
  - Current Unit: Ortho
  - Re Tx: 4
  - New evals: 4

- Ann E.
  - Current Unit: Ortho
  - Re Tx: 4
  - New Eval: 4

- Tae E.
  - Current Unit: Ortho
  - Re Tx: 4
  - New Eval: 4
Technical Approach: DB Design
Deliverables

Minimum

- Create and populate database
- Implement Rails app framework
- PT/OT view and permissions
- Shadow-informed front-end mockups for all users
- Prioritization algorithm implemented in Rails app

Expected

- Manager view + permissions
- ESB set up and integrated with Rails app
  - Refreshing every 5 mins
- Single-sign-on server configuration

Maximum

- Physician view + premissions
- Deployed at JHBMC
- Tested by PT/OT teams at JHBMC
- Instances deployed or configured to be deployed at non-JH facilities
Dependencies

• Enterprise Service Bus (ESB) integration
• Cooperation between Web Services
• Secure development environment
  – SSL into Hopkins server
• Knowledge of Rails
• PostgreSQL
• JIRA + Bitbucket (SCRUM)
• Cooperation with JHBMC PT/OT team for shadowing
• HIPAA compliance (intermediate certification)
• D3.js for visualization
• Possibly DataTables.js + DTEditor.js
• Weekly team meetings Tuesdays on Hangout and at FF East
• Cooperation with Tony Pan (dev partner)
Milestones


Data from Epic
  ESB form to API web services
Key Use Case run-through (with PT/OT teams)
MATLAB algorithm deep-dive
SQL Database schema creation
  Test seed data
  Anonymized data
Rails model creation and setup
Master UI design
  Front end charting
  Front end implementation
User-specific views design
Single-sign-on server configuration
Final Presentation
ReHAP

Rehabilitation and Healthcare Analytics Platform