University of Iowa Health Care

Presentation to

The Board of Regents, State of Iowa

June 5-7, 2018
Opening Remarks

Operating and Financial Performance

Faculty Presentation: Autonomous Diagnostic Artificial Intelligence
OPENING REMARKS

Brooks Jackson, MD, MBA
Vice President for Medical Affairs
& Dean, Carver College of Medicine
OPERATING AND FINANCIAL PERFORMANCE

Kenneth P. Kates
Associate Vice President
& Chief Executive Officer, UI Hospitals and Clinics

Doug True
Interim Associate Vice President for Finance
& Chief Financial Officer
Volume and Financial Highlights
Through April 2018

Operating Margin
- April year-to-date actual 3.1%, budget of 2.3%
- Continuing good financial recovery against budget

Volume Growth
- Year-over-year: Inpatient 2.7%, Surgeries 3.7%, Clinic Visits 6.6%

Acuity
- Case Mix Index continues to be high – above 2.0 for all payers (2.11) and Medicare (2.32)
- At the 64th percentile compared to other AMCs

Census
- Many days above 90% occupancy
- 138 days where census at 5AM (M-F) above 700.
- 2 more Operating Rooms to open in Children’s Hospital in FY19 bringing the total to 50
- Closer relationship with post-acute providers being developed

Length of Stay Index (through March)
- Adult at .90 – below the expected index of 1.0
- Pediatrics at 0.99 - below the expected index of 1.0
  - much progress achieved over past several months

Readmission Rates (through December)
- Adult at 9.92% - below target of 12.08%
- Pediatrics at 8.56% - above target of 7.69%
  - Patients with multiple comorbidities and chronic illness
  - Inappropriately including planned admissions and patient transfers as readmissions
  - Trending positively since previous quarter

Revenues
- 2.1% above budget year-to-date

Payer Mix
- Medicare growth continues
- FY17: 35.7%, FY18: 36.9%

Accounts Receivable
- Positive trend for government and out-of-state payers
- Progress resolving older cases

Salary Expenses
- 2.8% below budget year-to-date

Non Salary Expenses
- 5.6% above budget year-to-date
- Implant and pharmacy costs
Volume - Highlights and Trends

Operating and Financial Performance

Inpatient Discharges

- Volume growth continues year over year – up 759; 2.7% compared to last fiscal year to date
- All major clinical areas have grown year over year except Pediatric Psychiatry – down 17%
  - driven by our continued challenges to place these patients when they no longer require acute care
- Compared to other AMCs, UIHC benchmarks at the 93rd percentile in terms of Acute Care Occupancy Percentage.

Surgical Cases

- Progress continues in surgical case volume growth since the slow start in July
- Year to date, case volumes are up by 967 cases; 3.7% compared to the same time period last fiscal year
- All services experiencing growth except Otolaryngology/Head and Neck Surgery
  - decline driven by the departure of three faculty members. Two have been replaced and are performing well with recruitment underway for the third. Preferred candidate has been identified.
Volume - Highlights and Trends
Operating and Financial Performance

Emergency Department Visits
- Compared to last fiscal year, visits continue to be down–1,217 visits; 2.4%
  - This decline is driven by:
    - lower acuity patients seeking care at other sites (i.e. Quick Care)
    - increases in psychiatry patients who require inpatient services when our psychiatry beds are often filled
    - days with very high inpatient census resulting in patients having to wait in the ED for admission
- New outpatient Crisis Stabilization Unit to open for patients requiring emergency psychiatric care
- Acuity of patients continues to increase – 34.8% are admitted compared to 33.3% last year
- Admissions through the Emergency Department make up 58% of all inpatient admissions
Volume - Highlights and Trends
Operating and Financial Performance

Length of Stay

- Continued improvement in our length of stay (12 month rolling average) for both adult and pediatric patients
  - Adult index has improved from 0.91 last year to 0.90 this year
  - Pediatrics index has improved from 1.03 last year to 0.99 this year

- Focused efforts on:
  - Documentation to ensure we accurately reflect the acuity of our patients
  - Discharge Preparation - working with outside facilities as well as patients and family members to transition them to the most appropriate setting post-discharge

Readmissions (All-cause 30 day)

- Adult patients readmission rates continue to perform well compared to AMC colleagues

- Pediatrics, while making progress is above the benchmark; primarily driven by planned readmissions being included in the data set and patient transfers being counted as readmissions
Volume - Highlights and Trends
Operating and Financial Performance

Outpatient Visits

- Growth continues to be experienced year over year – up a total of 50,600 visits; 6.6% increase
- Increased volumes at all locations; main campus, Iowa River Landing (IRL) and off-site
- All services experiencing growth year over year except Family Medicine and Neurology
  - The reported decline in General Surgery visits is due to the Vascular Surgery Clinic and the Vascular Ultrasound Lab moving to the new Heart and Vascular Center facility that opened in mid September 2017. Excluding the vascular patients, General Surgery Clinic visits are up year over year by 672 visits; 5.3%
  - Family Medicine is showing a year-over-year decline due to the closure of three of our Quick Care locations, one of which has now reopened, and one outreach clinic. From ongoing operations, visits have increased by 2,793 visits or 2%
Financials - Highlights and Trends

Operating and Financial Performance

Revenue

- Given the strong volume, year to date net revenue is 2.1% above budget
- Collections for the second half of the fiscal year will be impacted by $6.5M of governmental payment reductions
- Significant collections of very old accounts receivable (AR > 270 days old) occurred in October – December of FY18. This was the result of diligent collection processes and structured communications with the Medicaid MCO’s. This represents significant progress, but some challenges with collection efforts for this payer group still exists.

Expenses

- Salary expenses are 2.8% below budget, due to successes in the $86M budget initiative plans
- Non-Salary expenses are 5.6% above budget, mainly due to supply and pharmacy expense. The expense increases are directly tied to increasing surgical volume and acuity, and specific pharmacy initiatives
**Update: $86M Revenue Enhancement/Expense Reduction Initiatives**

- Achieving good progress to date on our $86M plan
- $50.7M has been realized through April*; 83% of the year to date target
- 60% of the initiatives to achieve the $86M were planned for the second half of the fiscal year; 37% of the initiatives were planned for the last quarter of the fiscal year
- Over half of the full year target is tied to reducing labor costs
- 500 FTE targeted savings - through April 27th – 479.3 FTEs achieved
- Goal to reduce agency nurses by 149 positions – 192 positions reduced through April 10th. Replaced with UIHC nurses
- Progress continues to be achieved on revenue growth ($14.8M) and non-labor expense reductions ($6.7M). Examples include: PET/MRI expanded hours, pharmacy initiatives, contracts for virtual hospitalist services, supply reductions.
- Deferred the start of some capital projects and major equipment acquisitions. This will reduce capital spending this fiscal year by about $60M.

*Some initiatives are not reported through April due to a lag in the data.*
Financials - Highlights and Trends
Operating and Financial Performance

Update: Medicaid MCOs

- Days in Accounts Receivable for Medicaid MCOs is in a range of 51 to 67
- 21% of Medicaid hospital claims require UIHC action after initial claim submission compared to 10% for commercial payors
- Overall MCO denial rate is 2.5 times greater when compared to other commercial payors for hospital claims
- Percent of hospital Accounts Receivable over 180 days is in a range of to 15% to 25% across the MCOs
- AmeriHealth Resolution
  - Actively working through resolution of claims
  - Estimated Net Accounts Receivable was $12M at end of November. Current net estimate of Accounts Receivable outstanding is $2.8M
  - Goal is to resolve all claims by June 30th
Board Action Requested

Operating and Financial Performance

- Approve UI Health Care salary policy for FY19
- Approve authority to transfer up to $9.5 million additional funds from UI Health Care to UI Health System
FACULTY PRESENTATION:
AUTONOMOUS DIAGNOSTIC ARTIFICIAL INTELLIGENCE

Michael D. Abramoff, MD, PhD
Robert C. Watzke, MD, Professor of Retina Research
Professor of Ophthalmology and Visual Science,
Electrical and Computer Engineering, and Biomedical Engineering

Support IDx LLC, Arnold and Mabel Beckman Initiative for Macular Research, National Eye Institute R01 EY019112, EY018853, EY017066, Veterans Administration I01 CX000119, Alimera Inc.

Conflicts of Interest IDx LLC – Founder, Employee, Patents and Investor.
DR can be detected algorithmically

May 2000, Copenhagen

LOW LEVEL SCREENING OF EXSUDATES AND HAEMORRHAGES IN BACKGROUND DIABETIC RETINOPATHY

M.D. Abramoff1,2,3, MD MSc, J. J. Staal3, MSc, M.S. Suttorp1, MD PhD, B.C.P. Polak, MD PhD, M.A. Viergever, PhD,

Dept. of Ophthalmology and Diabetes Center, Vrije Universiteit
University Hospital, Amsterdam, Netherlands
Image Sciences Institute, University Hospital, Utrecht, Netherlands
12 Engineering, Amsterdam, Netherlands

Purpose: to develop a fast and reliable method to screen fundus images on exsudates and haemorrhages in early background diabetic retinopathy

Methods: a differential topology based, scale and color space indexed operator was used to obtain geometrical features in digital fundus images (Canon non-mydriatic fundus camera, 800x600 pixels, 24 bit JPEG decompressed). Using this operator the eigenvalues of the Hessian and the structure tensor were mapped nonlinearly to a multidimensional probability measure

\[ f = \text{prob}(\Gamma(H_\lambda, \ldots, \lambda), G_\lambda, \ldots, \lambda)) \]

The operator is constructed in such a way that reddish and white-yellowish ellipsoid structures (20-500\mu m) give optimal response.

Results: 500 images were used for optimization. The features detected were found to correspond closely to the exsudates and haemorrhages
Case made at my investiture
Robert C. Watzke, MD, Professor of Retina Research

Scientist
• h-index
  metric for scientific productivity
  ~ citations * publications

Physician / scientist
• p-index = \( \frac{\text{number of patients that improve}}{\text{number of patients}} \)
Impacting patients


Chapter 15

2000: Detection of retinopathy lesions

CAN NEURAL NETWORKS EXPLAIN DYSLFlUENT SPEECH?

Malkit Abramoff, Ton Coolen, George Wienk, and Peggy Jensen

This pilot study is based on the assumption that neural networks for simulating the temporal aspects of the motor control network for simulating the temporal aspects of motor connections between the neurons. Reproduced at a later time, the stuttering behavior, noise patterns and other patterns were correlated with increased temporal variability and with the selection process.

Recently, artificial neural networks from various disciplines (e.g., computer science, psychology, and neuroscience) have been used for simulating the temporal aspects of motor control. More specifically, it adds to the analysis of the temporal aspects of motor control and how these networks can be influenced in such a way that the temporal aspects of motor control may be modified. The temporal aspects of motor control are reproduced at a later time, and the noise patterns and other patterns were correlated with increased temporal variability and with the selection process.

Neural network

Generally, a neural network is interconnected by axons ending in the network. These parts are all interconnected, and the summation of all its inputs is the output of the network. This output is then used to control the next level of the network, which is the output of the next level of the network. The output of the network is then used to control the next level of the network, which is the output of the next level of the network.
Impacting patients


2000: Detection of retinopathy lesions

2003--: Many more lesion detection publications

2008--: Even more DR detection system publications

2000: Detection of retinopathy lesions

2003: Many more lesion detection publications

2008: Even more DR detection system publications

2009: 22+ patents on retinal image analysis/imaging
Revenge of the machines

By Peter J. McDonnell, MD
director of the Wilmer Eye Institute,Johns Hopkins University School of Medicine, Baltimore, and chief medical editor of Ophthalmology Times.

He can be reached at 727 Maumee Building600 N. Wolfe St. Baltimore, MD 21287-2278Phone: 443/287-1511 Fax: 443/287-1514E-mail: pmcdonn1@jhmi.edu

When I was a boy, an older friend told me...
The day after—*h*–index 52, starting on that *p*-index!
CONCORD-3, Lancet, 2018. Analysis of individual records for 37,513,025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. Global distribution by continent and country of age-standardised 5-year net survival for adults (15–99 years) diagnosed during 2010–14 with colon cancer or breast cancer (women) and children (0–14 years) diagnosed with acute lymphoblastic leukaemia. Lancet, 2018
But way too expensive: Healthcare needs Autonomous AI

US Labor Productivity (Output Per Worker Hour)

- Productivity in healthcare
- Productivity in agriculture and all other industries

http://data.bls.gov/pdq/SurveyOutputServlet
So far, automation has lowered physician productivity

Electronic health record impact on productivity and efficiency in an academic pediatric ophthalmology practice

Travis K. Redd, BS, a,b Sarah Read-Brown, BA, a Dongseok Choi, PhD, a,b,c Thomas R. Yackel, MD, d Daniel C. Tu, MD PhD, a,b and Michael F. Chiang, MD, a,d

To measure the effect of electronic health record (EHR) implementation on productivity and efficiency in the pediatric ophthalmology division at an academic medical center.

Four established providers were selected from the pediatric ophthalmology division at the Oregon Health & Science University Casey Eye Institute. Clinical volume was compared before and after EHR implementation for each provider. Time elapsed from chart open to completion (OTC time) and the proportion of charts completed during business hours were monitored for 3 years following implementation.

Overall there was an 11% decrease in clinical volume following EHR implementation, which was not statistically significant (P = 0.18). The mean OTC time ranged from 5.5 to 28.3 hours among providers in this study, and trends over time were variable among the four providers. Twenty-four percent of all charts were filled outside normal business hours (30% on weekdays, 14% on weekends).

EHR implementation was associated with a negative impact on productivity and efficiency in our pediatric ophthalmology division. (J AAPOS 2014;18:584-589)
Moving specialty diagnostics to primary care

- Autonomous AI system
- Robotic Camera
- Interactive AI for Image Quality
- Realtime Diagnostic Output
- Existing Support Staff (4 hour training only req)
- Aligned with AAO Preferred Practice for DR
Autonomous AI algorithm based on biomarkers

Biomarker Detection (mostly CNN)

Quality Assessment

Anatomy Localization

Disease Assessment Clinical Decision

Physiologically plausible: Abramoff et al, IOVS 2007
## Diagnostic Accuracy in Context

<table>
<thead>
<tr>
<th></th>
<th>Point estimate</th>
<th>95% CI</th>
<th>Superiority Endpoint</th>
<th>Preclinical study</th>
<th>Studies of Ophthalmologists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary sensitivity</td>
<td>87.2%</td>
<td>81.8% - 91.2%</td>
<td>85.0%</td>
<td>96.8%</td>
<td>33%, 34%, 70%</td>
</tr>
<tr>
<td>Primary specificity</td>
<td>90.7%</td>
<td>88.3% - 92.7%</td>
<td>82.5%</td>
<td>87.0%</td>
<td>100%, 99%, 90%</td>
</tr>
</tbody>
</table>

96% (95.0% CI, 94.0 - 96.8%) of subjects had sufficient quality images.

No significant effects for sex, race, ethnicity, HbA1C, lens status, or site.

Age > 65 caused a significant increase in specificity (p = 0.030), but no change in sensitivity.
Thank You
University of Iowa Health Care