Sunday General Ortho/Practice Management
Allopathic Medical Education in NC; the Impact of an Educator and a Rough Rider

L. Andrew Koman MD
Purpose:

- History Medical & Orthopaedic education in NC
- Influence *Flexner*, an educator, *Teddy Roosevelt*, the rough rider on that process
- The Orthopaedic residencies
Medical Education in NC the start

Apprenticeship school Cabarrus County

- Charles Harris (1776-1825)
- Trained University Pennsylvania
- Cabarrus county
- Trained ~ 93 students
Medical Education in NC

Apprenticeship school Cabarrus County

- Charles Harris (1776-1825)
- Trained university Pennsylvania
- Cabarrus county
- Trained ~ 93 students

Seven Allopathic / one osteopathic

- Three closed
- Remaining allopathic:
  - WF; Duke; UNC; EC (Brody School)
Medical schools in NC
the 1st
Edenborough Medical College

➢ Hector McLean
➢ Robeson County
➢ 1867-1877
Medical schools in NC

• Edenborough Medical College (Robeson County) 1867
• Leonard Medical School (Shaw) Raleigh 1882
• University North Carolina (Chapel Hill) 1879 **
• North Carolina Medical College (Davidson) 1887
• University Medical Department Raleigh (UNC) 1902 **
• Wake Forest College Medical School (Wake Forest) 1902 #
• Duke University School of Medicine (Durham) 1930
• Bowman Gray School of Medicine (Winston –Salem) 1941 #
• University North Carolina (Chapel Hill) 1952 **
• University North Carolina “Brody School of Medicine” (Greenville) 1977
Medical schools in NC

Leonard Medical School 1882

Shaw University

- First 4 year medical college in NC
- Trained Black Americans
- $5,000 donation Henry Martin Tupper
Medical schools in NC

North Carolina Medical College

Davidson

- 1887 – one year
- 1893 – three years
- 1902 – 4 years
- 1907 relocated to Charlotte and renamed NC Medical School
Wake Forest College Medical School

- 1902 (Wake Forest, N.C.)
  - Two year non-clinical
  - 7/13 students – “failed”
  - Clinical exposure Raleigh (17 miles)

Bowman Gray School Medicine 1941

- Winston-Salem

Wake Forest School Medicine 1997

Wake Forest Baptist Health System
University North Carolina (first 3/4)

1879-1885
- Thomas W. Harris MD– dean
- Two-year curriculum

1890 -1902
- Richard Whitehead MD– dean
- One year until 1896 – two years

1902 – 1910
- University Medical Department Raleigh
- Rex & Dorthea Dix
- “four years”
Abraham Flexner

- Educator
- 1910 the reform of medical education in the United States and Canada. Published by the Carnegie Foundation for the Advancement of Teaching
Medical schools in NC

Flexnor Report impact in 1910

Unsatisfactory Rating ending in North Carolina

- Leonard Medical School
- North Carolina Medical College (Davidson)
  - merged MCV
- University Medical Department Raleigh (UNC)
Medical schools in NC

Flexnor Report

Satisfactory

➢ *Wake Forest*- “the laboratories of this little school are, as far as they go, models in their way. Everything about them indicates intelligence and earnestness”
Medical schools in NC

- 4 schools at turn of century
- 3 closed after Flexor report
- Wake Forest continued as 2 year school
The rough rider
Teddy Roosevelt & NC Medical Education

- President
- Sherman antitrust act
- Tobacco Cartel

"A man who has never gone to school may steal from a freight car; but if he has a university education, he may steal the whole railroad."

Theodore Roosevelt
Teddy Roosevelt & NC Medical Education

Tobacco Cartel 1907

- American tobacco
- RJ Reynolds
- Lorillard
- Liggett & Myers
Dissolution American tobacco Cartel

J B Duke – American Tobacco Durham

Reynolds ---Reynolds Tobacco in Winston-Salem

Bowman Gray  RJR
  1924 - President
  1935 – CEO

Created fund at his death for “cause beneficial to the community”
Medical schools in NC

Duke University School of Medicine

- 1930
- James B. Duke
  - 4 year school
  - Men and women
- $10,000,000
  - $4,000,000 construction etc.
  - $227,000 books;
  - $300,000 Rockefeller Foundation
  - Support university
NCBH

North Carolina Baptist Hospital building, known as Old Main, in 1930
Bowman Gray School of Medicine 1941

- move to Winston –Salem
- 4 year school (founded 1939)
- 14,000 shares RJRT
- $160,000
- Total $690,000
- “$750,000” (interest)
University North Carolina

Chapel Hill

- 1948/9 - legislature
- 1952 – Memorial Hospital clinical training
- 1954 – first MD degrees

Greenville (Brody)

- 1977-
Orthopaedic residency training North Carolina

Duke – Durham
Wake Forest - Winston-Salem
UNC Chapel Hill - Chapel Hill
Carolinas Medical Center-- Charlotte
Duke Orthopaedic Residency

1930:
Division of Orthopaedics - within Surgery
Alfred Shands Jr – first chief
Bev Rainey – first resident
8 residents per year
UNC
Orthopaedic Residency

R. Bev Rainey, MD
Wake Forest Orthopaedic Residency

R. A. Moore, MD
Chair: 1941-1953

2 faculty:
• Cabel Young (Duke)
• Ed Martinet

Residency
• 1 resident / year
• 2 year program
• First resident

Butch Tiller
Carolinas Medical center
Orthopaedic Residency

Initially Community Program
Now Carolinas Medical Center

Oscar miller

- 5 residents per year
What Drives Orthopaedic Surgery Residents? Intellectual Stimulation and Other Self-Reported Factors Influencing Fellowship Choice

Joseph J. Kavolus M.D. M.S.C.R., Andrew P. Maston M.D., William A. Byrd M.D., Brian E. Brigman M.D. P.h.D.
Disclosures

• No conflicts of interest to report
The next generation of Orthopedic Surgeons will inherit a rapidly changing healthcare environment

- Mountains of Student Debt
- New payment models
- Never before seen levels of outcome reporting
- Increased bureaucratic responsibility from documentation and EMR requirements
METHODS

- After IRB approval Link to Survey was emailed to programs coordinators with instructions to disseminate
- All responses anonymized
- Only fully complete surveys accepted
- Collected a litany of demographics, planned fellowship choice, and Likert Scale rankings for a number of factors influencing career
Demographics

- 360 Orthopedic Trainee responses 86% male 14% female
- All PGY years represented including current fellows

<table>
<thead>
<tr>
<th>Answer Options</th>
<th>Response Percent</th>
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</table>
Plans of Current Trainees

Post-Residency Plan Breakdown

<table>
<thead>
<tr>
<th>Option</th>
<th>Number of Respondents</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Undecided</td>
<td>75</td>
<td>20.83%</td>
</tr>
<tr>
<td>Sports Medicine</td>
<td>73</td>
<td>20.26%</td>
</tr>
<tr>
<td>Adult Reconstruction</td>
<td>53</td>
<td>16.37%</td>
</tr>
<tr>
<td>Hand/Upper Extremity</td>
<td>51</td>
<td>14.32%</td>
</tr>
<tr>
<td>Trauma</td>
<td>28</td>
<td>7.88%</td>
</tr>
<tr>
<td>Spine</td>
<td>26</td>
<td>7.22%</td>
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<tr>
<td>Pediatrics</td>
<td>17</td>
<td>4.72%</td>
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<tr>
<td>Shoulder and Elbow</td>
<td>14</td>
<td>3.89%</td>
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<tr>
<td>Foot and Ankle</td>
<td>9</td>
<td>2.50%</td>
</tr>
<tr>
<td>Oncology</td>
<td>9</td>
<td>2.50%</td>
</tr>
<tr>
<td>No Fellowship (General Orthopedic Practice)</td>
<td>5</td>
<td>1.39%</td>
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<tr>
<td>Alternative Career path (i.e., Administration, Banking, consulting, etc?)</td>
<td>0</td>
<td>0.00%</td>
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</table>
# Average Likert Score of Factors

<table>
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<tr>
<th>Factor</th>
<th>Rating Average</th>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
## Unique Concerns Per Specialty

<table>
<thead>
<tr>
<th>Subspeciality</th>
<th>Unique Factor(s)</th>
<th>Least Important Factor(s)</th>
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</thead>
<tbody>
<tr>
<td>Undecided (n=75)</td>
<td>Practice Location 3.32</td>
<td>Potential to Conduct Research 1.92</td>
</tr>
<tr>
<td>Generalist/no Fellowship (n=5)</td>
<td>Practice Location 3.4</td>
<td>Potential to Join Academic Practition 1.0</td>
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<tr>
<td>Adult Reconstruction (n=53)</td>
<td>Marketability 3.38</td>
<td>Outpatient Surgery 1.44</td>
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<tr>
<td>Foot and Ankle (n=9)</td>
<td>Practice Location 3.33</td>
<td>Potential to Join Academic Practition 1.38</td>
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<tr>
<td>Hand/Upper Extremity (n=51)</td>
<td>Outpatient Surgery 3.14</td>
<td>Potential to Conduct Research 1.88</td>
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<tr>
<td>Oncology (n=9)</td>
<td>Join Academic Practice 3.56</td>
<td>Outpatient Surgery 1.56</td>
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<tr>
<td>Pediatrics (n=17)</td>
<td>Alturism 3.12</td>
<td>Outpatient Surgery 1.47</td>
</tr>
<tr>
<td>Shoulder and Elbow (n=14)</td>
<td>Outpatient Surgery 2.86</td>
<td>Interaction with other Specialties 2.07</td>
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<tr>
<td>Spine (n=26)</td>
<td>Marketability 3.04</td>
<td>Outpatient Surgery 1.46</td>
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<tr>
<td>Sports Medicine (n=73)</td>
<td>Outpatient Surgery 3.18</td>
<td>Potential to Conduct Research 2.16</td>
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<tr>
<td>Trauma (n=28)</td>
<td>Alturism 2.79</td>
<td>Outpatient Surgery 1.46</td>
</tr>
</tbody>
</table>
Conclusion

- Highest reported percentage of residents planning to pursue fellowship 98.6%
- Judging from resident concerns: intellectual stimulation, marketability, mentors coupled with current healthcare environment explains “necessity” of fellowship
Moving forward. Climbing higher.
Gender Preferences of Patients When Selecting Orthopaedic Providers

NCOA Annual Meeting
October 9, 2016

Hannah Dineen MD, Scott Eskildsen MD, Brendan Patterson MD, Zoe Gan BS, J. Megan Patterson MD, Reid Draeger MD
Disclosures

None
Orthopaedics is male-dominated

- 2010: 47.8% female medical students
- 15% full-time women faculty in orthopaedics
- 13.2% of orthopaedic residents are women
- From 2004-2009, only 1% increase in female medical students going in orthopaedics
Background

• Female physicians add important elements to doctor-patient relationships
  – Spend more time with patients
  – Display more sensitivity and encourage more positive self-talk than male counterparts
• Patients have preferences for gender in primary care and ob/gyn

Roter, Janssen
Questions

1) Do patients have a preference for the gender of their orthopaedic surgeon?

2) What traits are important to patients in their orthopaedic surgeon?
Hypothesis:

Patients will not cite a specific gender preference, but will prefer an orthopaedic surgeon that demonstrates many qualities seen in female physicians.
Methods

• 191 new patients seen in the Emergency Department and orthopaedic urgent care over a course of 6 months at a single university healthcare center

• Patients given survey regarding their preferences for follow up with an orthopaedic provider
  – preferred gender of their provider
  – preferences in traits exhibited by their provider

• Exclusion criteria: < 18 years old, non-English speaking, current patient
## Results

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
<th>Missing data points</th>
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<tbody>
<tr>
<td><strong>Gender</strong></td>
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</tr>
<tr>
<td>Male</td>
<td>72 (38.7)</td>
<td>2</td>
</tr>
<tr>
<td>Female</td>
<td>114 (61.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>52.7 years (mean)</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>18-90 years range</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>White or Caucasian</td>
<td>139 (75.5)</td>
<td>7</td>
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<tr>
<td>Black or African American</td>
<td>28 (15.2)</td>
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<tr>
<td>Hispanic or Latino</td>
<td>11 (6.0)</td>
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</tr>
<tr>
<td>Asian, Native Hawaiian or Pacific Islander</td>
<td>4 (2.2)</td>
<td></td>
</tr>
<tr>
<td>American Indian or Native American or Alaska Native</td>
<td>3 (1.6)</td>
<td></td>
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<tr>
<td>Other</td>
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<td></td>
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<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
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<tr>
<td>8th grade or less</td>
<td>4 (2.2)</td>
<td>5</td>
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<tr>
<td>Some high school, but did not graduate</td>
<td>14 (7.5)</td>
<td></td>
</tr>
<tr>
<td>High school graduate or GED</td>
<td>26 (14)</td>
<td></td>
</tr>
<tr>
<td>Some college or 2-year degree</td>
<td>34 (18.3)</td>
<td></td>
</tr>
<tr>
<td>4-year college graduate</td>
<td>38 (20.4)</td>
<td></td>
</tr>
<tr>
<td>More than 4-year college degree</td>
<td>70 (37.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Emotional health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>77 (41.4)</td>
<td></td>
</tr>
<tr>
<td>Very good</td>
<td>67 (36.0)</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>26 (14.0)</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>14 (7.5)</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>2 (1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
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<td></td>
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<tr>
<td>Single</td>
<td>43 (23.4)</td>
<td>7</td>
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<tr>
<td>Partner/married</td>
<td>109 (59.2)</td>
<td></td>
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<tr>
<td>Separated/divorced</td>
<td>21 (11.4)</td>
<td></td>
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<tr>
<td>Widowed</td>
<td>11 (6.0)</td>
<td></td>
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<tr>
<td>Other</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Total Patients in Study

- No Preference for Gender of their Provider: 88 Female, 68 Male
- Had a Preference for Gender of their Provider: 27 Female, 3 Male

No Preference for Gender of their Provider: 25 Female, 2 Male
Preferred Gender of their Provider: 1 Female, 2 Male

p=0.001
Preferences for Traits in Orthopaedic Surgeon

Ask concise questions that are efficient and to the point

Spend more time interacting with me in clinic and getting to know me as a person

p=1.00
 Preferences for Traits in Orthopaedic Surgeon

Be friendly, warm and focus on my needs

Have more technical competence and mechanical skill (works well with tools)

p = 0.49
Preferences for Traits in Orthopaedic Surgeon

Direct me to the decision he or she thinks is best

Spend more time encouraging me to make the right decisions for my health

p=0.73
Preferences for Traits in Orthopaedic Surgeon

Sympathize with me and be able to relate to my problems

Possess superior physical strength

p=0.24
Preferences for Traits in Orthopaedic Surgeon

Ask me about my feelings and emotions

Understand and play sports and be able to relate to athletes

p=0.007
<table>
<thead>
<tr>
<th>Subspecialty</th>
<th>% no preference</th>
<th>% with a preference</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Prefer Male</td>
<td>Prefer Female</td>
</tr>
<tr>
<td>Joints</td>
<td>90.3</td>
<td>9.7</td>
<td>0.013</td>
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<tr>
<td></td>
<td></td>
<td>6.8</td>
<td>2.8</td>
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<tr>
<td>Hand</td>
<td>91.6</td>
<td>8.4</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.2</td>
<td>6.2</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>90.5</td>
<td>9.0</td>
<td>0.181</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.8</td>
<td>6.2</td>
</tr>
<tr>
<td>Spine</td>
<td>89.9</td>
<td>10.1</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.15</td>
<td>3.91</td>
</tr>
<tr>
<td>Foot and Ankle</td>
<td>91.1</td>
<td>9.0</td>
<td>0.043</td>
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<tr>
<td></td>
<td></td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Sports</td>
<td>92.7</td>
<td>7.26</td>
<td>0.184</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.47</td>
<td>2.79</td>
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</tbody>
</table>
Important Traits in an Orthopaedic Surgeon

- Hospital he/she works at: 96.7%
- Board certification: 96.2%
- Reputation or prestige: 95.4%
- Amount of published research: 92%
- Years in practice: 76%
- Physical appearance: 44.4%
- Gender: 34.3%
- Racial Background: 33.3%
- Age: 30.9%
Discussion

• Patient satisfaction, access to care, communication improved with gender and ethnic diversity

• Majority of patients do not cite preference
• Patients that do have a preference tend to be female and prefer females
Discussion

• Patients may be more comfortable with providers of same sex
  – Easier to talk to

• Gender concordance has been shown to improve communication
  – Female concordant visits are longer with more emotional exchange
  – Male-male visits are shortest with more domination of conversation by physician
• Female physicians spend more time counseling and teaching
• Average primary care clinic visit 23 minutes vs 21 minutes
• Patients in our study preferred surgeon who talked about patient feelings and emotions
• Sex diversity is important to meet patient needs
• Differences for gender preferences seen based on subspecialty
  
  • Female hip, knee and tumor fellowship applications are 6% female
  • 3% of spine applicants are female
  • 25% of pediatric orthopaedic applicants are female
  • 20% hand surgeon trainees are female
Limitations

- Sample size largely comprised of female, Caucasian, greater than 4 year college education
- 49% of surveys were incomplete
- Hawthorne effect
- May have various answers depending on socioeconomic level
Conclusion

• 0.6% of female medical students choose orthopaedics
• Unequal representation at residency programs with 30 programs over 2009-2014 with no female trainees
• Female orthopaedists are desired by patients and have much to contribute
• Bias is present regarding females in orthopaedics, especially in certain subspecialties
• Important for early exposure to the field and more access to role models

Van Heest, Blakemore
Thank you
References

Electronic Medical Record Implementation Results in Less Efficient Delivery of Care

Daniel J. Scott MD, MBA, Eva Labro PhD, Colin Penrose MD, Michael P. Bolognesi MD, Samuel S. Wellman MD, Richard C. Mather III MD, MBA
Do we know the impact of EMRs?
Study Design

Time Driven – Activity Based Costing

How it works:
1) Map the work flow
2) Time each activity
3) Allocate cost to each activity

Negrini D et al. J Health Organ Manag. 2004
Kaplan RS, Porter ME. NEJM. 2010.
Study Design

Prospective, hand timed data collection

48 patients – Pre EMR implementation

Total 112 patients

33 patients – 2-3 months after EMR implementation

31 patients – 6 months after EMR implementation
• Total clinic labor cost increased ($36.88 to $46.04, p = 0.0506) at 2 months compared to previous levels…

• But returned to prior levels at 6 months ($38.75, p = 0.689)
Clinic staff spent more time per patient

Clinic Staff average Time Spent per Patient

- **Pre-EMR**: 35.18
- **3 months Post EMR**: 51.65
- **6 months Post EMR**: 51.31

p<0.001 for pre-EMR vs 3 months post, p = 0.002 pre-EMR vs 6 months post
EHRs increase documentation

Time Spent with Patients vs. Documentation

Pre- EMR
- Patient interaction (min): 3.28
- Document Encounter (min): 14.65

3 Months Post EMR
- Patient interaction (min): 7.63
- Document Encounter (min): 12.16

6 months Post EMR
- Patient interaction (min): 8.43
- Document Encounter (min): 10.03

p = 0.027 time with patients; p<0.001 for documentation time
Effect on specific staff

• Certified Medical Assistant spent more time with patients (3.4 vs 9.1 vs 6.7 min, p < 0.001)

• Attending surgeons spent similar amounts of time with patients (9.38 vs 10.97 min, p=0.21; 9.41 min at 6 months)
EHR Implementations are Hard

• Cost “neutral” at 6 months -> Implantation period?
• Clinic visits take longer
• Less interaction with patients, more time documenting
• Expect changes to patient volumes and work-flows
Thank you

- NCOA
- Dr. Eva Labro
- Dr. Colin Penrose
- Dr. Michael Bolognesi
- Dr. Samuel Wellman
- Dr. Richard Mather
References


Figure 1 - Workflow

Total Knee Office Visit Value Chain – Page Road Clinic

**Registration and Verification**
- Receptionist, Financial Counselor

**Intake**
- Nurse, Receptionist, MA

**Clinician Visits**
- MD, mid-level, RN, GME

**Plan of Care Discussion**
- MD, mid-level, RN, GME

**Plan of Care Scheduling**
- Patient Service Coordinator, Receptionist

**Patient Arrives**

1. Check in patient at 3rd floor

2. **Assess Patient**
   - Patient already has x-ray?
     - NO
     - YES
6. **Patient decides to stay?**
   - NO
   - YES

7. **X-ray useable?**
   - NO
   - YES
8. **Patient here for prescheduled injection**
   - NO
   - YES

9. **Inject needed?**
   - YES
   - NO
10. **Pre-op?**
    - NO
    - YES

11. **Review records/see patient**
    - NO
    - YES

12. **New patient?**
    - NO
    - YES

    - NO
    - YES

14. **Discuss Plan of Care**
    - NO
    - YES

15. **Pre-op?**
    - NO
    - YES

16. **Prepare injection**
    - NO
    - YES

17. **Perform injection**

18. **Surgery or follow up**

19. **Pick surgery date**

20. **Review new records/see patient**

21. **Discuss plan of care**

22. **Schedule tests, f/u or consults**

**Decision Points**

- Pre-op
- Consent patient
- Discuss plan of care
- Schedule pre-op
### Time Driven Activity Based Costing

<table>
<thead>
<tr>
<th>Activity</th>
<th># of patients</th>
<th>Mean</th>
<th>Median</th>
<th>Std Dev</th>
<th>Mean</th>
<th>Median</th>
<th>Std Dev</th>
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<tbody>
<tr>
<td>Common Activities:</td>
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<td></td>
</tr>
<tr>
<td>Talk with receptionist</td>
<td>18.00</td>
<td>1.75</td>
<td>1.71</td>
<td>0.62</td>
<td>$0.41</td>
<td>$0.39</td>
<td>$0.14</td>
</tr>
<tr>
<td>Take patient to X-ray (CMA)</td>
<td>29.00</td>
<td>1.92</td>
<td>1.42</td>
<td>1.44</td>
<td>$0.56</td>
<td>$0.41</td>
<td>$0.42</td>
</tr>
<tr>
<td>Take X-ray (RT)</td>
<td>30.00</td>
<td>11.63</td>
<td>11.38</td>
<td>0.08</td>
<td>$5.39</td>
<td>$5.28</td>
<td>$2.17</td>
</tr>
<tr>
<td>Evaluates patient (CMA)</td>
<td>48.00</td>
<td>3.43</td>
<td>3.06</td>
<td>2.26</td>
<td>$1.00</td>
<td>$0.89</td>
<td>$0.66</td>
</tr>
<tr>
<td>Review records/see pt (assistant)*</td>
<td>36.00</td>
<td>14.65</td>
<td>12.96</td>
<td>8.47</td>
<td>$8.47</td>
<td>$5.97</td>
<td>$9.21</td>
</tr>
<tr>
<td>Prepare injection (CMA)</td>
<td>13.00</td>
<td>3.13</td>
<td>2.92</td>
<td>1.44</td>
<td>$0.91</td>
<td>$0.85</td>
<td>$0.42</td>
</tr>
<tr>
<td>Injection (attending or assistant)</td>
<td>14.00</td>
<td>6.23</td>
<td>4.98</td>
<td>3.35</td>
<td>$13.25</td>
<td>$11.24</td>
<td>$8.25</td>
</tr>
<tr>
<td>Plan of Care (attending)</td>
<td>46.00</td>
<td>7.35</td>
<td>5.90</td>
<td>4.93</td>
<td>$18.64</td>
<td>$15.35</td>
<td>$12.62</td>
</tr>
<tr>
<td>Documentation after visit (assistant or MD)</td>
<td>39.00</td>
<td>3.28</td>
<td>2.75</td>
<td>2.08</td>
<td>$2.28</td>
<td>$1.94</td>
<td>$1.67</td>
</tr>
<tr>
<td>Check out (receptionist)</td>
<td>37.00</td>
<td>2.42</td>
<td>1.90</td>
<td>2.65</td>
<td>$0.56</td>
<td>$0.44</td>
<td>$0.61</td>
</tr>
<tr>
<td>* does not include time spent with attending</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total receptionist time</td>
<td>48.00</td>
<td>0.07</td>
<td>0.07</td>
<td>0.04</td>
<td>$0.98</td>
<td>$0.96</td>
<td>$0.51</td>
</tr>
<tr>
<td>Total CMA time</td>
<td>48.00</td>
<td>6.07</td>
<td>5.31</td>
<td>0.06</td>
<td>$1.80</td>
<td>$1.55</td>
<td>$1.03</td>
</tr>
<tr>
<td>Total Radiology Tech time*</td>
<td>30.00</td>
<td>11.63</td>
<td>11.38</td>
<td>0.08</td>
<td>$5.39</td>
<td>$5.28</td>
<td>$2.17</td>
</tr>
<tr>
<td>Total physician assistant time**</td>
<td>12.00</td>
<td>19.61</td>
<td>0.29</td>
<td>0.18</td>
<td>$20.85</td>
<td>$18.30</td>
<td>$11.54</td>
</tr>
<tr>
<td>Total Fellow time**</td>
<td>7.00</td>
<td>21.72</td>
<td>19.67</td>
<td>12.94</td>
<td>$10.35</td>
<td>$9.37</td>
<td>$6.17</td>
</tr>
<tr>
<td>Total Resident time**</td>
<td>14.00</td>
<td>24.06</td>
<td>21.76</td>
<td>10.06</td>
<td>$7.76</td>
<td>$7.02</td>
<td>$3.25</td>
</tr>
<tr>
<td>Total Medical student time**</td>
<td>3.00</td>
<td>28.75</td>
<td>25.33</td>
<td>10.82</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.40</td>
</tr>
<tr>
<td>Total attending (all patients)</td>
<td>46.00</td>
<td>9.38</td>
<td>0.15</td>
<td>0.09</td>
<td>$22.02</td>
<td>$20.96</td>
<td>$13.19</td>
</tr>
<tr>
<td>Total attending time (for patients seen by the attending with no assistant)</td>
<td>12.00</td>
<td>0.00</td>
<td>12.35</td>
<td>4.84</td>
<td>$26.97</td>
<td>$23.75</td>
<td>$11.09</td>
</tr>
</tbody>
</table>

**Total average cost***

<table>
<thead>
<tr>
<th>Mean</th>
<th>Median</th>
<th>Std Dev</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$36.88</td>
<td>$31.93</td>
<td>$19.62</td>
<td>87.96-10.51</td>
</tr>
</tbody>
</table>

*only includes times for those patients requiring X-rays  
**only includes patients when they were the attending's primary assistant  
***includes all times, including some not captured above
## Provider Variation

### Time Driven Activity Based Costing System

#### Variations in time and cost by assistant

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of patients</th>
<th>average MD time spent</th>
<th>average assistant time spent with patient</th>
<th>Total visit average cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patient seen</td>
<td>48</td>
<td>8.99</td>
<td>17.49</td>
<td>$36.88</td>
</tr>
<tr>
<td>Attending with any assistant</td>
<td>46</td>
<td>11.77</td>
<td>17.73</td>
<td>$37.37</td>
</tr>
<tr>
<td>Patients seen by Attending without an assistant</td>
<td>12</td>
<td>9.38</td>
<td>0.00</td>
<td>$35.48</td>
</tr>
<tr>
<td>PA as assistant or primary provider</td>
<td>12</td>
<td>7.67</td>
<td>18.31</td>
<td>$46.94</td>
</tr>
<tr>
<td>PA as assistant</td>
<td>10</td>
<td>8.09</td>
<td>21.15</td>
<td>$47.84</td>
</tr>
<tr>
<td>PA only with no attending</td>
<td>2</td>
<td>0</td>
<td>11.91</td>
<td>$18.54</td>
</tr>
<tr>
<td>Fellow as assistant</td>
<td>7</td>
<td>7.34</td>
<td>21.72</td>
<td>$32.67</td>
</tr>
<tr>
<td>Resident as assistant</td>
<td>14</td>
<td>8.89</td>
<td>24.06</td>
<td>$33.24</td>
</tr>
<tr>
<td>medical student as assistant</td>
<td>3</td>
<td>7.45</td>
<td>28.75</td>
<td>$23.60</td>
</tr>
</tbody>
</table>

#### New vs. return patients

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of patients seeing attending</th>
<th>average attending time spent</th>
<th>average assistant time spent</th>
<th>number of patients seeing assistant</th>
<th>average assistant time spent</th>
<th>average cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>New patients</td>
<td>12</td>
<td>12.87</td>
<td></td>
<td>10</td>
<td>29.96</td>
<td>$57.57</td>
</tr>
<tr>
<td>Return Patients</td>
<td>34</td>
<td>8.07</td>
<td></td>
<td>28</td>
<td>19.52</td>
<td>$30.69</td>
</tr>
</tbody>
</table>
Bundled Payments for Care Improvement (BPCI): Boom or Bust?

Brian Curtin, MD
Robert Russell, MD
Susan Odum, PhD
Disclosures

• Consultant: Ethicon, Depuy, CareStream, Zimmer Biomet

• Research Support: Depuy/Stryker/Zimmer

• Editorial Review Board: Journal of Arthroplasty, CORR, Orthopedics, and EJOST.
Background

- Historically, TJA for elderly patients with low activity level
- Indications have expanded to younger and more active patients
- This has caused tremendous growth in the number of total joints performed
• National Hospital Discharge Survey 2010
  – Total Knee Replacement (TKA): 719,000
  – Total Hip Replacement (THA): 332,000

• Projections for 2030 (JBJS 2007)
  – TKA: 3.48 million (673% increase)
  – THA: 572,000 (174% increase)
• The Centers for Medicare and Medicaid Services (CMS) are the payer
  – $7 billion spent on primary THA/TKA in 2013

• The projected increase in volume will impose enormous economic burden on the US healthcare system
Solutions

- Rationing of healthcare
- Transition cost to patients
- Bundled payments to providers
- Capitation
Bundled Payment

• What is a “bundled payment”?
  – Reimbursement to healthcare providers (e.g. hospitals and physicians) on the basis of expected costs for a clinically defined episode of care

• Bundled care
  – 72 hours prior to hospital admission
  – Inpatient stay
  – 90 days post-discharge
Payment Structure

• Fee for service
  – Incentivizes volume
  – Excessive use of services

PROBLEM: No incentive for physician to help hospital reduce its costs, even though physician controls them.
Payment Structure

- Bundled payment
  - Designed to incentivize coordination of care
  - Promote quality and efficiency/control costs

**SOLUTION:** Allow physician fee to increase if hospital costs are reduced
Bundled Payment Care Initiative (BPCI)

• CMS introduced BPCI in 2013

• Early implementers, mostly large academic centers (NYU), have shown decreased:
  – hospital LOS
  – discharges to inpatient facilities
  – readmission rates
  – Overall expenditures
Purpose

• To compare total expenditures and post-acute care metrics for patients enrolled in the OrthoCarolina BPCI program to non-bundle patients.
Methods

• CMS data was used to compare total expenditures of diagnosis related groups (DRG)
• Non-BPCI (n=8,415)
  – January 2009-December 2012
• BPCI (n=4,757)
  – January 2015-December 2015
Outcomes

• Total expenditures
  – converted to 2016 dollars using Consumer Price Index
• Skilled nursing facility (SNF) admission
• Home health (HH) utilization
• Readmissions to the hospital
Average Total Spend Trended

Average Total Spend Trended - Hip & Knee (DRG 470 - Electives)

- Baseline (Group): $20,509.17
- 2015Q1 (Jan, Feb & Mar): $18,550.23
- 2015Q2 (Apr, May & Jun): $17,823.49
- 2015Q3 (Jul, Aug & Sep): $19,459.98
- 2015Q4 (Oct & Nov): $17,900.72
Average Post Acute Total Spend Trended

Average Post-Acute Total Spend Trended - Hip & Knee (DRG 470 - Electives)

- Baseline (Group): $7,798.83
- 2015Q1 (Jan, Feb & Mar): $6,659.28
- 2015Q2 (Apr, May & Jun): $5,966.06
- 2015Q3 (Jul, Aug & Sep): $7,209.31
- 2015Q4 (Oct & Nov): $5,948.27
SNF-Hip & Knee (DRG 470-Electives)

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Incidence Rate</th>
<th>Average Length of Stay (LOS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline (Group)</td>
<td>35.5%</td>
<td></td>
</tr>
<tr>
<td>2015Q1 (Jan, Feb &amp; Mar)</td>
<td>16.3%</td>
<td>18.1</td>
</tr>
<tr>
<td>2015Q2 (Apr, May &amp; Jun)</td>
<td>28.2%</td>
<td>14.8</td>
</tr>
<tr>
<td>2015Q3 (Jul, Aug &amp; Sep)</td>
<td>28.2%</td>
<td>18.3</td>
</tr>
<tr>
<td>2015Q4 (Oct &amp; Nov)</td>
<td>21.7%</td>
<td>15.9</td>
</tr>
</tbody>
</table>

Legend:
- SNF LOS
- SNF Rate
Readmit Rate Trended

Readmit Rate Trended - Hip & Knee (DRG 470 - Electives)

- Baseline (Group): 8.9%
- 2015Q1 (Jan, Feb & Mar): 5.3%
- 2015Q2 (Apr, May & Jun): 8.1%
- 2015Q3 (Jul, Aug & Sep): 6.5%
- 2015Q4 (Oct & Nov): 6.0%
Summary

<table>
<thead>
<tr>
<th>Outcome</th>
<th>BPCI savings</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total expenditure</td>
<td>$2700 per case</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Post-acute care spend</td>
<td>$1500 per case</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>SNF admission</td>
<td>7% reduction</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Home Health usage</td>
<td>6% reduction</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Readmissions</td>
<td>6.5% vs 8.9%</td>
<td>0.02</td>
</tr>
</tbody>
</table>

LOS for post-acute care
*BPCI HH LOS 12 days vs 24 days
Discussion

• BPCI patients were able to significantly decrease CMS expenditures for elective THA and TKA

• This required substantial resource utilization by the organization, both financial and human resources
Discussion

• Areas of savings
  – Implant costs
    • Re-negotiate vendor contracts
  – Post-acute care spending
    • Care coordinators
  – Readmissions
    • Preoperative patient optimization
    • Evidence based protocols
Patient Optimization

Table 1
Preoperative Checklist: Managing Risk for Readmission and Increased LOS after TJR.

1. Diabetes: Hgb A1c if >7.9 delay and refer
2. Smoker: if YES then refer to smoking cessation
3. BMI: if >40 refer for counseling, metabolic consult
4. Anemia: if Hgb <12 in females and <13 in males, delay and refer for work up or blood management
5. Staph colonization: if in HC facility or HC worker or history of MRSA, screen and decolonize
6. Narcotic dependence, manage upfront, pain consult
7. Anticoagulation or VTE history, evaluate and counsel
8. Lack of supportive home environment, social work intervention
9. Psychiatric diagnosis, depression, anxiety, consult

Froimson JOA 2015
Discussion

- Payers are shifting risk to providers
- Catastrophic complications are costly to the provider, no longer the payer
Discussion

• While BPCI implementation was successful at OrthoCarolina, is this generalizable?

• Most THA and TKA procedures are performed by low- to mid-volume providers (hospitals and surgeons)

• What is the sustainability for CMS in this model
Thank you