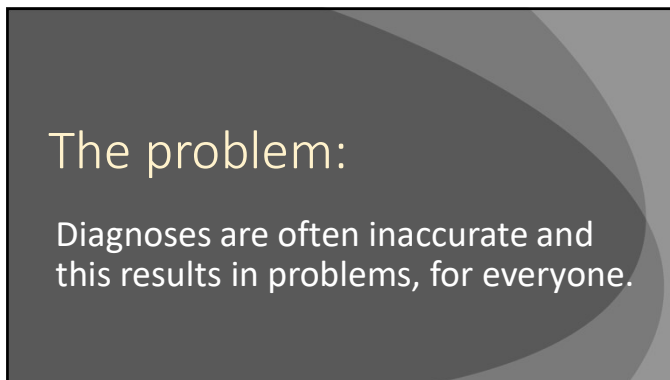


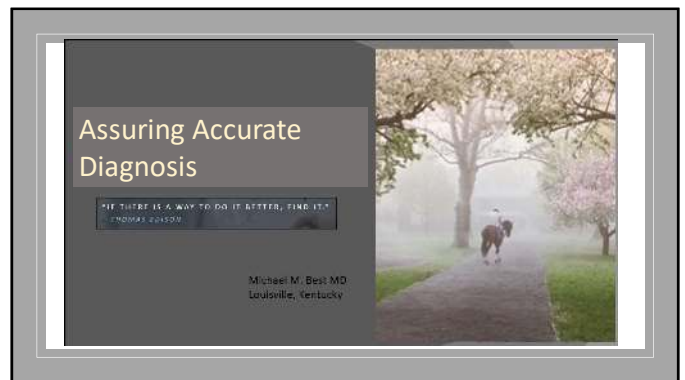
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So... 25% got a D or T

The AMA --- 1.1 million MD's in the US...


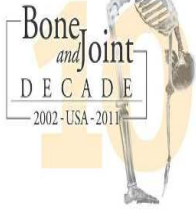
Are 900,000 MD's incompetent in Musculoskeletal Diagnosis and Treatment ???

7




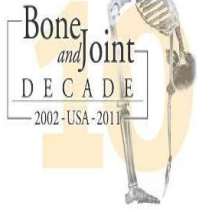
- Musculoskeletal diseases affect more than one out of every two persons in the United States age 18 and over, and nearly three out of four age 65 and over.

8



- In 2004 total cost attributed to patients with musculoskeletal diseases of **\$849 billion**, or 7.7 percent of the US GDP.

9



- Musculoskeletal conditions such as arthritis and back pain affect more than 1.7 billion people worldwide.
- Second greatest cause of disability.
- 4th greatest impact on the overall health of the world population when considering both death and disability.

10

The Basis of the Problem --

...Mis-Diagnosis

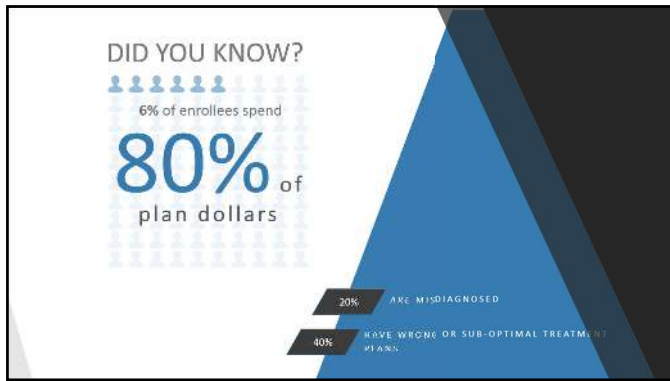
11

IN THE NEWS --- Medical Mis-diagnosis



- 1999 Institute of Medicine: "To Err is Human : Building A Safer Health System "
- 2015 Institute of Medicine: "Improving Diagnosis in Healthcare "
- 2017 Mayo Clinic: 21% of Patients Are Mismatched

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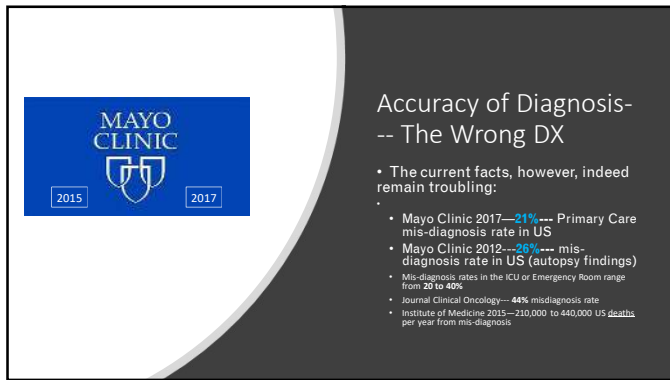


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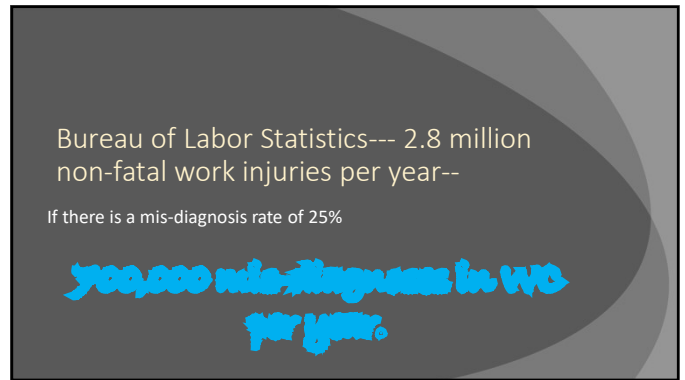
Table 1. Sampling of Diagnostic Error Rates in Specific Conditions

Study	Conditions	Findings
Dijkstra et al (2015) ¹³	Pulmonary TB	Review of autopsy studies that have specifically focused on the diagnosis of pulmonary TB: 50% of these diagnoses were not suspected antemortem
Filardi et al (2015) ¹⁴	Pulmonary embolism	Review of fatal autopsies over a 9-yr period at a single institution: 61% of patients also died of pulmonary embolism; the diagnosis was not suspected clinically in 31 (50%)
Leider et al (2016) ¹⁵ van Eindhoven et al (2016) ¹⁶	Ruptured aortic aneurysm	Review of all cases at a single medical center over a 7-yr period: 23 cases involving abdominal aneurysms; diagnosis of ruptured aneurysm was initially missed in 14 (61%); in patients presenting with chest pain, diagnosis of involving aneurysm of the thoracic aorta was missed in 10% of cases
Edlow (2016) ¹⁷ Bostom et al (2016) ¹⁸	Subarachnoid hemorrhage Cerebral aneurysm	Autopsy review of ruptured aneurysms or subarachnoid hemorrhage: 30% are misdiagnosed on initial evaluation
Scarr et al (2016) ¹⁹	Breast cancer	Autopsy study at a single hospital of the 150 malignant breast tumors that autopsied: 11% were either misdiagnosed or undiagnosed, and in 57% of the cases the cause of death was judged to be related to the cancer
Yodanis et al (2016) ²⁰	Malaria	56 autopsies ordered to review mammograms of 79 women: 46 of whom had breast cancer; the cancer would have been missed in 30%
Yodanis et al (2016) ²⁰	Malaria	Second review of 5,131 biopsy samples: diagnosis changed in 11%, 11.1% from benign to malignant, 4.2% from malignant to benign, and 4.8% had a change in tumor grade
Wells (2015) ²¹	Stroke diagnosis	The initial diagnosis was correct in 30% of patients with stroke; 70% of autopsies are correct; diagnosis error common
Dall et al (2016) ²²	Appendicitis	Retrospective study at 12 hospitals of patients with abdominal pain and excision for appendicitis: Of 1,026 patients who had surgery, there was no appendicitis in 120 (11.7%) or 314 patients with a final diagnosis of appendicitis; the diagnosis was missed or wrong in 17% (38.4%)
Katz et al (2016) ²³	Cancer pathology	The frequency of errors in diagnosing cancer was measured at 4 hospitals over a 3-yr period. The error rate of pathologic diagnosis was 27-45% for gynecologic cases and 4%-12% for oncologic cases; errors represented sampling deficiencies, transcription problems, and mistakes in histologic interpretation
Buchheit et al (2016) ²⁴	Endometritis	Digital autopsies of laparoscopies were shown to 108 gynecologic surgeons; the interobserver agreement regarding the number of lesions was low (45%)
Gruber et al (2016) ²⁵ Rajan et al (2016) ²⁶	Parvovirus infection Atrial flutter/fibrillation	1 of 257 with parvovirus infection died of thrombocytopenia; the diagnosis was missed or wrong in 9 cases (19%) Review of additional ECG interpretations was as accurate as that recorded: 30% of the patients were misdiagnosed by the machine, and the error was detected by the reviewing clinician only 65% of the time
Arora et al (2016) ²⁷	Infant botulism	Study of 125 infants in California suspected of having botulism during a 5-yr period: only 56% of the cases were suspected at the time of admission
Fisher et al (2016) ²⁸	Riboflavin deficiency	Retrospective review of 1,429 patients with laboratory evidence of riboflavin deficiency (plasma >200 ng/dL or hemoglobin A _{1c} >7.6%); there was no mention of diabetes in the medical record of 30% of patients
Rezell et al (2016) ²⁹	Chest surgery in the ED	6% (10%) of cases were incorrectly interpreted by the ED staff; corrected with the final findings by radiologists

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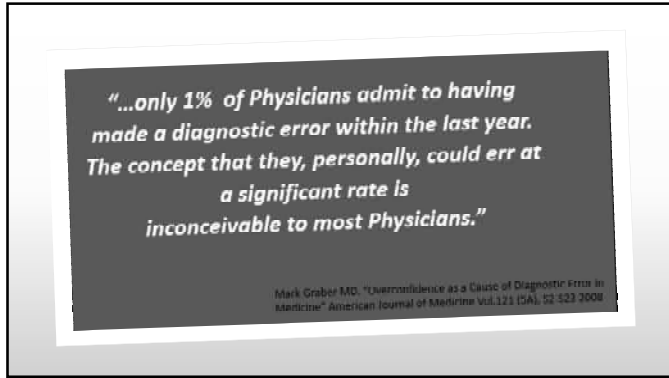
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But...

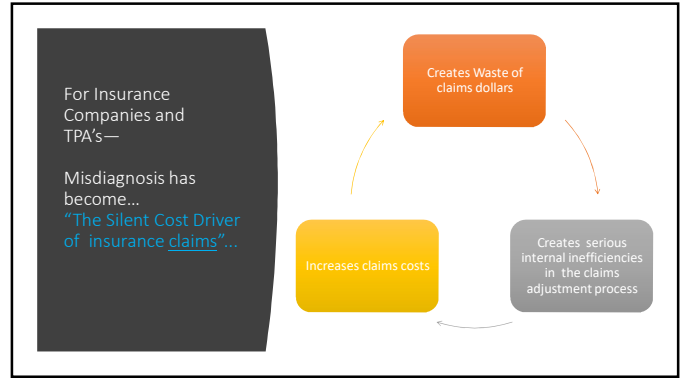
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The Root of the Problem....

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- Case Manager Responsibilities:** CASE MANAGERS ARE RESPONSIBLE FOR ASSESSING, PLANNING, COORDINATING, IMPLEMENTING AND EVALUATING INURED EMPLOYEES. USED IN 10% CASES.
- Role:** THEY WORK AS INTERMEDIARIES BETWEEN CARRIERS, EMPLOYERS, MEDICAL CARE PROVIDERS, EMPLOYEES AND EMPLOYEES TO ENSURE APPROPRIATE AND COST-EFFECTIVE HEALTH CARE SERVICES.
- Impact of Delays:** DELAYS IN CASE MANAGEMENT INTERVENTION (WRONG DIAGNOSIS) QUICKLY LENGTHEN RETURN TO WORK AS MUCH AS 50%, AND COST PAYERS OVER 30% MORE.

Case management is at the heart of workers' compensation

Genex 2018

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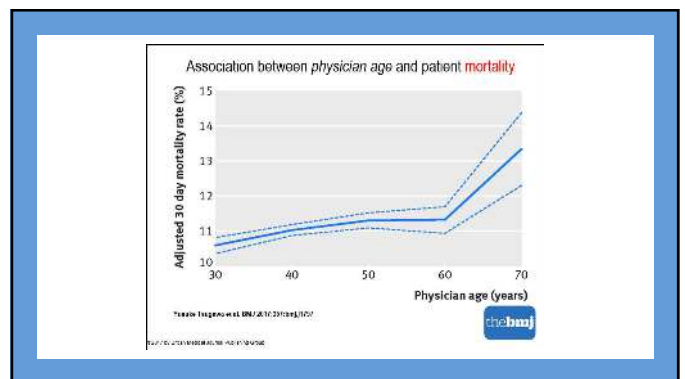
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“Medicine has become too complex. Only about 20% of the knowledge clinicians use today is evidence-based.”

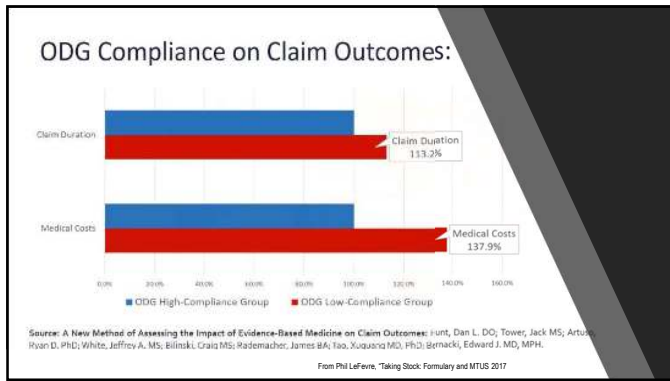
Steven Shapiro
Chief Medical & Scientific Officer
University Pittsburgh Medical Center

- Medical info is doubling every 5 years
- 81% of physicians spend < 5 hrs / month reading medical journals

23



24



25

BKT:

What if the 22 years of claims data --- billions --- of pieces of data --- contains a 25% mis-diagnosis rate ???

(And--- Treatment Guidelines are Diagnosis-Specific ---)

26

What are possible solutions?
What will the future bring?

27

The Future...
Artificial Intelligence and
Technology Solutions

28

The CDS software solution ...

29

What is CDS ?

Our Clinical Decision Software system is an intuitive medical software that *aids* the Physician by :

- improving diagnostic accuracy
- recommending state-of-the-art, evidence-based treatments

30

The CDS software... *simple and intuitive*

- Poses questions specific to the complaint
- Requires a "positive" or "negative" response to each question
- Offers an interactive touch screen to determine "where does it hurt"
- "Negative" such response and generates a specific list of the most likely diagnoses
- If then, recommends the most appropriate evidence-based treatment
- Result...**... *early, accurate diagnosis and treatment*

- Early, accurate diagnosis and treatment result in:
 - o Reduction in Chronic Discomfort
 - o Reduced Hospitalizations
 - o Reduced waiting
 - Result...**... *reduced costs*

- CDS is an evidence-based knowledge system that provides the platform for continuous software updates with Artificial Intelligence (AI) -system "learning"
- Physician profiles allow a continuous evaluation for improvement
- Patient healthcare visits, treat the healthcare history
- Result...**... *cost savings, "data analytics"... including performance analysis of the Physician, and analysis of patient results.*

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Preparing for AI: The Impact of Clean Data

Harvard Business Review

bad data is costing your company money--- weakens decision making--- wastes time

[Harvard Business Review study](#)
cost of bad data --- the "rule of ten" "it costs ten times as much to complete a unit of work (medical care) when the data are flawed in any way as it does when they are perfect."
eliminating a single root cause can prevent thousands of future errors,

32

Economic Value of Rotator Cuff Repair --- \$77,662 for a 40 Y/o person
JBS Nov 2013

For 90 Days pre-op --- costs of \$ 2748 to \$3750
... 13% Injections, 18% Physician visits, 28.5% PT, 5% pre op labs
Journal Shoulder-- Dec 2013

Post Op--- ODG--- 24 Physical Therapy visits

If Surgery performed within 3-4 weeks of Injury... 38% full duty @ 7.6 months --- (30% earlier) ---
Arthroscopy 2010

Early Surgery ... 30 day return to work and reduced work absence costs and decreased time off work (3.9 months vs 10.1 months)
Occupational Medicine 2011 Indiana Ortho Journal, 2014

Early Surgery... (w/in 3-4 weeks) less pain, greater ROM, fewer re-tears
Journal Sports Trauma 2011 Journal Shoulder and Elbow 2017

Early Surgery (3-4 weeks)

Advantages

Advantages

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Our Results..

"our success has been phenomenal. ..."claims costs decreased by nearly the same (75%) percentage"

34

A look at CDS... an AI software system that reduces mis-diagnosis

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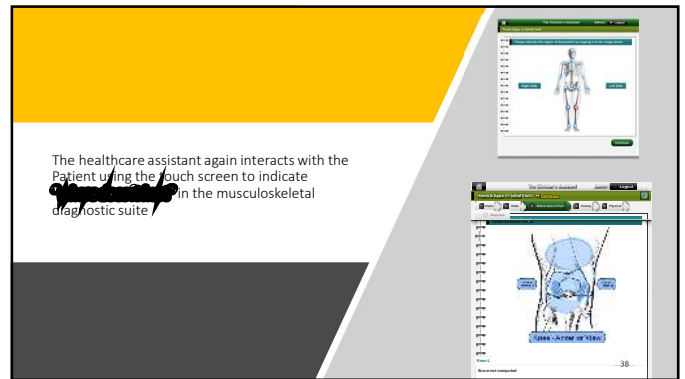
The Patient Encounter begins by gathering an administrative and medical history... by the Med. Assistant

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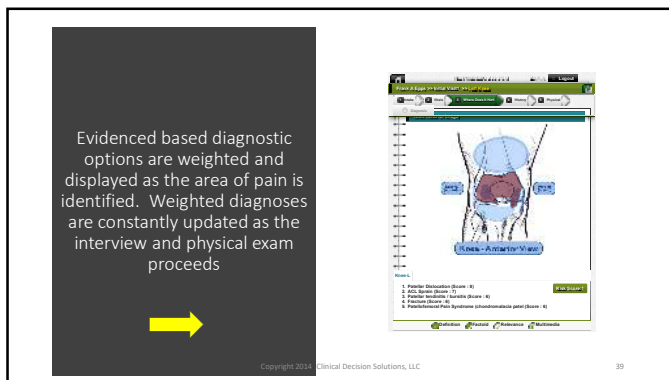
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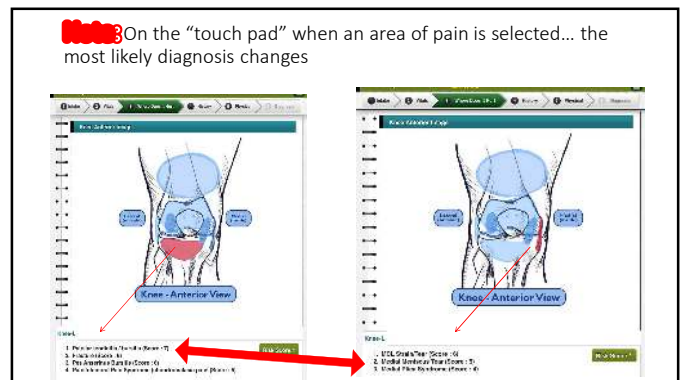
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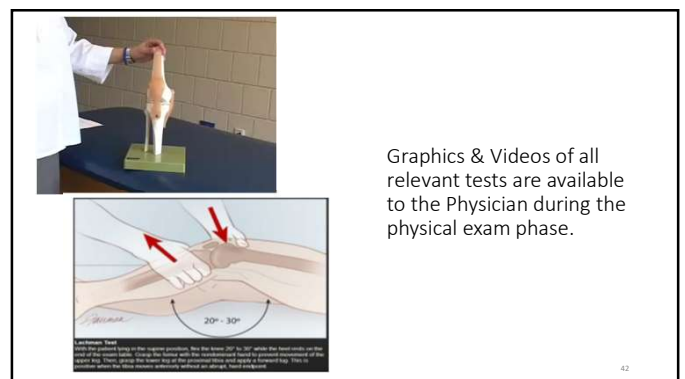
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The Physician has the option of choosing a pre-determined diagnosis or overriding the program with his/her own diagnosis

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A Evidence-based *Plan of Care* is prescribed for the patient that accessible to the patient, therapist and caregiver online

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Patient education videos are provided for review between the health care assistant and the patient while at the clinic and are also available on-line for the patient.

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The Results...

Improved Accuracy of Diagnosis	Increased use of Evidence-based Treatment	Reduced Cost of Care— Truly a P4P platform	Produces the first— AI—Data Driven Care network
Encourages Early / Safe Return to Work	Provides the ability to monitor the care provided by MD's, NP's, and PA's	Allows Physician to see and treat more patients (56% increase in total patient encounters over 3 years)	Improves injured worker satisfaction with care (increased MD-Patient interactions)

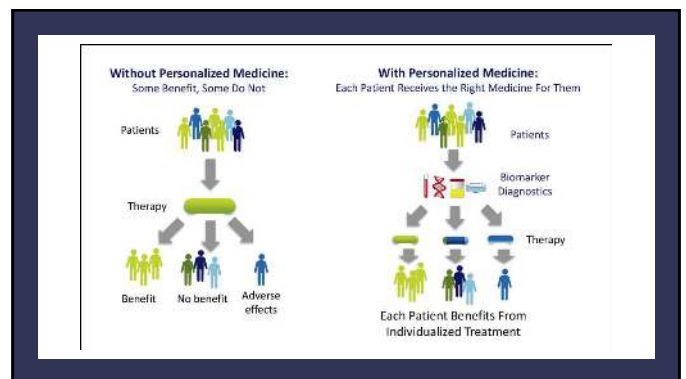
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\$5 billion
Estimated annual cost of wasted prescription drugs in the US.

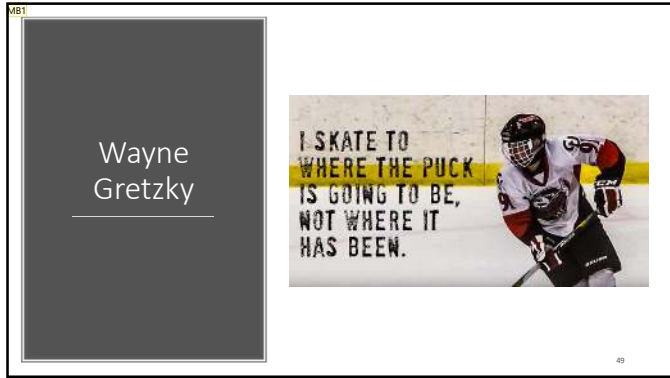
\$3 billion
Estimated cost of wasted hospital cancer drugs.

THE FUTURE OF PERSONALIZED MEDICINE

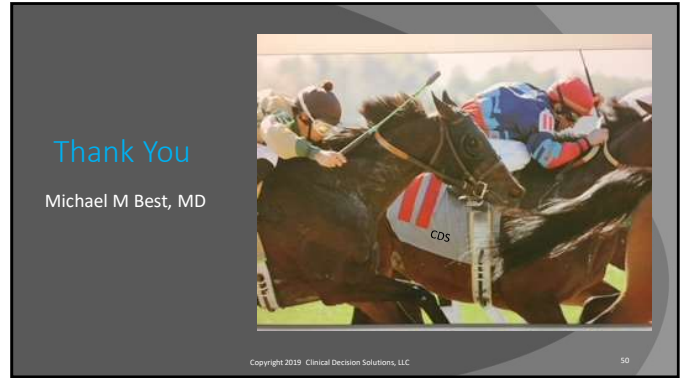
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