The Diagnostic Management Team:
Past, Present and Future

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I have no conflicts of interest.

Patients Commonly Have No Idea When:

- **They are managed by a non-expert who seeks no input from colleagues**

- **If their time to diagnosis was delayed or their diagnosis was missed completely due to the lack of diagnostic expertise**

The evidence for these conclusions is that 1 in 5 Americans believe they have been a victim of a diagnostic error, but in fact, every virtually every adult in the US has been a victim of at least one

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Why is Choosing Tests so Difficult?

- **Physical Examination: Fewer than 50 things to note**
- **Imaging Studies: Fewer than 50 tests**
- **Microscopic Evaluations: Fewer than 50 tests**
- **Clinical Laboratory Tests: Greater than 5000 tests**

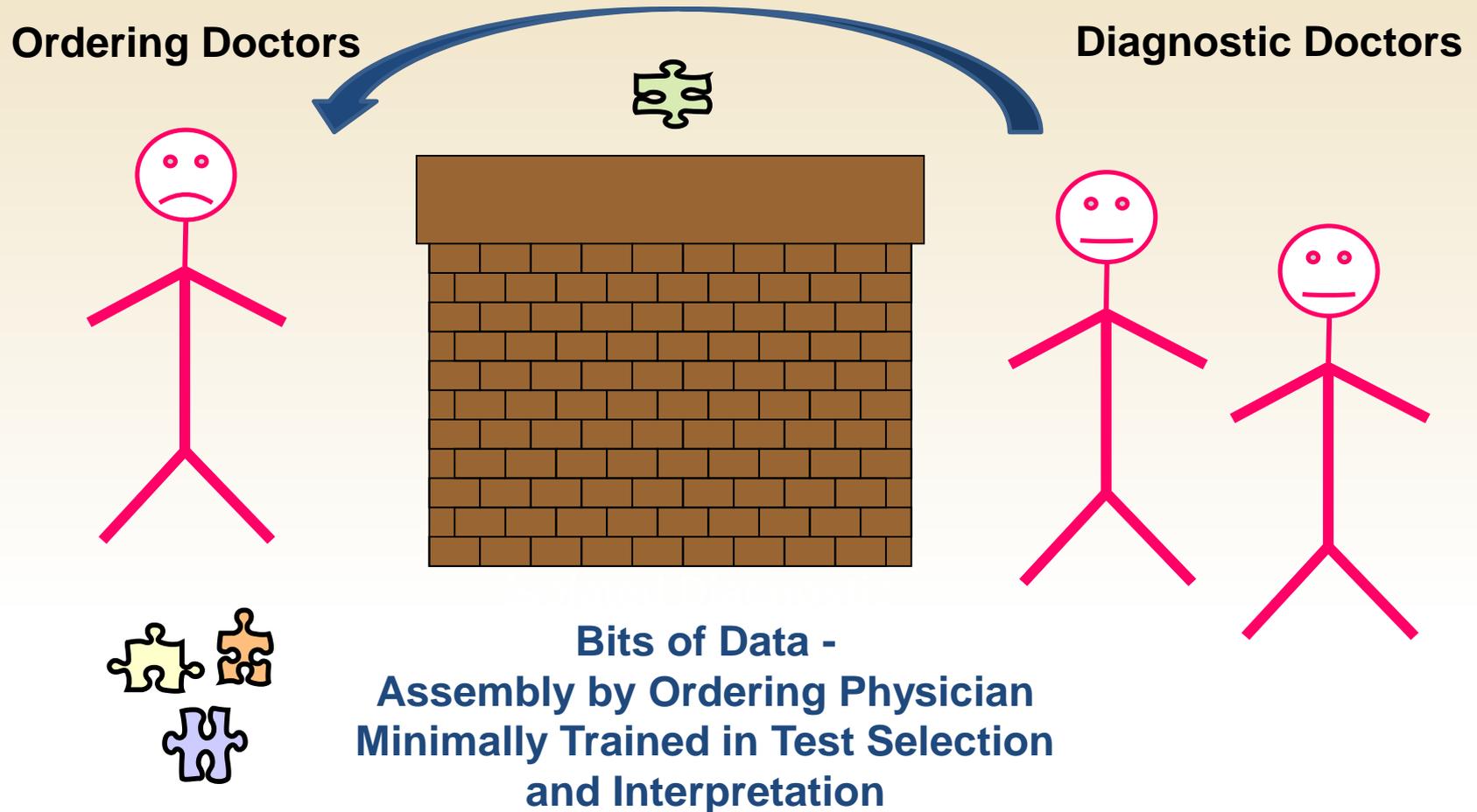# In 2014 it was Estimated that US Doctors are:

- **Unsure of correct tests to order for <u>27 million patient visits</u>**

- **Unsure of proper interpretation of test results for <u>15 million patient visits</u>**

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Basic Concept of a Diagnostic Management Team

Instead of "throwing test results over the wall to treating physicians"

The DMT puts together the diagnostic puzzle and generates a diagnosis or short list of diagnostic options and provides the information to the treating healthcare provider
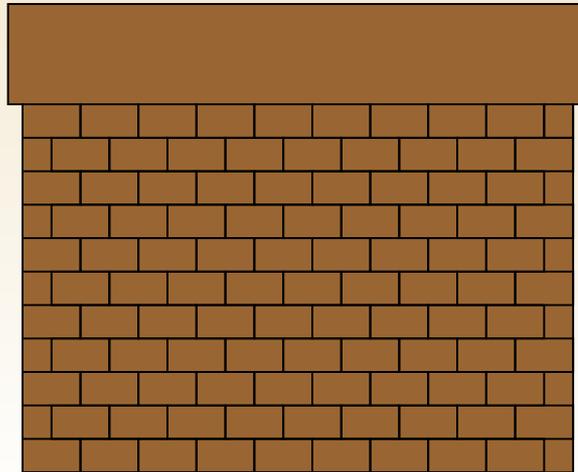
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Conventional Approach

Ordering Doctors
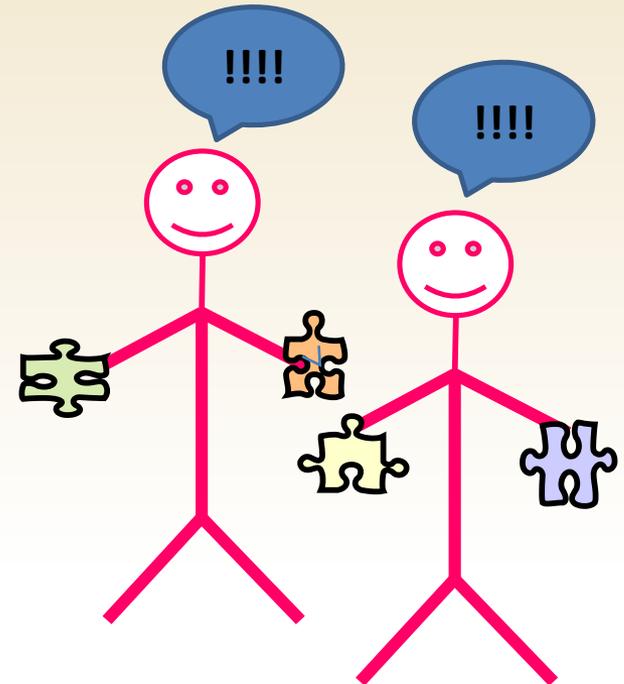
Diagnostic Doctors

**Bits of Data -
Assembly by Ordering Physician
Minimally Trained in Test Selection
and Interpretation**

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Diagnostic Management Team Approach

Diagnostic Management Team Approach
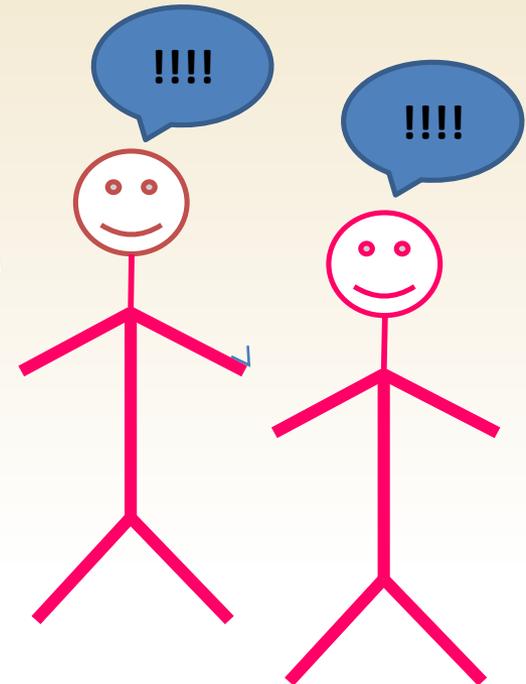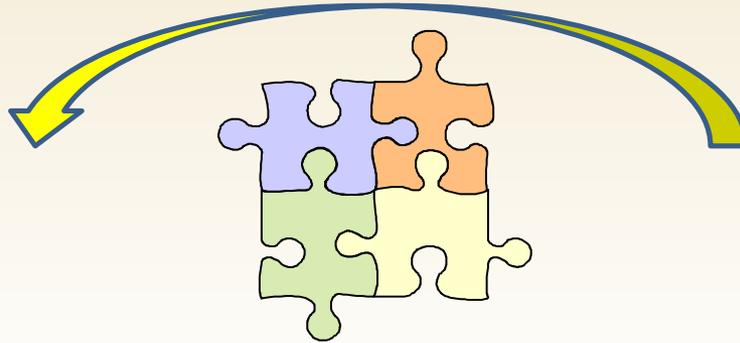
Instead of providing information that is a set of numbers, difficult to understand abbreviations of test names, or simple "positive" or "negative" answers, an understandable narrative report is delivered

Data Presentation in the Medical Record for Coagulation Studies Prior to Initiation of the Patient-specific, Expert-driven Coagulation Interpretations

JUNE 30, 2010

Pat-PT: 13.9   PT-inr: 1.1   PTT-pt: 43.6*   PoolNP: 28.1   P+N0Hr: 38.3   P+N1Hr: 36.2   P+N2Hr: 35.9   Pat-TT: 15   F8Act: 95   F9Act: 102   RVVT: 1.5*   DRVVT: Lupus Anticoagulant Confirmed   DMX: 1.3   F11Act: 96   F12Act: 54

Report in the Medical Record <u>After</u> Initiation of the Daily Rounds to Interpret All Complex Evaluations from the Special Coagulation Laboratory

JULY 1, 2010

This patient has an elevated PTT, with a normal PT/INR and normal thrombin time.

A PTT mixing study failed to correct into the normal range. These results were consistent with the presence of an inhibitor (such as a lupus anticoagulant) in the sample.

The Dilute Russell Viper Venom time (dRVVT) is used for detection of Lupus Anticoagulant, and the test was positive, indicating the presence of Lupus Anticoagulant.

Taken together, this is a patient with a prolonged PTT based upon the presence of a lupus anticoagulant. There is no increased bleeding risk in this patient, despite the prolonged PTT.

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News in the public domain and medical community has identified medical error (250,000 deaths per year in the US),

which includes the subset of diagnostic error (64,000 deaths annually in the US) as the third leading cause of death in the US

THE WALL STREET JOURNAL.

EATING & DRINKING
Pho Recipes That Think Outside the Bowl

RUMBLE SEAT
Ford F-150 Raptor Review: A …

DESIGN & DECORATION
Maison & Objet 2017: Best in Show from Paris …

ADVENTURE &
China's
West: A Soph
Traveler's G

JOURNAL REPORTS: HEALTH CARE

The Biggest Mistake Doctors Make

Misdiagnoses are harmful and costly. But they're often preventable.

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https://www.wsj.com/articles/SB1000142
4052702304402104579151232421802264

OPINION | COMMENTARY

How to Make Hospitals Less Deadly

Doctors' errors annually kill hundreds of thousands of Americans. Here are five reforms that would bring down the death toll.

Why does a DMT reduce medical error?

Because it reduces delayed and missed diagnoses by bringing experts to a case

Javier Larrea—Getty Images/age fotostock RM

MEDICINE

Your Doctor Likely Orders More Tests Than You Actually Need

Alice Park
Mar 23, 2015

When you're rushed to an emergency room, the doctors immediately order a battery of tests to figure out what's wrong. But while scans and blood draws can tell them an incredible amount about what's ailing you and the best treatment you should get, study after study shows that all of this testing isn't actually leading to better care. Now, a new survey of emergency room doctors suggests why.

Of the 435 ER physicians asked about the tests they order for their patients, more than 85% admitted that in general, they call for too many tests, even if they know the results won't really help them decide how to treat their patients. Reporting in the journal *Academic Emergency Medicine*, the authors also say that nearly all of the doctors—97%—admitted to personally ordering unnecessary imaging tests.

http://time.com/3754900/doctors-unnecessary-tests/

Why does a DMT save money?

Because experts minimize overutilization and underutilization of diagnostic tests and reach a definitive diagnosis sooner with fewer studies

The US Spends Approximately $2.5 trillion Annually on Healthcare and the Waste in about 30%

Spent

Waste

$2-3 trillion

$800-900 billion
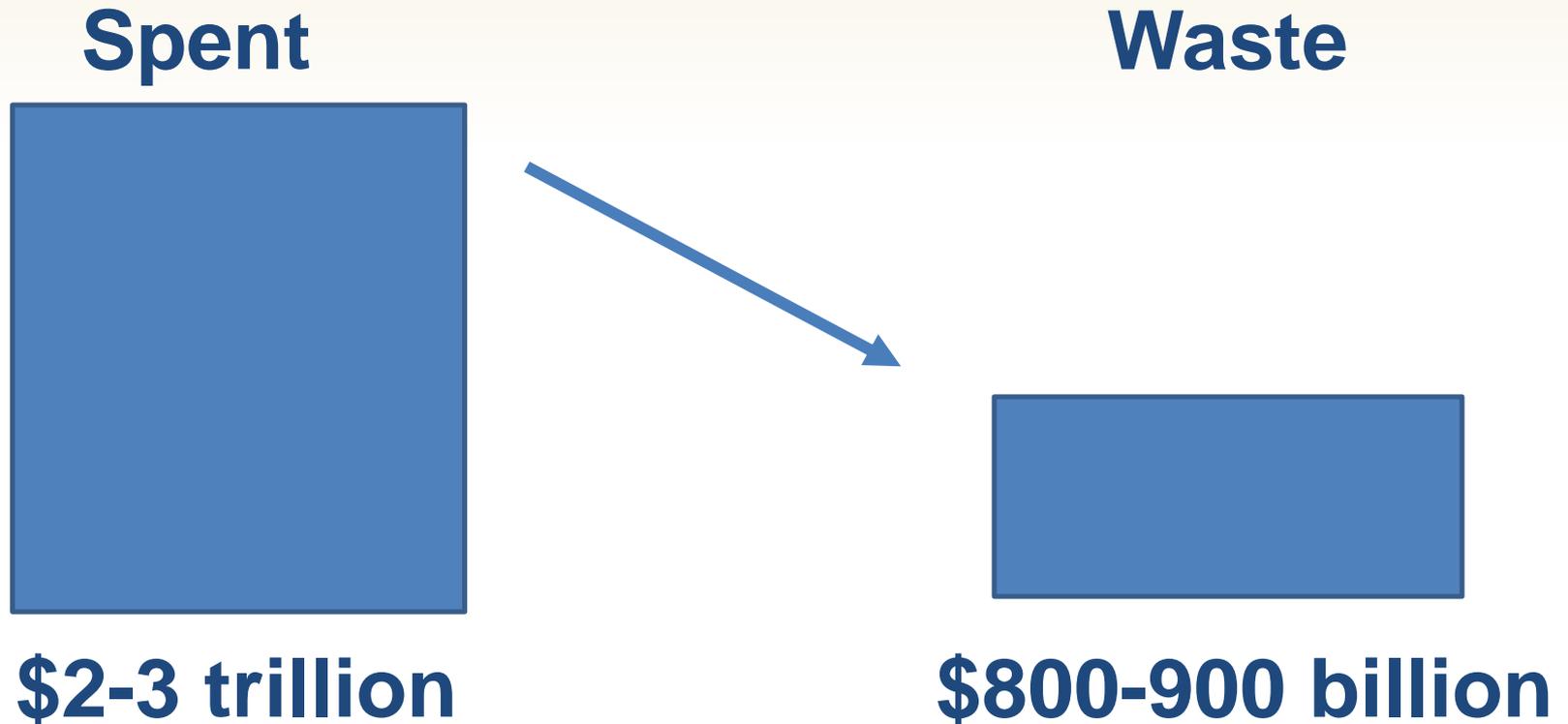
NIH Budget to Fund Discoveries to Cure Major Diseases in Our Society: $40 billion

$30 billion

$120 billion

Faster to
New Cures
$ Treatment

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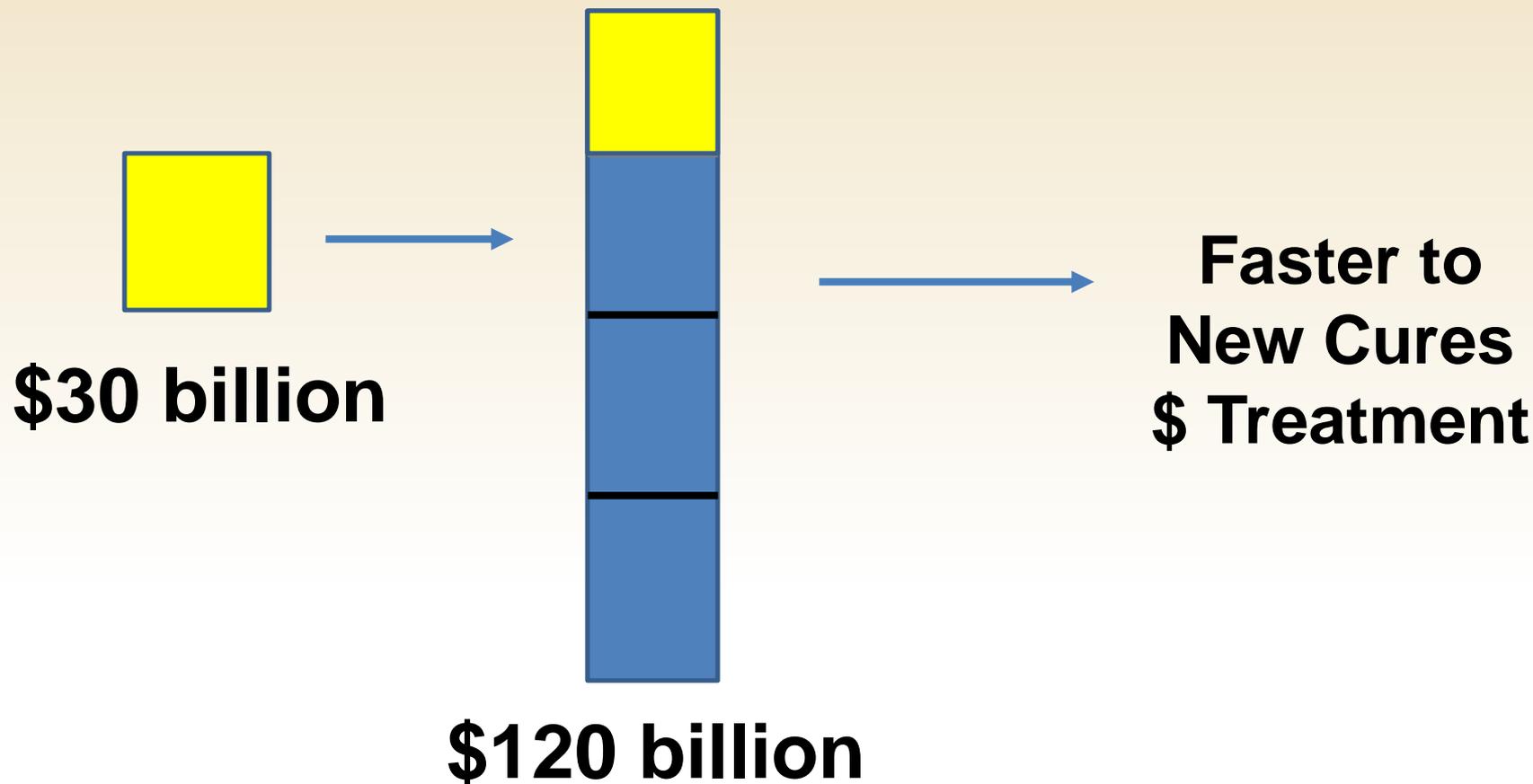
Definitions and Attributes

Diagnostic Management Team

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Official Definition: Diagnostic Management Team (DMT)

Unless <u>all</u> four of the following are met, a group <u>cannot</u> be designated as a DMT

1. **Team must meet frequently and regularly and provide patient specific reports with no request required to provide an interpretation**

2. **Report must be delivered before or during the time when treatment decisions are made**

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Official Definition: Diagnostic Management Team (DMT)

Unless <u>all</u> four of the following are met, a group <u>cannot</u> be designated as a DMT

3. Report must consider the clinical context in which the diagnostic tests are ordered, and attempt to synthesize all relevant diagnostic test results

4. Report must be entered into the patient's medical record

Is It a Diagnostic Management Team Activity or Just a Case Conference?

A True DMT

All Current Cases Discussed & Have a Narrative Interpretation Generated & Entered in Patient's Record

$\longrightarrow$

All Cases Discussed with Charted Narratives & Optimized Test Selection with Continuous Enhancement

All Cases Discussed with Narratives in Chart and Optimized Test Selection in Place

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Goals of a DMT

**Involve diagnostic experts
with high-level content knowledge to:**

- **Shorten the time to diagnosis**

- **Increase the accuracy of diagnosis**

- **Optimize the utilization of laboratory tests**

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Members of a DMT

The experts may have general training in different clinical areas

Such as medicine, critical care, pathology, or clinical chemistry

But each member must have specialized knowledge in the focused area of a particular DMT

With the public concern published to date, the problems of medical and diagnostic errors, and poor utilization of diagnostic error have been prominently identified

What has emerged
as a solution in the US?

SMALL STEPS WITHOUT
A MAJOR CHANGE
TO MEDICAL PRACTICE

Identified Obstacles to DMT Creation:

Roadmap to Institute Improved Care at Lower Cost

Problem #1: Not Enough Experts?

- **The problem specific to the US is the inordinate financial incentive for pathologists to perform only surgical pathology and cytopathology**

- **Today, there are few "true" pathologist experts in the US in laboratory medicine knowledgeable enough to lead a DMT**

**Because of this, there are simply not enough pathologists, even in many academic medical centers,
to form DMTs**

There must be at least two leaders in an individual service line to provide DMT services on a daily basis, due to vacations and travel

Many reasons have been offered as to why pathologists and non-MD laboratory experts do not want to create and lead DMTs

Why Lab Leaders Do Not Start a DMT?

1. Not comfortable making a final diagnosis

2. Unwilling to accept call on nights and weekends

3. Worry about loss of court case as a non-expert

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Why Lab Leaders Do Not Start a DMT?

4. Would limit my research program

5. Would not be compensated

6. My personality is not suited to comfortable communication with treating physicians

Can Non-MD Experts Lead a DMT?

- **A major problem is that non-MD experts feel uncertain about their knowledge of clinical medicine**

- **The perception by non-MDs that MD experts have in-depth knowledge into all clinical presentations and all diagnostic procedures is incorrect**

- **Expert level information can be learned by non-MDs in a matter of months, and then as more cases are encountered, the expertise grows**

The Doctorate in Clinical Laboratory Science (DCLS) students have a curriculum that exposes them to virtually <u>all</u> of these diagnostic areas

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Competence Development in Different Diagnostic Areas

Chemistry Fellowship vs. Doctorate in Clinical Laboratory Science

Chem
Coag
Heme
Micro
Blood Bank
Radiol
Anat Path
Cardio/Pulm
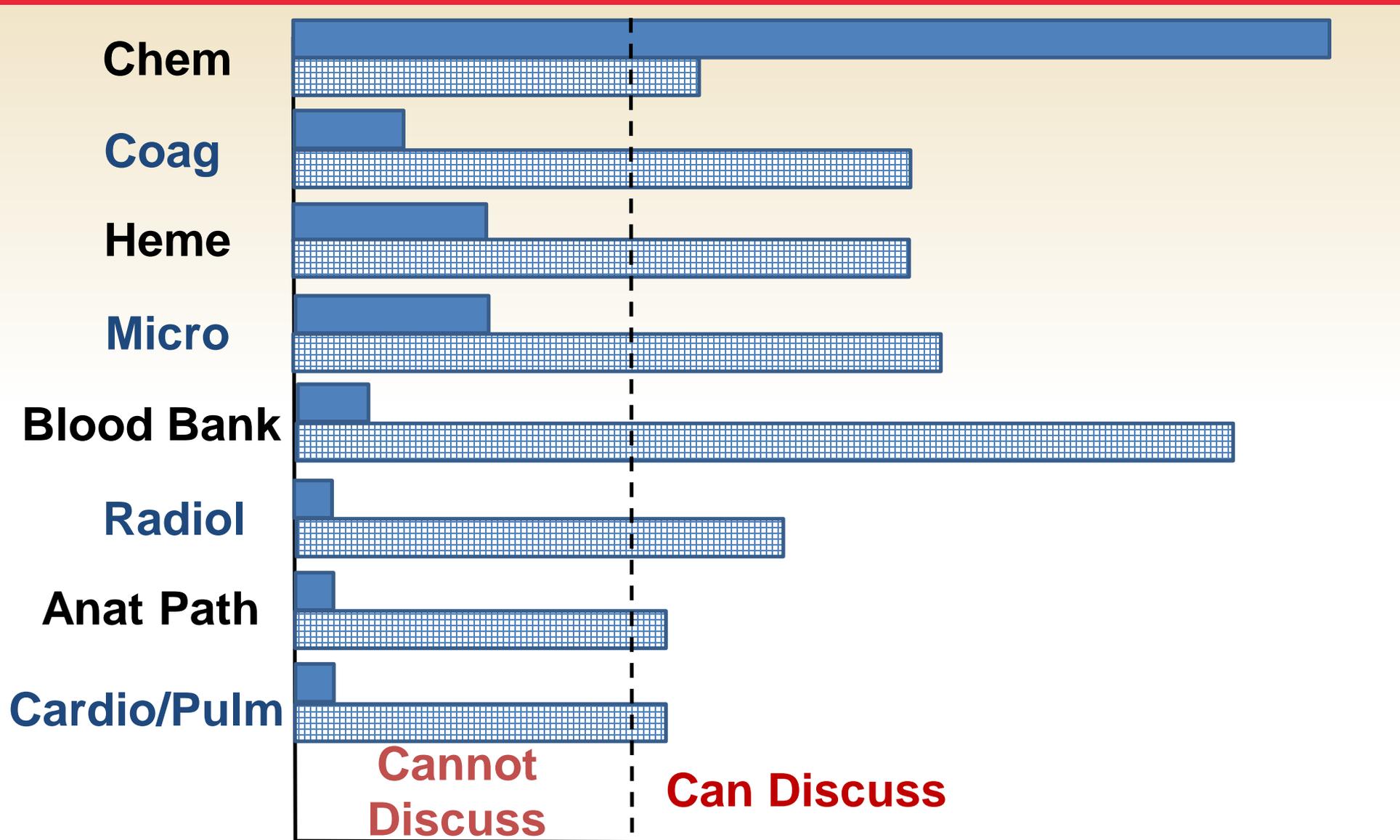
Cannot Discuss

Can Discuss

Chemistry Fellowship

DCLS Training

DCLS Curriculum Includes

- **DMT experience in Coagulation, Anemia, Autoimmunity, Transfusion Medicine, Microbiology, and Liver Disease**

- **Patient rounds on clinical units in Internal Medicine, Gynecology, and Surgical Intensive Care**

Financial Comparison

Clinical Chemistry Fellowship:
- **Funded by hospital or other faculty funds**
- **Limited support for salary for fellows**
- **20-30 graduates per year**

DCLS Degree:
- **Funded by students paying tuition**
- **Revenue for institution from students**
- **Expect hundreds of graduates per year**

DMTs in Development by DCLS Students at UTMB

Toxicology/Opioid Management

Autoimmunity

Cardiovascular/Lipids

Hematology/Anemia

Anticoagulant Management in a Rural Setting

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One Solution if Pathologists Represent Most of the DMT Leaders

Combine experts within different hospitals in a healthcare enterprise

OR

Utilize a regional DMT, yet to be formed, similar to send-out testing

One Plan is to Create Regional or National Diagnostic Management Teams,

with Experts Passing a Certifying Exam, Independent of Doctoral Degree

The Number of DMTs in an Institution is Unrelated to Its Size

	Relative Size (1-10)	Number of DMTs by Topic
Massachusetts General Hospital	10	3
Vanderbilt	5	5
U Texas Galveston (UTMB)	3	6

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An Example of Service Coverage

	Location	Accepted # of Cases/Day	Days of the Week
Expert A	TX	10	Mon-Tue
Expert B	MA	5	Wed-Fri
Experts C-X	Anywhere	5-10	Any day

## 5 to 10 experts per team for one clinical area

There are multiple DMTs in institutions where Laboratory Directors are expected to lead a DMT within their self-identified expertise
AS PART OF THE JOB

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Problem #1: Proposed Solution

Traditional Health System Service Delivery
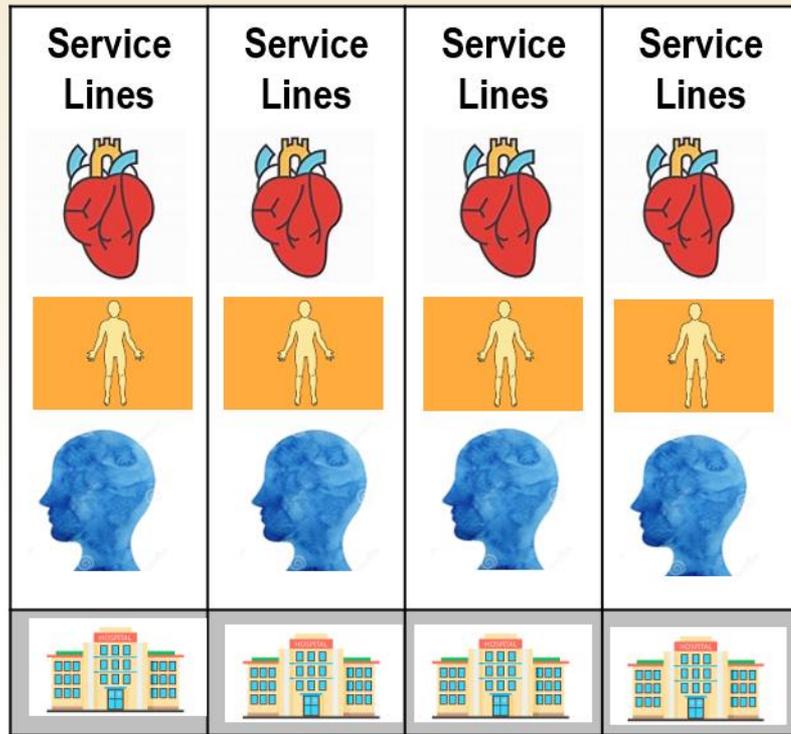
Transformative Health System Diagnostics Delivery

Coordinated Standardized DMTs across the health system
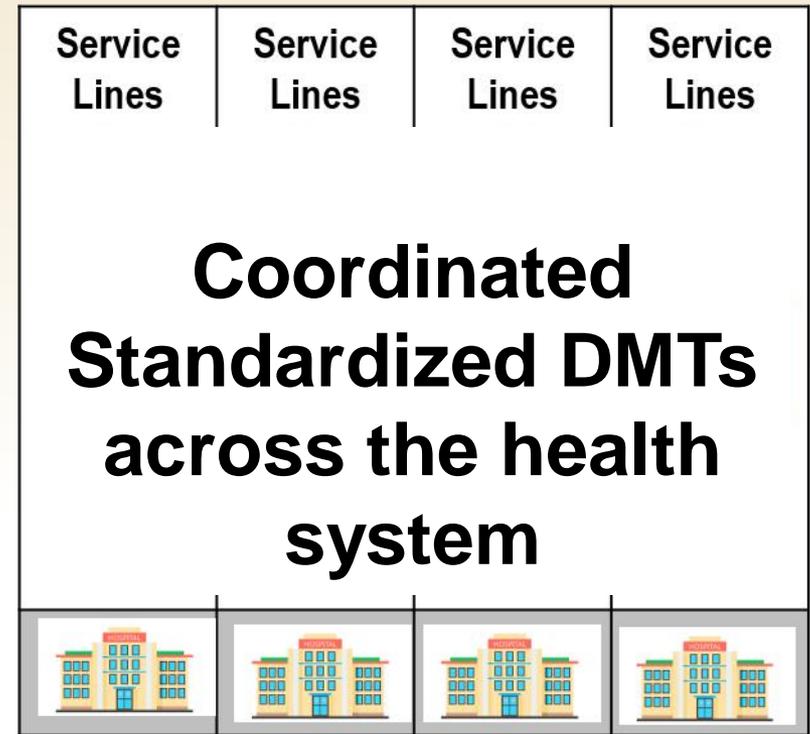
Cardiology   Musculoskeletal   Neurosciences   Hospital

Payment for

DMT Activity

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Payment Options for DMT Services

- **Insurance**

- **Fee for Service**

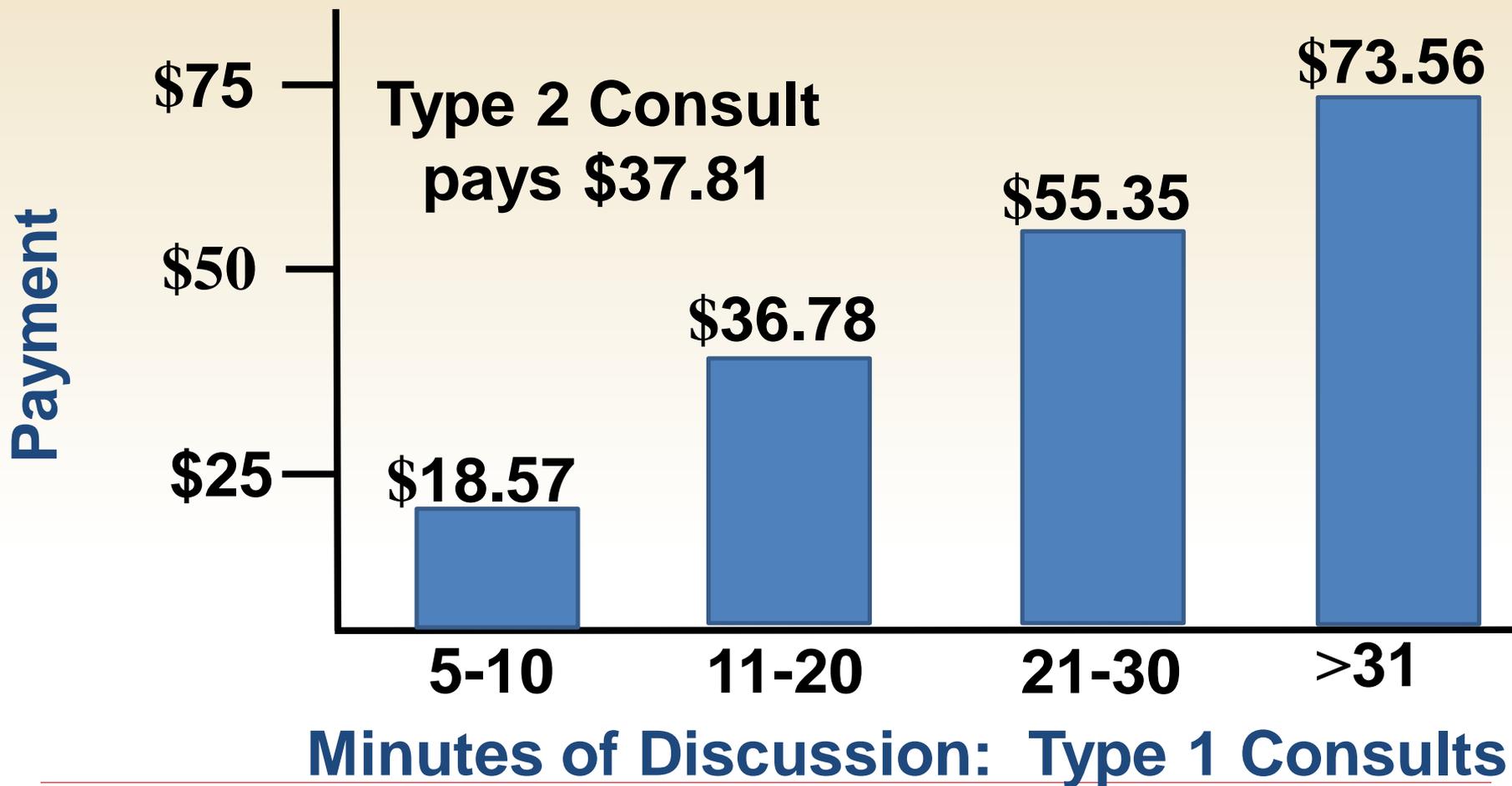- **Contract with an Institution or Pathology Practice**

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Internet Consultation

**Only MD billing,
but non-MD participation
likely in many cases**

Type 1:

- **≥ 50% of time discussing case with provider**
- **Longer call: Higher payment**
- **Medicare pays for these services and has billing codes**

Payment for Internet Consultations

Payment

- $75
- $50
- $25

Type 2 Consult pays $37.81

$18.57 — 5-10
$36.78 — 11-20
$55.35 — 21-30
$73.56 — >31

Minutes of Discussion: Type 1 Consults

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Internet Consultation

Type 2:

- **≥ 50% of time reviewing records**
- **Brief conversation with provider**
- **Medicare pays for these services and has billing codes**

Internet Consultation

Introductory paragraph in note from consultant indicates:

- **Verbal/written request was made**
- **Time spent discussing case and/or reviewing records**
- **Comment that patient has given verbal consent to internet consultation**

Telemedicine via Internet for Direct Healthcare Providers

- **Diagnoses may be simple (strep throat) or complex**
- **Not a consultation with a specialist; Not an "internet consultation"**
- **Use is high in rural areas with no physicians**

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Is Fee-for-Service an Option?

The payment for a DMT could resemble payment for a send-out test to a commercial lab

Except the analysis for payment is an interpretation of already existing laboratory results

Is Fee-for-Service an Option?

When a request for payment is made to a regional or national DMT, payment must be provided for the service to be rendered

Create a Contract with an Institution or Pathology Practice?

- **A pathology practice with 1 to X pathologists prefers to perform surgical pathology and cytopathology exclusively**

- **The practice chooses <u>NOT</u> to hire an MD or PhD in Laboratory Medicine to cover clinical laboratory issues**

- **The practice may or may not have its own clinical laboratory**

Contracts with Pathology Practice

- **A large pathology group can use DMT experts outside their group who have specialized knowledge in many areas**

- **The practice negotiates a fee, possibly different for simple vs. complex cases, with the outside DMT**

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Problem #2: Proposed Solution

Payment for optimized test selection and improved speed and accuracy of a diagnosis must be reimbursed, independent of the degree of the expert, incentivize experts to perform this critical task

Is it the hospitals? Insurance companies?

A new payment mechanism must be identified

Problem #3: Savings Impact is Greater than Revenue Impact

The DMT Impacts Savings Much More Than Revenue

and

No Credit is Offered by Most Healthcare Institutions for Saving Money

Only for Generating Revenue

Overutilization and Underutilization Worsens When it is Not Managed <u>By Experts</u>

Unnecessary lab tests ordered are largely performed without questioning the ordering provider,

Minimizing interest of ordering physicians to optimize test orders

And lab directors typically manage utilization as selected projects

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How Much Does Overutilization of Laboratory Tests Cost

X — **Unnecessary Cost for a Test Not Needed (personnel costs substantial)**

Y — **Cost to further evaluate an unnecessary test with abnormal result**

X + Y — **Potential Savings with No Overutilization**

Y >> X — **And Quantitation of Savings is Impossible**

Problem #3: Proposed Solution

Approximate range of savings with best estimates based upon known <u>expenses</u> (NOT charges) for diagnostic procedures and treatments

Problem #4: DMTs are Not Relevant to Anatomic Pathology Practice?

Why has there never been wide dissemination of DMTs that involve consideration of anatomic pathology findings alongside findings in radiology and genetic testing?

Pathologist-driven Data Integration from Multiple Areas of Testing is Essential

GI Biopsy

10 years ago	Now	5 years from now
Review Microscopically only	Microscopic Review Some Genetic Testing and Digital Scanning	Digital Scan of Biopsy Much Genetic Testing AI Role Increasing

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Starting Point Activities A/B/C Practiced

→

External Environment Changes Activities A/B/C done more efficiently using methods D/E/F
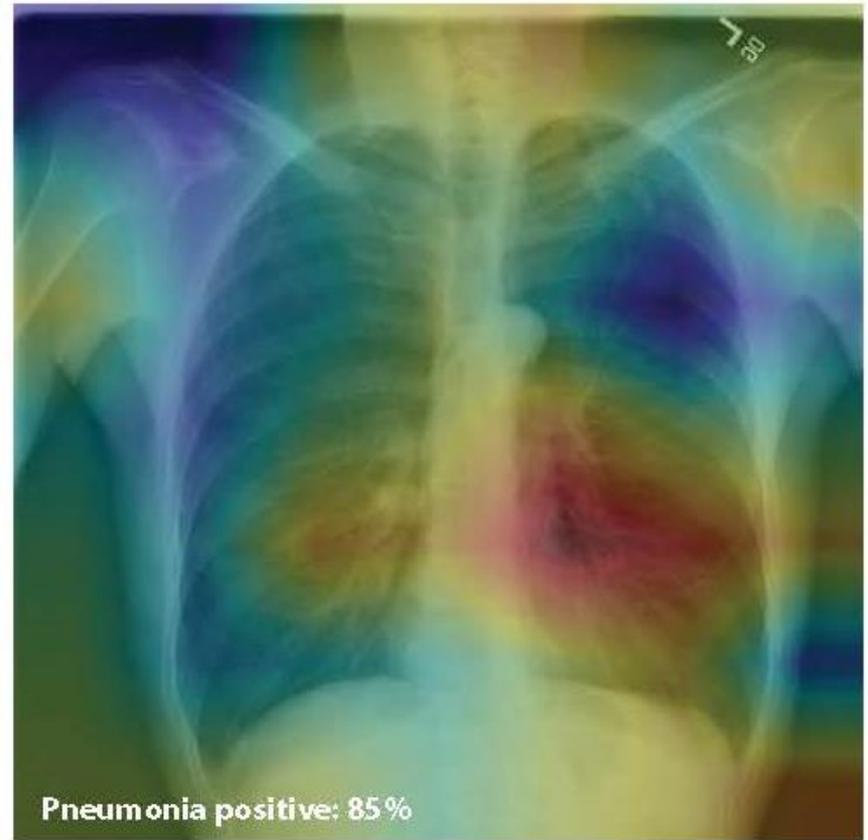
→ **Practitioner who learned activities D/E/F** successfully transitions to meet current needs

→ **Practitioner who does not learn practices D/E/F experiences loss of value**

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True for Virtually Every Profession

Especially Healthcare

Pneumonia positive: 85%

In this demonstration from the Stanford ML Group, researchers built a 121-layer convolutional neural network that inputs a chest X-ray image and outputs the probability of pneumonia along with a heatmap. After training on an NIH dataset, the CheXNet network was tasked with a new set of 420 Images. It outperformed four practicing Stanford University radiologists in diagnostic accuracy.

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Kwon S. Managed Care.
July/August 2019, pg. 18

Do This Thousands of Times:
Then Computer Knows It Is a Hepatoma

Electronic Image:
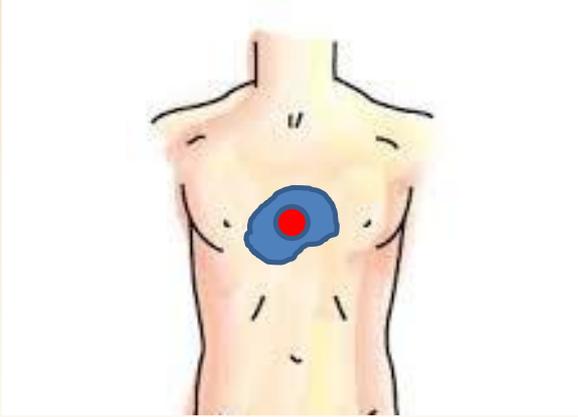
Features of the mass:
   Granularity
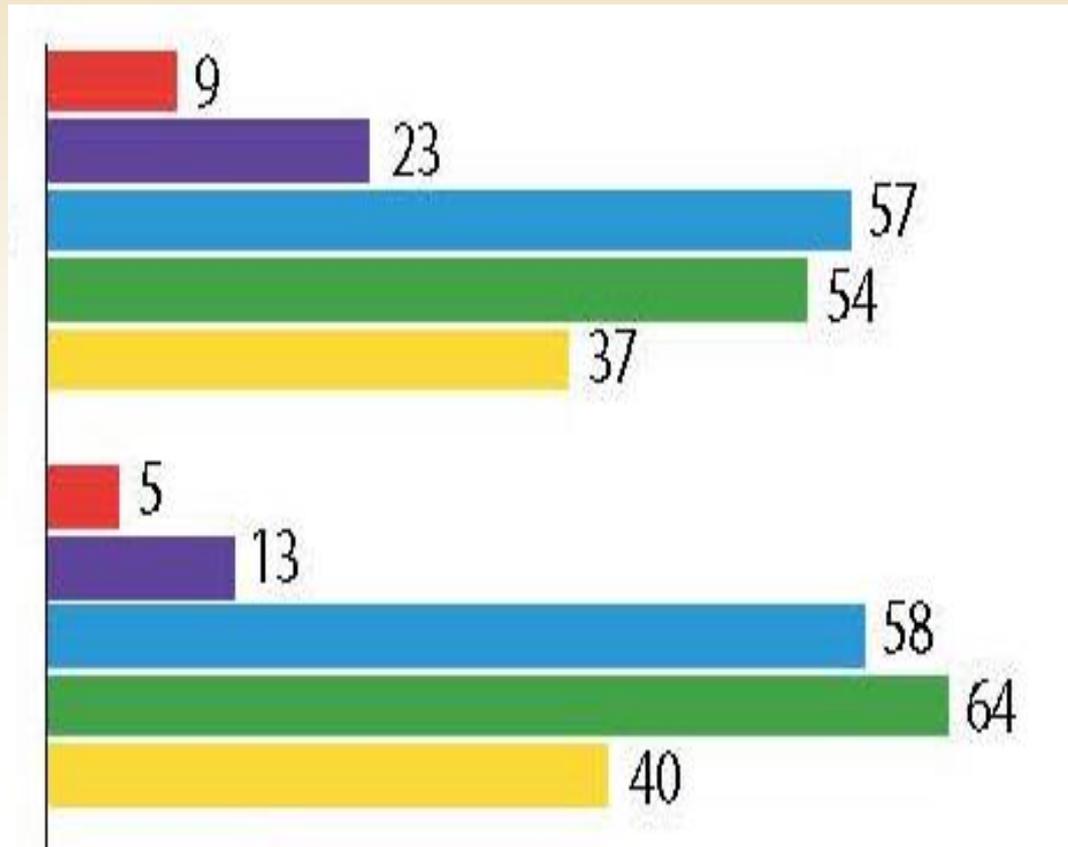   **Size**
   Shape
   Density

Electronic Report:

**Hepatoma,
Not hepatitis**

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Results of *Managed Care* Reader Survey on Health Care Innovations

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Artificial intelligence for diagnosis

# Artificial intelligence for screening

- 🟥 **Will never gain traction in health care industry**
- 🟪 **Will have limited usefulness in the health care industry**
- 🟦 **Good bet to catch on in the health care industry**
- 🟩 **Will enter the mainstream in the health care industry**
- 🟨 **Will be a game changer in the healthcare industry**

Image Review in Anatomic Pathology and Radiology is Changing Rapidly

What if Anatomic Pathology and Radiology integrated <u>all</u> diagnostic information for the treating physicians?
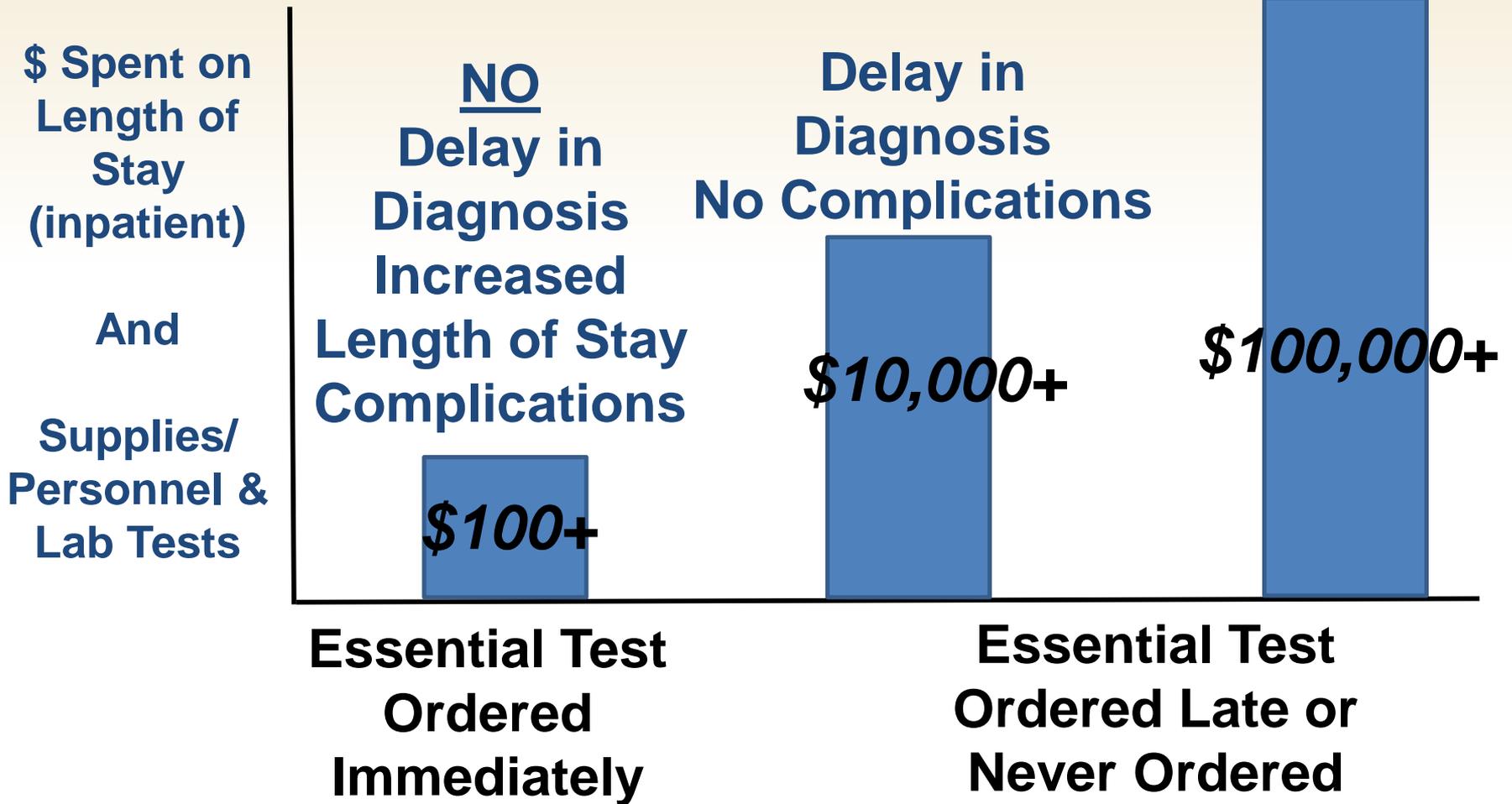
When You Are a Patient, Which One Do You Want?

Diagnosis *without* a DMT → **Non-experts Providing Most of the Care, Faced with Hundreds of Tests Unfamiliar to Them and with No One To Advise Them**
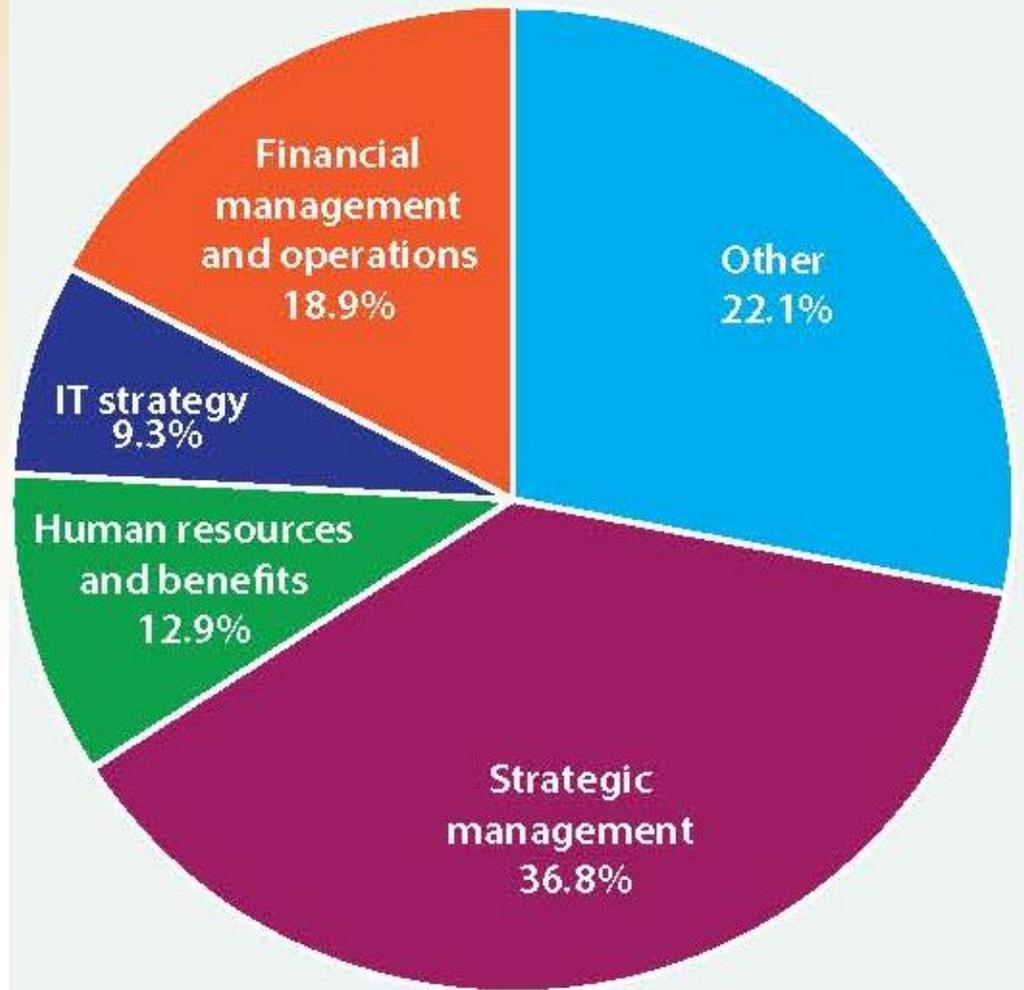
Diagnosis *with* a DMT → **Experts Directing Diagnostic Testing and Knowledgeably Interpreting Test Results**

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What Healthcare Consultants Consult About

Why not consult about how to optimize correct diagnoses?

Pie chart:
- Other 22.1%
- Strategic management 36.8%
- Human resources and benefits 12.9%
- IT strategy 9.3%
- Financial management and operations 18.9%

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Is the
External Environment Becoming More Conducive to
DMT Implementation Because Diagnostic Error information is now public knowledge?
Yes

Do doctors need consultations from DMTs now more than before?
Yes