



Clalit
Research
Institute

Data-driven care: Innovation in Practice

Prof. Ran Balicer MD, PhD, MPH

Director, Health Policy Planning, Clalit Healthcare Services, Israel

Director, Clalit Research Institute, Israel

Chair, Israel Society for Quality in Healthcare

Munich, February 2017

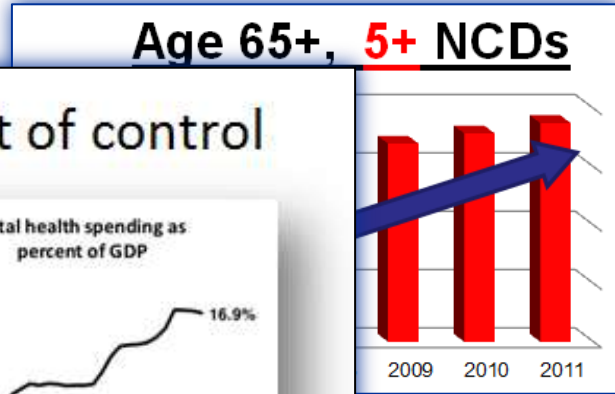
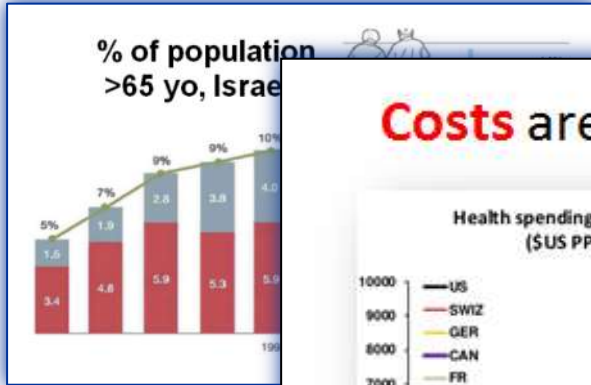
Where we are



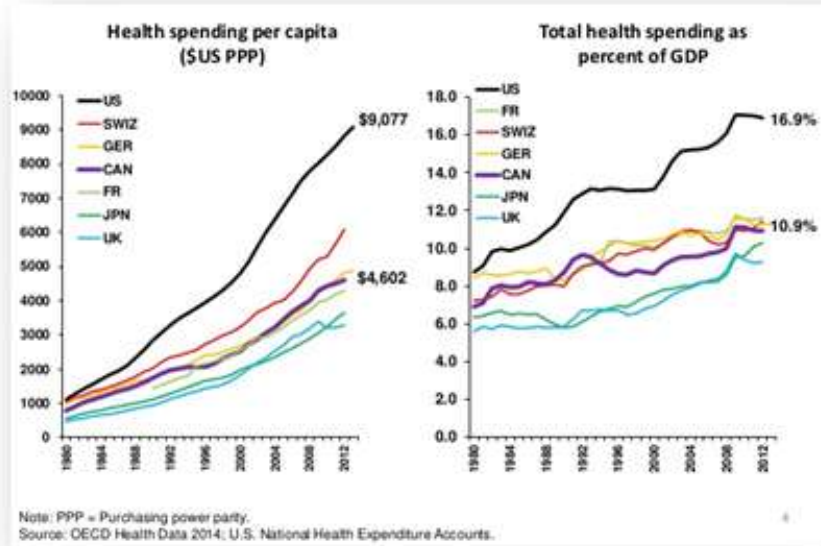
The resources vs. demand crisis

Our population grows **older**

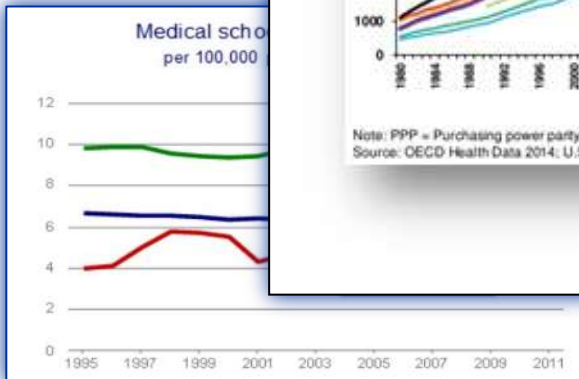
Chronic **multi-morbidity** ensues



Costs are spiraling out of control



Health prof
in **relativ**



**Expectations
increase**



The care quality crisis

**Great physicians + Good intentions
= excellent quality of care**



The care quality crisis

«At best, care is outstanding.
Often, care is sub-optimal to alarmingly poor.»

Dr. Donald Berwick



30%

**Healthcare errors:
cause of death**

#3

45%

**Of necessary
interventions
missed**

**Of care is futile,
no net value added**



Transformation is crucial

Work in silos

'Equal'

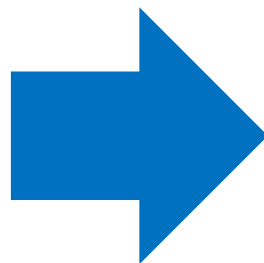
Therapeutic

Reactive

Paternalistic

Wasteful interventions

System-centered



Coordinated

Equitable

Preventive

Proactive

Engaging

RWE Based

Patient centered



Paradigm shift: Our vision



Smart use of data

= a requisite and driving force
for transforming care



Clalit Health Services: Israel's integrated Sick Fund

- » **Established 1911**
- » **53% market share - 4.2 million members**
 - Over-representing low SES, minorities, elderly
- » **All services under one 'roof'**
 - >1,500 clinics
 - 30% of Israel hospital beds
 - National leader in tele-care, online services



**Hospital inpatient, ED
and discharge data**

**Community primary
care clinic data**

Laboratory data

**Allied health services
data**

Disease registries

*Linked to
Ministry of
Health*

**National Cancer
registry**



**Administrative data
(costs)**

**Pharmacy,
medications data**

**Diagnostic and
imaging data**

*Linked to
national
database*



**Dental,
complementary
health services data**

**Socio-
demographic data**

Integrated data



**Decades of full life-span,
Cross-setting, ID-tagged,
Geo-coded, EMR-based
data on > 4M people**

*** Claims+EMR data, untainted by
financial upcoding drive (no DRG)**

Value in care: What actually works?



Are we providing futile care?

1



The NEW ENGLAND
JOURNAL of MEDICINE

What good are trials if the results aren't applicable to real-world patients and if, because of excessive expense, they can be used to answer only a tiny fraction of our important clinical questions?

Are we providing futile care?

1

Medscape Multispecialty ▾

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Pneumococcal Polysaccharide Vaccine: Efficacy Remains Controversial

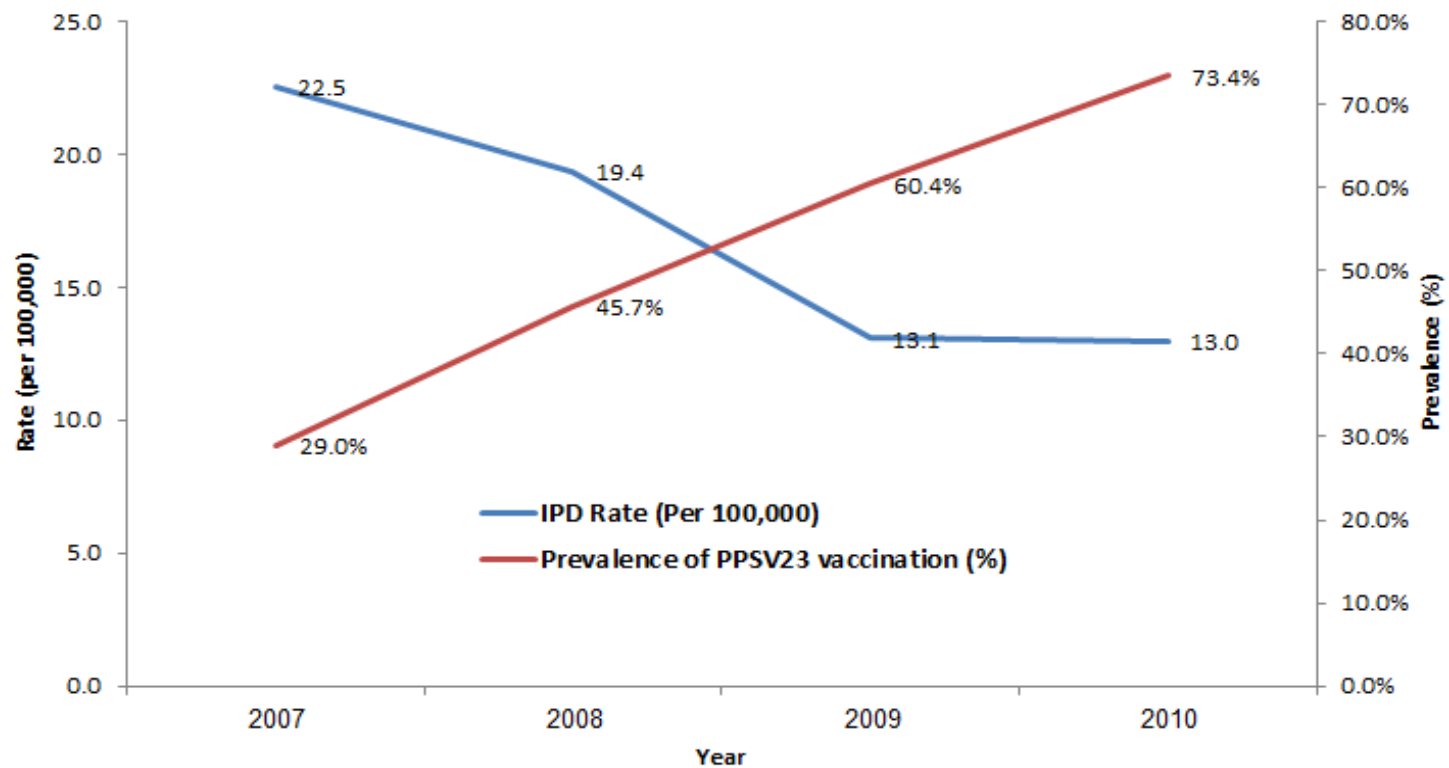
Allan S. Brett, MD

[Disclosures](#)



Determining treatment effectiveness

IPD rate (per 100,000) and prevalence (%) of PPSV vaccination in Clalit Members (65+ year old)



Policy Implications



Pneumococcal vaccination for older adults

Description: The percentage of individuals aged 65–71 years who received a pneumococcal vaccination.

Rationale: Improvement of pneumococcal vaccination coverage in older adults likely reduces morbidity and mortality that is caused by the *Pneumococcus* bacterium.

Denominator: Individuals aged 65–71 years

Numerator: The number of individuals in the denominator who received a pneumococcal vaccination once after age 65 years or within the past five years.

Comments: This indicator relates to the 23-valent formulation of the pneumococcal polysaccharide vaccine. The age range used for the present report (2008–2010) is a function of data availability.

National Program for Quality Indicators in Community Healthcare in Israel Report • 2008-2010

Pneumococcal vaccine targeting strategy for older adults: Customized risk profiling

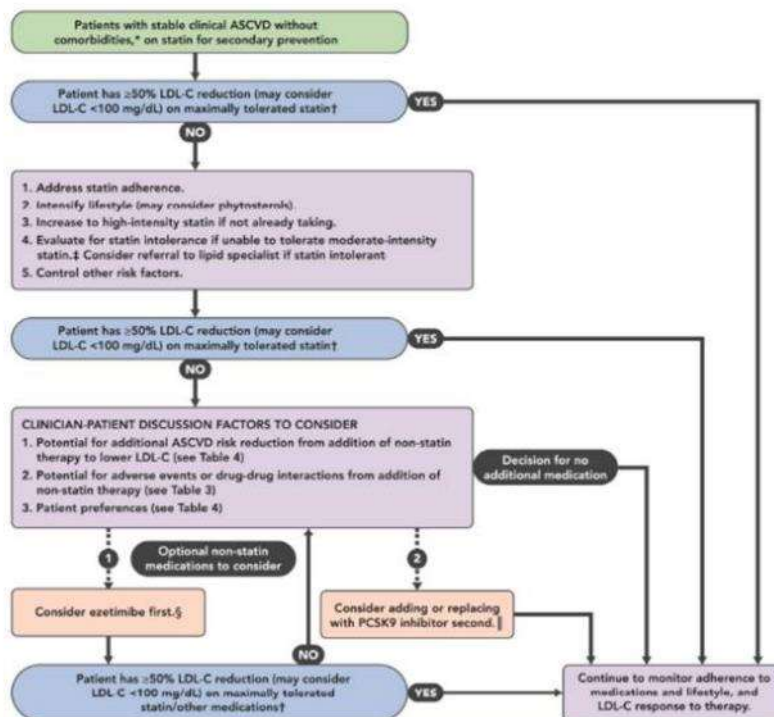
Ran D. Balicer^{a,b}, Chandra J. Cohen^a, Morton Leibowitz^a, Becca S. Feldman^a, Ilan Brufman^a,
Craig Roberts^c, Moshe Hoshen^a

Vaccination strategy		% of 50+ population targeted (n=526,717)	% of HTP cases in 2009-10 identified (n=10,423)	% of IPD cases in 2009-10 identified (n=90)	% of CTP cases in 2009-10 identified (n=4,603)
1	High and Moderate risk groups and all aged 65+	66% (347,008)	94% (9,818)	89% (80)	78% (3,572)
2	High and Moderate ACIP-based risk groups	51% (268,616)	83% (8,609)**	80% (72)	65% (2,980)*
3	Clalit model, 51% highest risk scores	51% (267,744)	85% (8,896)**	80% (72)	66% (3,045)*
4	ACIP-based highest risk group (Immunosuppressed)	17% (88,142)	35% (3,634) [†]	41% (37)	21% (971) [†]
5	Clalit model, 17% highest risk scores	17% (87,853)	54% (5,667) [†]	46% (41)	27% (1,246) [†]
6	Clalit model, 8.6% highest risk scores	8.6% (45,521)	35% (3,634)	31% (28)	15% (692)
7	Clalit model, 5% highest risk scores	5% (25,580)	23% (2,390)	18% (16)	9% (421)

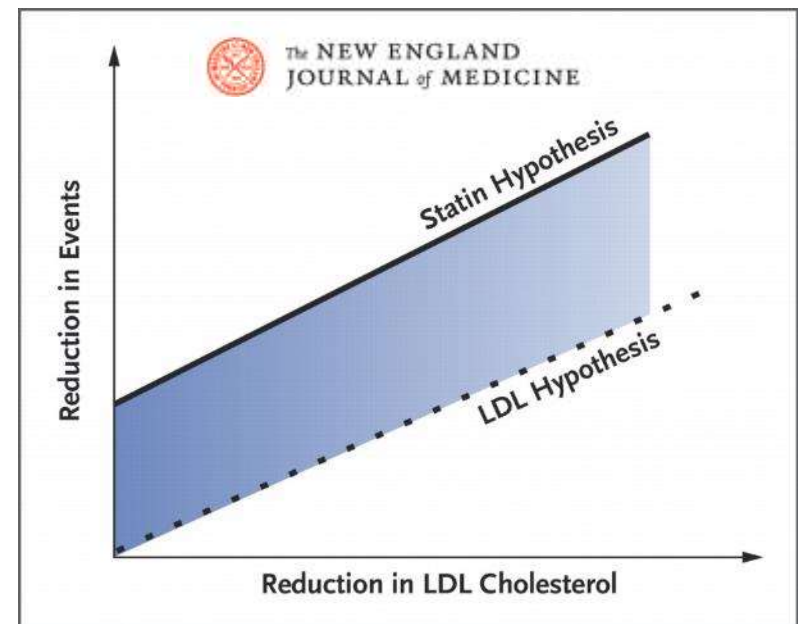
Determining treatment threshold

2

FIGURE 2A | Patients with Stable Clinical ASCVD without Comorbidities, on Statin for Secondary Prevention



LDL in high risk patients: “Lower is Better”?



Real-life Outcomes Research

JAMA Internal Medicine

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Original Investigation | June 20, 2016

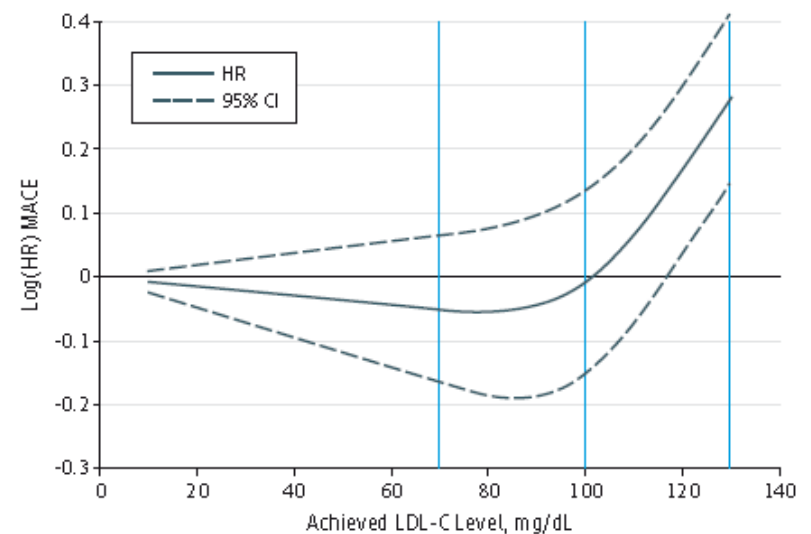
Association Between Achieved Low-Density Lipoprotein Levels and Major Adverse Cardiac Events in Patients With Stable Ischemic Heart Disease Taking Statin Treatment **ONLINE FIRST**

Morton Leibowitz, MD^{1,2}; Tomas Karpati, MD¹; Chandra J. Cohen-Stavi, MPA¹; Becca S. Feldman, ScD¹; Moshé Hoshen, PhD¹; Haim Bitterman, MD^{1,2}; Samy Suissa, PhD^{3,4}; Ran D. Balicer, MD, PhD^{1,7}

[\[+\] Author Affiliations](#)

JAMA Intern Med. Published online June 20, 2016. doi:10.1001/jamainternmed.2016.2751

Figure 2. Estimated Cubic Spline Transformation of the Association Between Achieved Low-Density Lipoprotein Cholesterol (LDL-C) Level and the Risk of Major Adverse Cardiac Events (MACEs)



Vertical dotted lines separate index LDL-C groups (low, ≤ 70.0 mg/dL; moderate, 70.1-100.0 mg/dL; high, 100.1-130.0 mg/dL). HR indicates hazard ratio.

Controlling the public message

THE Sun

HOME

FOOTBALL

SPORT

TV & SHOWBIZ

LIVING

PILL-OCKS Statins are **USELESS** at preventing more heart attacks in recovering patients, say boffins

Doubts over effectiveness of pills taken by eight million Brits every day

BY PAT HARRIS
SHARE NOW

21st June 2016, 1:20 am

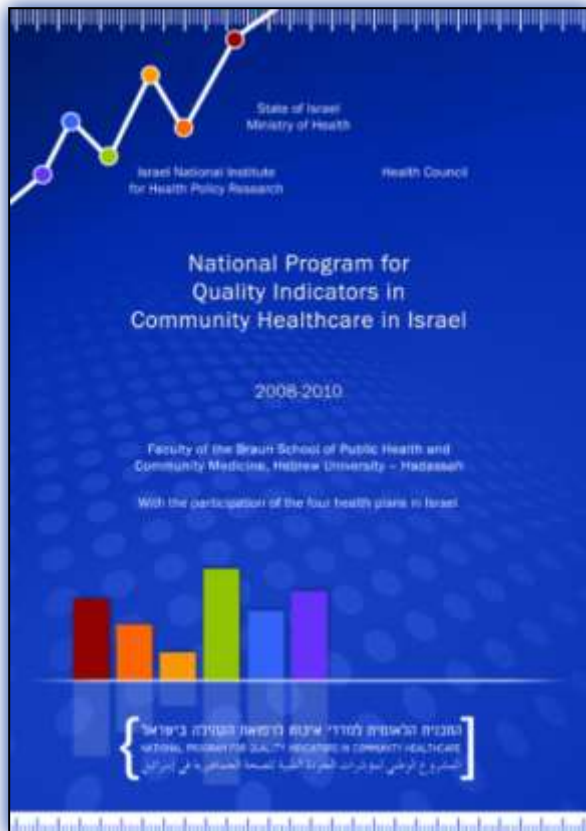
COMMENT NOW



CHOLESTEROL-slashing statins may not protect everyone against heart attacks, a study found.

Around eight million Brits take the pills daily to drive down harmful LDL cholesterol in the blood.

Policy Implications



Percentage of adults after coronary artery bypass surgery and/or interventional cardiac catheterization with LDL levels less than or equal to 100 mg/dL (ages 35-74 years)

Percentage of individuals with LDL levels less than or equal to 100 mg/dL (numerator) among individuals aged 35-74 years, after interventional cardiac catheterization and/or interventional cardiac catheterization who had a record of LDL cholesterol (denominator)

Figure 84 by year



- What is the impact of antibiotic choice on resistance?

Quinolone resistance rates in urine culture e-coli by district, by relative use of quinolones

Quinolone Resistance	Nitrofurantoin resistance	Rate of using quinolone vs nitrofurantoin	District
30%	4%	4.74	1
23%	3%	5.50	2
22%	4%	4.26	3
21%	3%	2.01	4
20%	4%	3.94	5
20%	4%	0.85	6
12%	3%	1.06	7
8%	3%	2.79	8
21%	3%		Overall

Change in Rate %

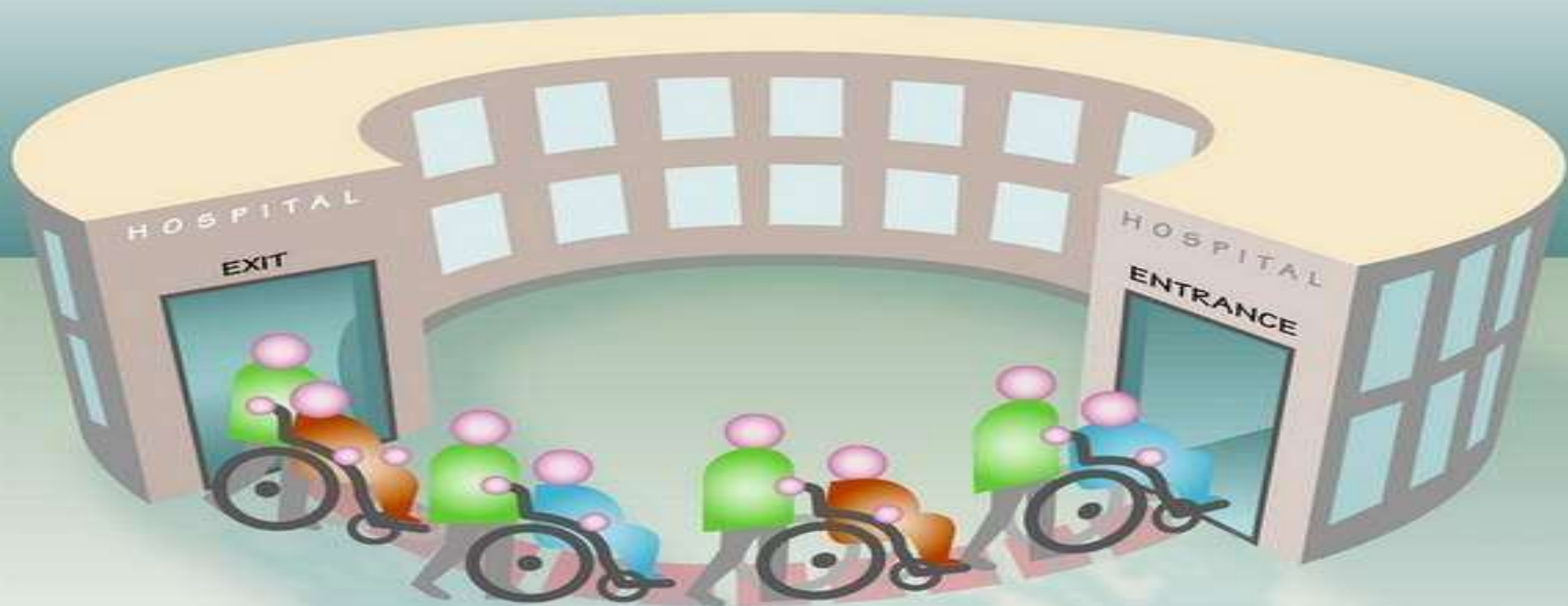
Difference Rate %
44
10
67
10
4
195
26
5
101
70
20
24
802
30
25
0.1

4 million

6.6 million prescriptions
22% of prescriptions

4.8 million prescriptions
2.3 million prescriptions
1.9 million prescriptions
18% of which

Care integration and readmissions



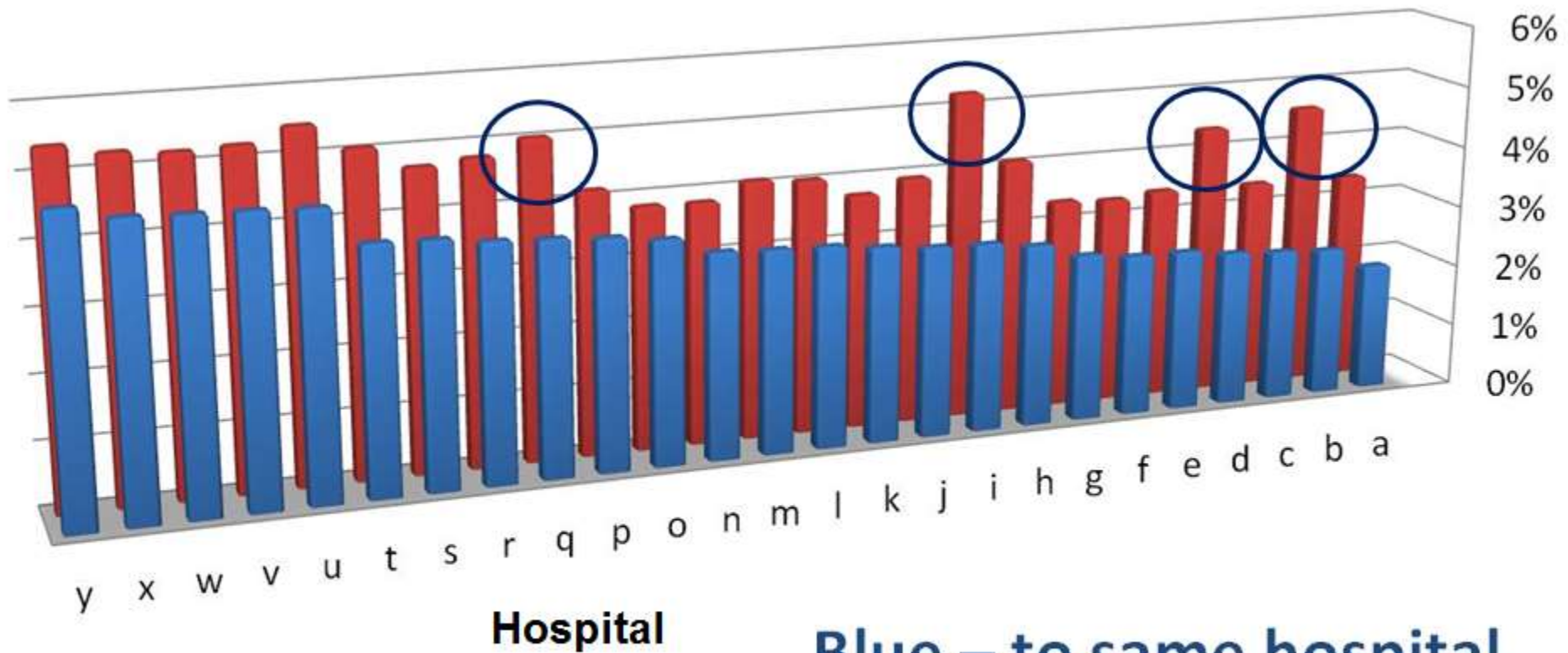
Reducing Readmissions

Real-time data sharing system

Bridging the Silos



7d readmission rate



Blue – to same hospital
Red – to any hospital

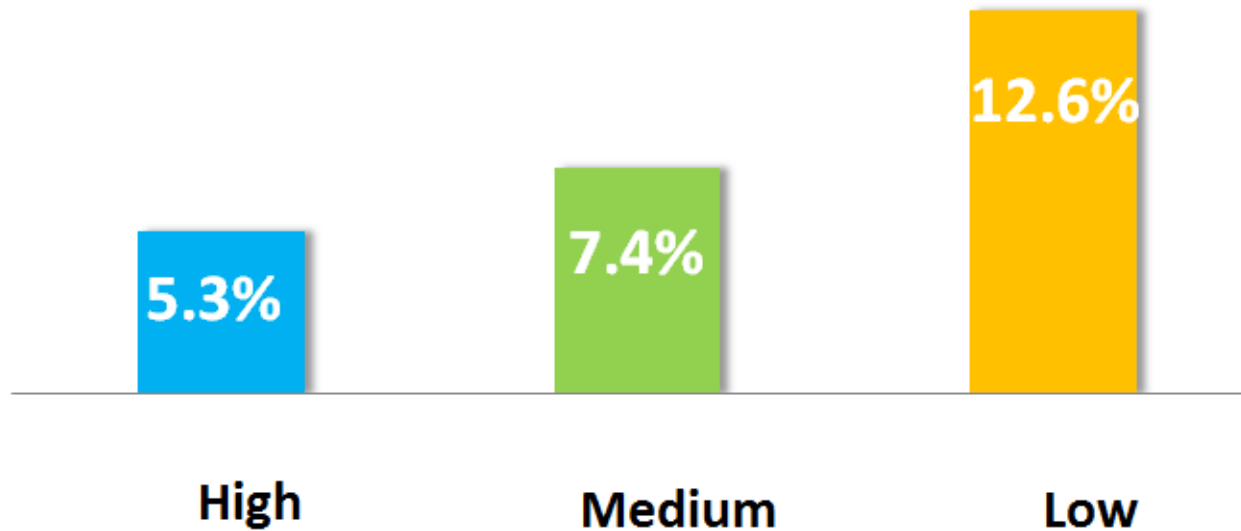
Readmission: PREMs

Patient experience surveying at Clalit:

- » Ongoing, year round
- » >250,000 individuals surveyed by phone
- » In proximity (in time) to service delivery
- » Most extensive customer survey in Israel

Readmission: PREMs

30-day readmission by perceived
Hospital discharge preparedness



OR= 0.766; P-value = 0.01

Readmission: Predictives



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Clinical Review EXPAND »

CLINICIAN'S CORNER

Risk Prediction Models for Hospital Readmission

A Systematic Review

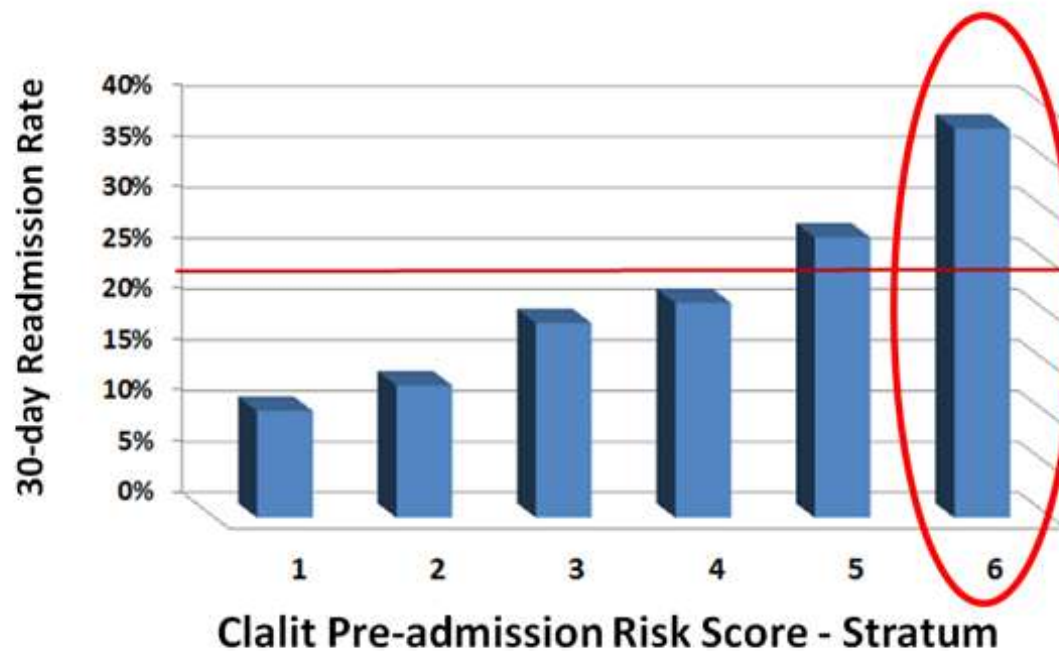
Devan **Kansagara**, MD, MCR; Honora Englander, MD; Amanda Salanitro, MD, MS, MSPH; David Kagen, MD; Cecelia Theobald, MD; Michele Freeman, MPH; Sunil Kripalani, MD, MSc

Readmission risk prediction remains a poorly understood and complex endeavor.

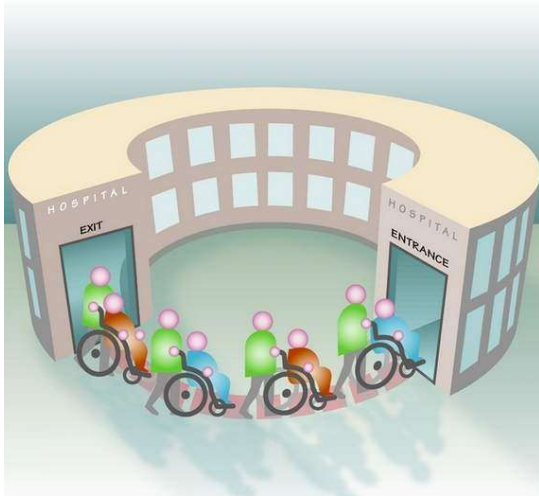
Readmission: Predictives

Predicting 30-Day Readmissions With Preadmission Electronic Health Record Data

Efrat Shadmi, PhD,† Natalie Flaks-Manov, MPH,† Moshe Hoshen, PhD,† Orit Goldman, PhD,†
Haim Bitterman, MD,†‡ and Ran D. Balicer, MD, PhD†§*



Readmissions prevention



- » Indicator in hospital EMR
- » Indicator in GP/nurse EMR
- » Daily intervention reports
- » Introduce to nursing rounds
- » Add transition care nurses
- » Add to community nurses morning routine + reports
- » Monitoring and feedback

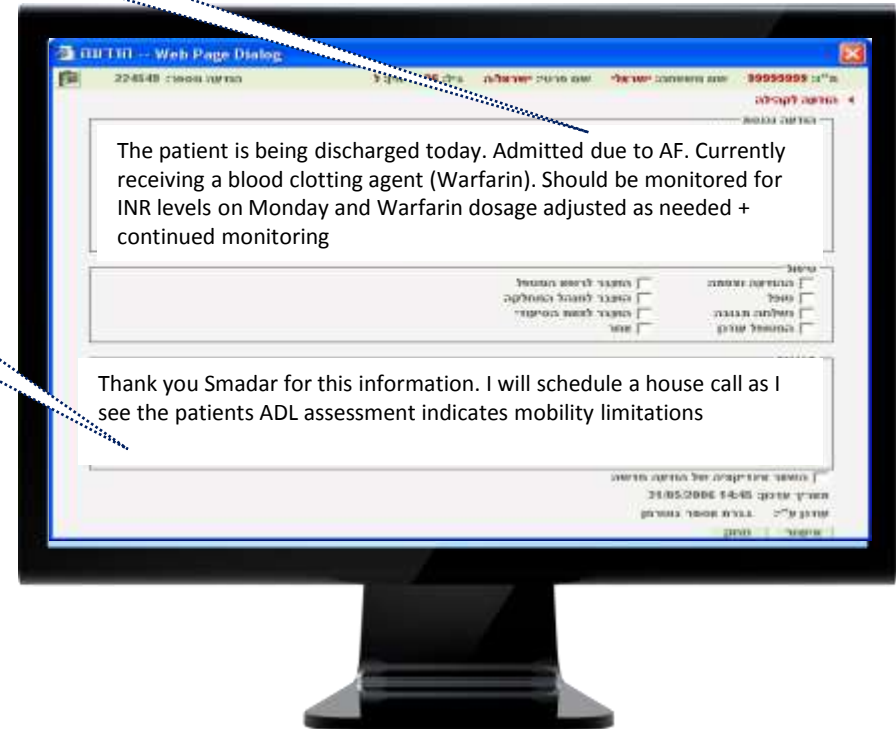
Continuity of care: Discharge planning

Hospital Nurse

Primary Care Clinic Nurse

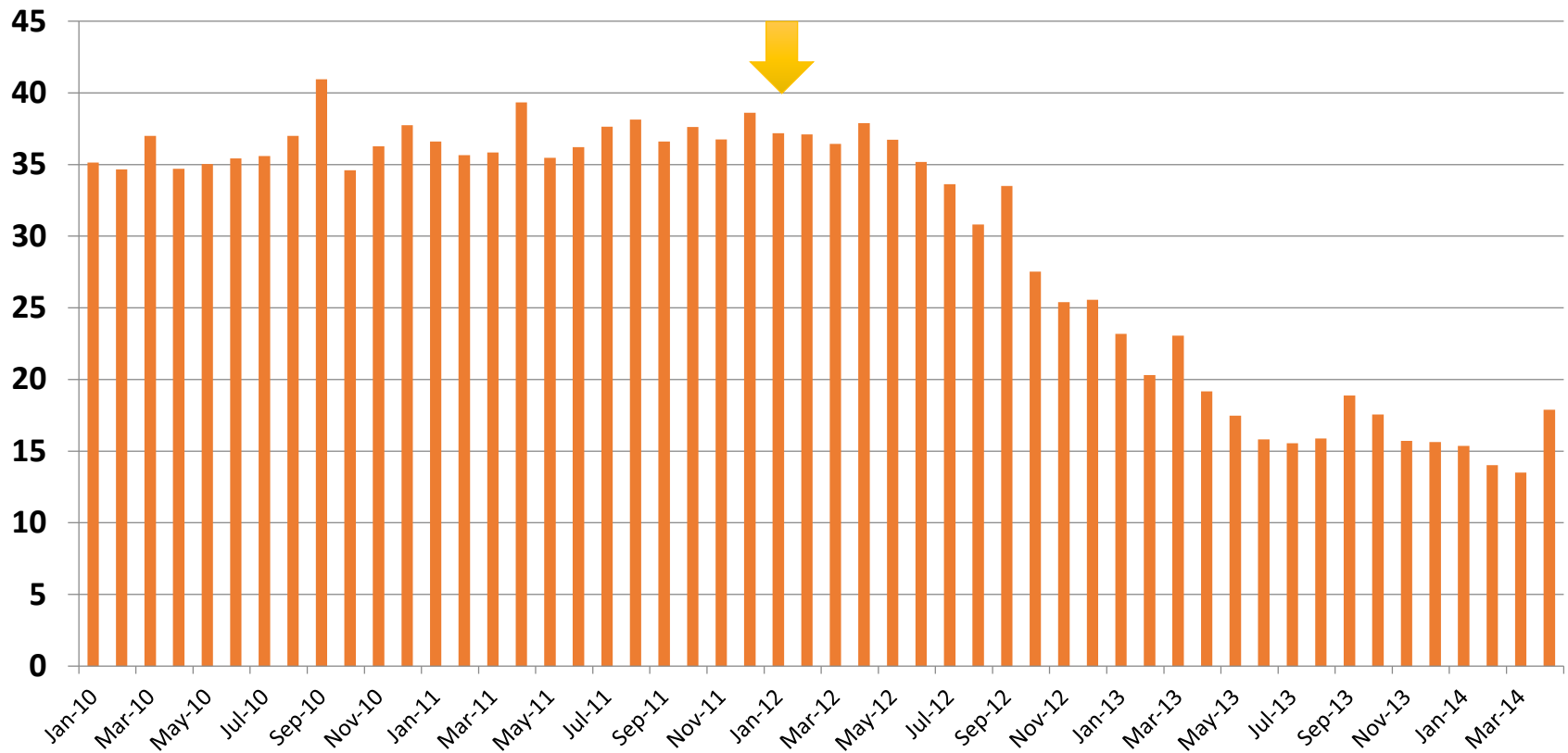
The patient is being discharged today. Admitted due to AF. Currently receiving a blood clotting agent (Warfarin). Should be monitored for INR levels on Monday and Warfarin dosage adjusted as needed + continued monitoring

Thank you Smadar for this information. I will schedule a house call as I see the patients ADL assessment indicates mobility limitations



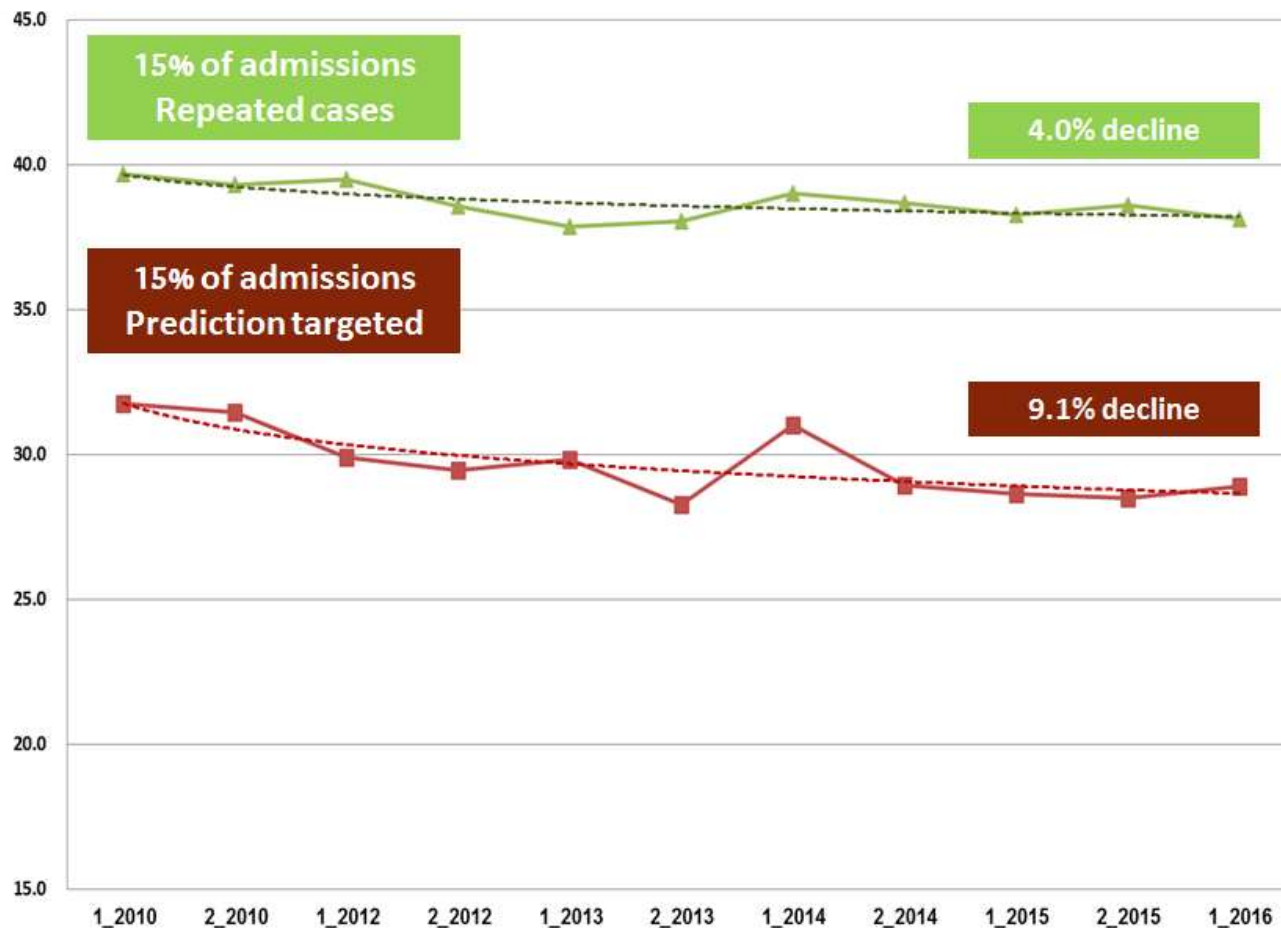
Impact on patient outreach

7-day no-contact rates



Readmissions prevention

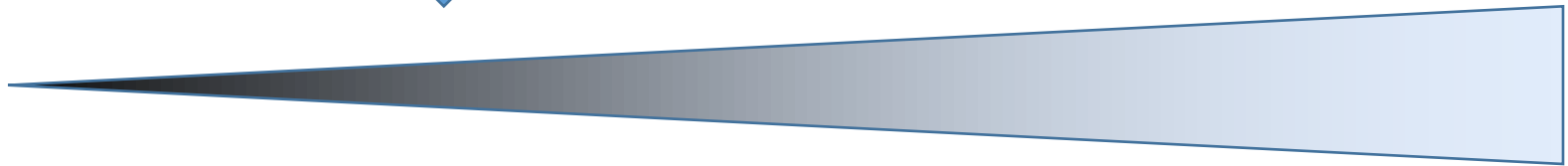
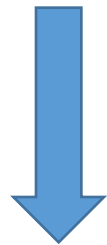
Readmission rates by predictive score



Predictive proactive care



Definition of illness and health



Full scale disease:
Irreversible
pathology
with severe
functional impact

Early
Disease

Pre-disease
signs

Early tissue
pathology

Pre-pathology
Changes:
Cellular,
epigenetic

Healthy

Predictive proactive care

Identify patients at:

- » Pre-clinical stage (Pre-disease)
- » Risk for acquiring the condition

Tailor interventions to:

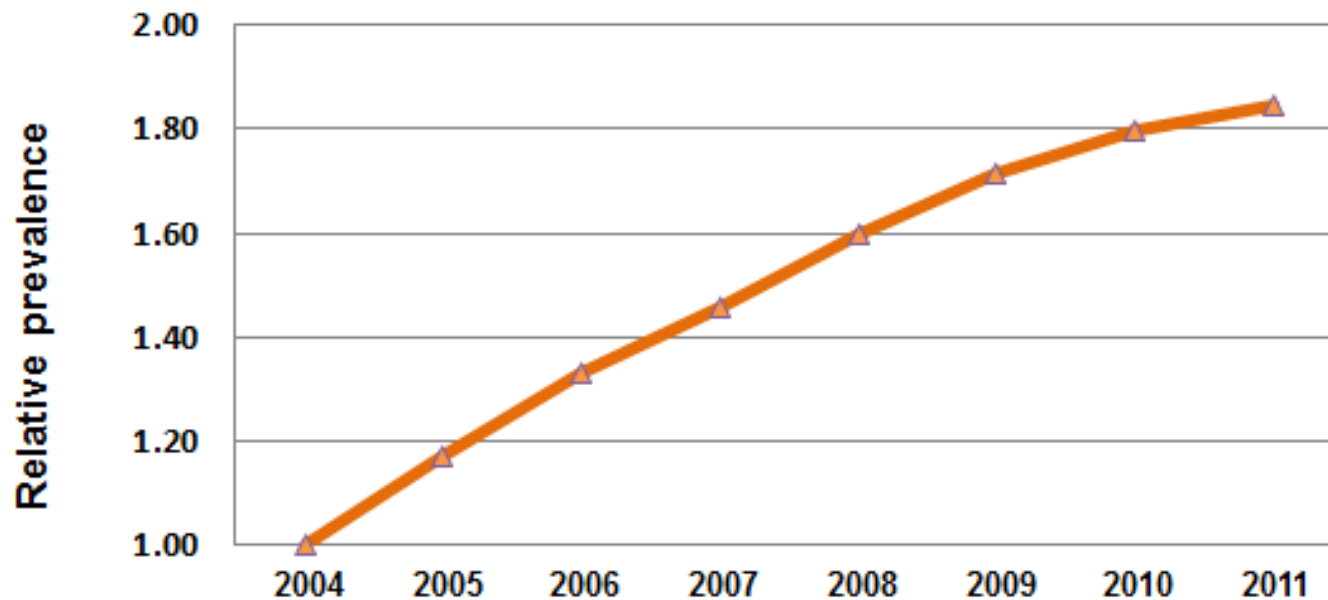
- » Prevent progression to chronic disease
- » Treat when treatment most effective



Renal Failure

Trends: Renal Replacement Therapy

Prevalence rates (per 1,000 members):
Relative increase vs. 2004, Clalit

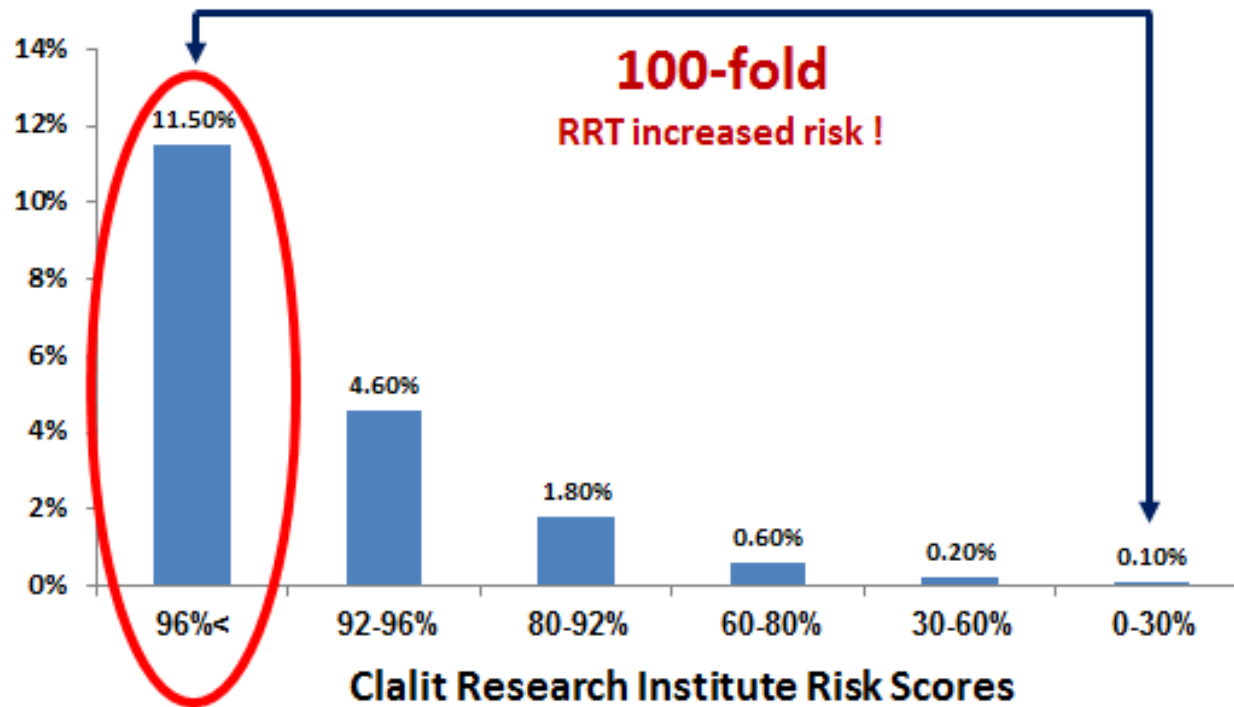




Predictive proactive care



5-year deterioration rates to RRT among CKD stage 3 patients, Clalit



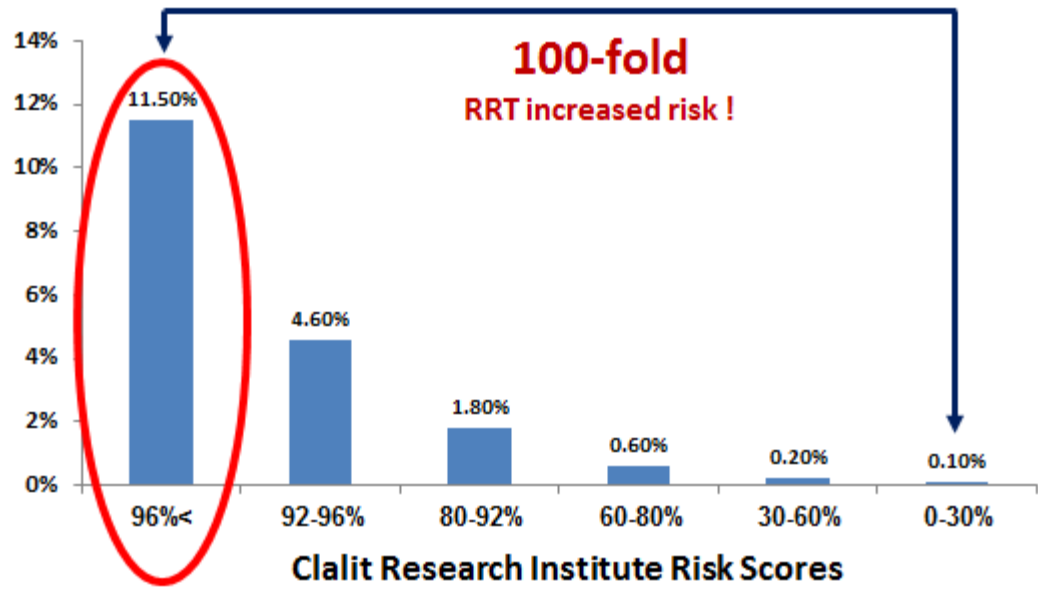
8% of the subgroup holds **70%** of future deteriorations



Preventing Renal Failure



5-year deterioration rates to RRT among CKD stage 3 patients, Clalit



External validation and comparison of three prediction tools for risk of osteoporotic fractures using data from population based electronic health records: retrospective cohort study

Noa Dagan,^{1,2} Chandra Cohen-Stavi,¹ Maya Leventer-Roberts,^{1,3} Ran D Balicer^{1,4}

Hip fractures

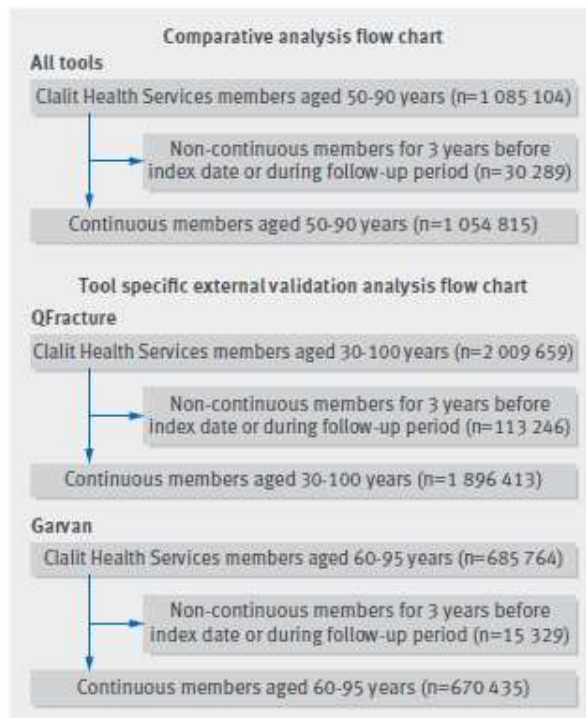
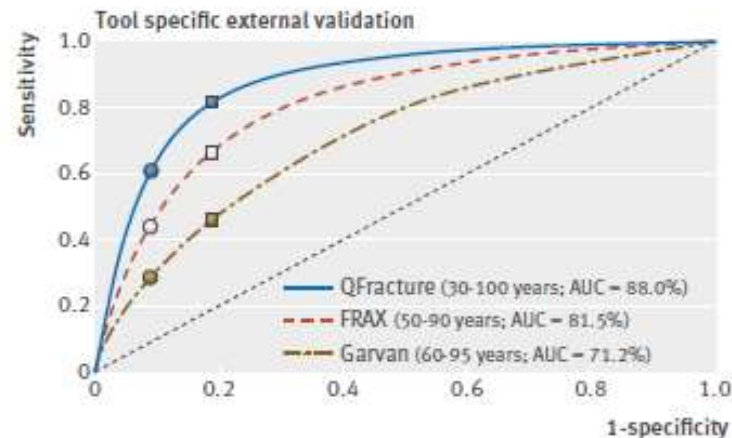


Fig 1 | Population flowchart for comparative and tool specific external validation analyses (FRAX external validation population is same as population used for comparative analysis)



Predictive care in practice

- » Nephrology
- » Diabetes
- » Influenza and pneumonia
- » Geriatric syndrome
- » Colon cancer
- » Multi-morbidity risk
- » ...



» Multi-disciplinary group

» Mandate: Turn data to insights, insights to policy

- Real-life Effectiveness / Outcomes Research
- Advanced analytics and predictions
- Data-driven care models design

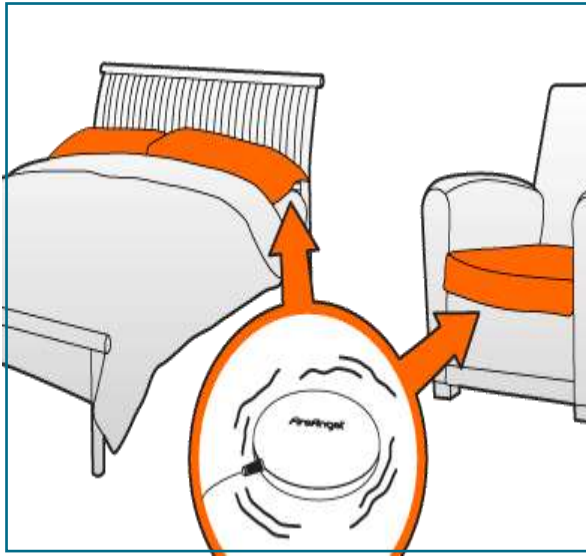
» Innovation hub

- Rapid Transition research -> practice



Big data

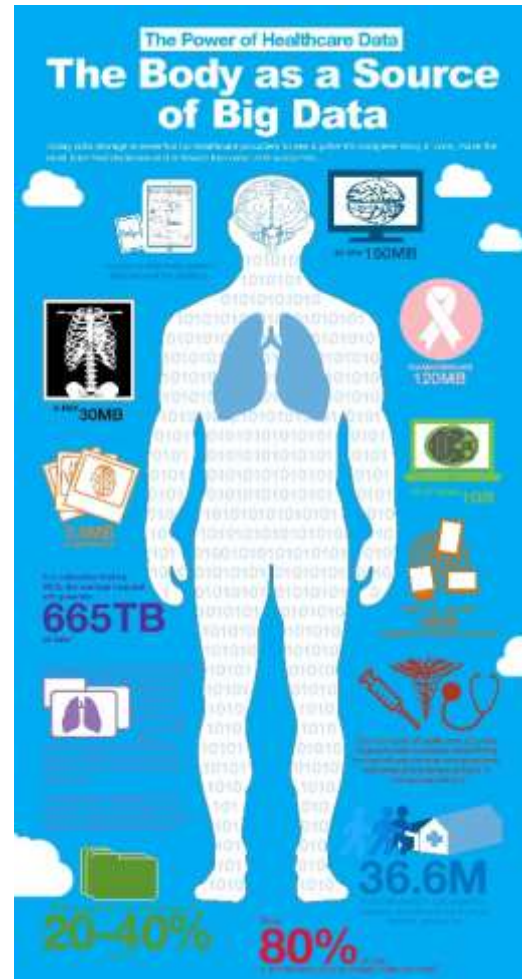




The human mind cannot compile so much data



Beyond the structured data



Advanced analytics



Poker program Cepheus is unbeatable, claim scientists

Cepheus learned poker by playing over a billion billion hands - more than have been played in the entirety of human history

'Perfect' online poker bot Cepheus has one flaw: it can't adapt



Cepheus can lose a run of poker hands as a result of bad luck, but will always come out on top in the end.
Photograph: Mike Clarke/AFP/Getty Images

Computerized

vision

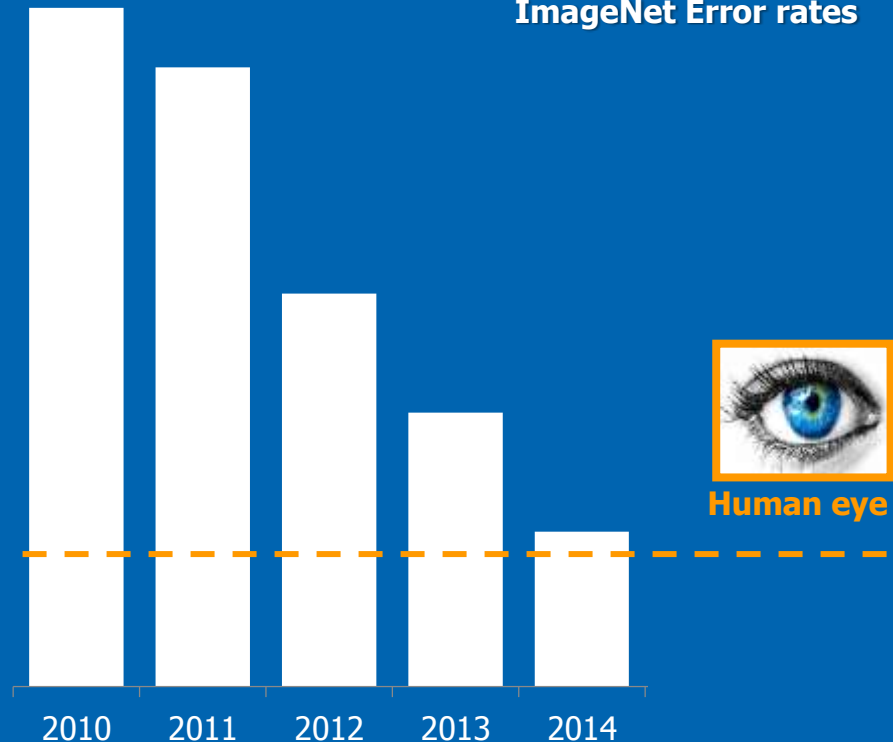
The Machine Vision Algorithm Beating Art Historians at Their Own Game

Classifying a painting by artist and style is tricky for humans; spotting the links between different artists and styles is harder still. So it should be impossible for machines, right?



2015

ImageNet Error rates

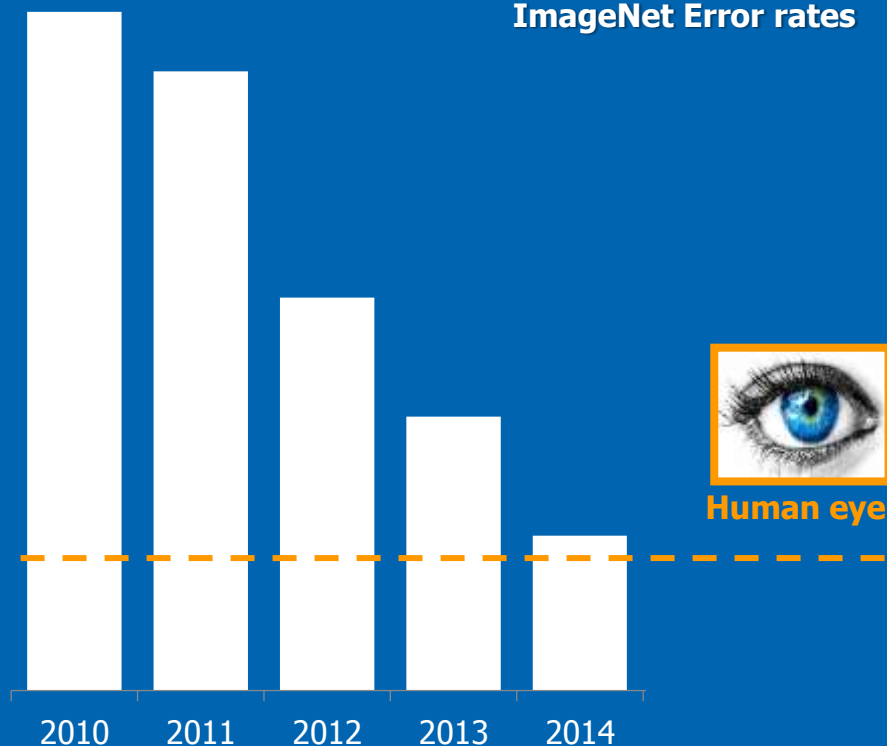


Computerized

vision



ImageNet Error rates

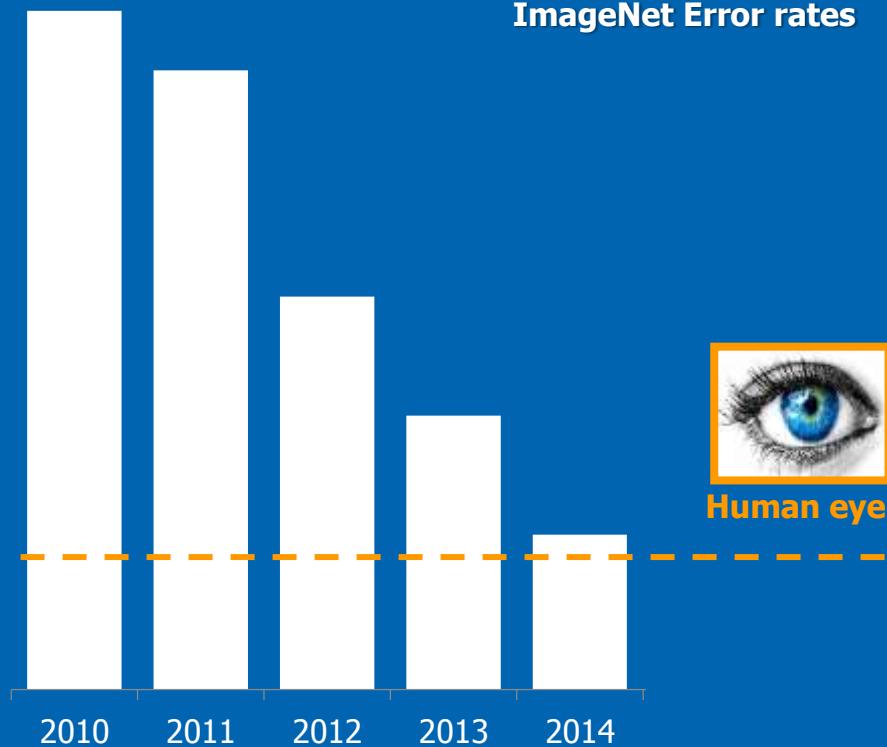


Computerized

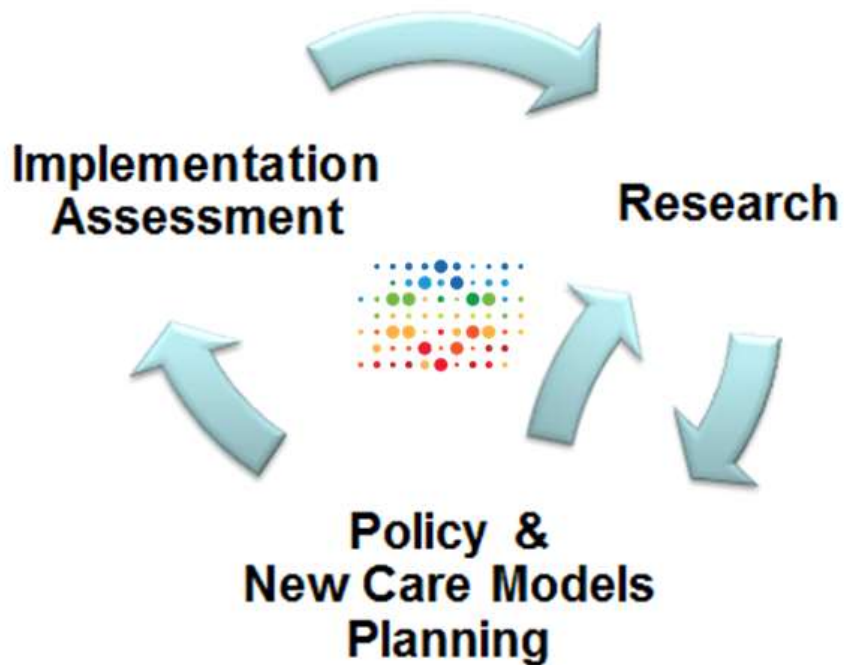
vision



ImageNet Error rates



Innovation in practice



START-UP NATION

The Story of Israel's Economic Miracle

Getting more out of available tests


YAHOO!
FINANCE

Search

Finance Home Originals Events Personal Finance Technology Markets Industries

Zebra Medical Vision And Clalit Health Services Announce Algorithm That Can Increase Osteoporosis Detection By 50%

Business Wire November 28, 2016



OSTEOPOROSIS

- 1 of 3 female, 1 of 5 male
- \$18B annual cost in the US
- 20% mortality post first fracture

(Photo: Zebra Med) Multimedia Gallery URL

SHEFAYIM, Israel--(BUSINESS WIRE)--

Zebra Medical Vision (<https://www.zebra-med.com>) and Clalit Health Services are announcing the completion of a software algorithm which uses existing CT data to identify candidates for bone density screening, allowing earlier identification of patients



Huge Potential – Yet Untapped



McKinsey&Company

December, 2016

Transforming care through data



Proactive care: preventing deterioration



Improving **test interpretation** accuracy



De-vesting futile interventions & policies



Precise Tx: Tx selection by personal expected impact



Safeguards from error & missed care opportunities



Patient self-care decision support

International collaboration

Noncommunicable diseases

News

Events

Resolutions and meeting reports

Health systems response to noncommunicable diseases

Topics in this category

- Cancer
- Cardiovascular diseases
- Chronic respiratory diseases
- Diabetes
- Mental health
- Obesity

How can innovative data-driven approaches help tackle NCDs?

23-03-2015

The technical meeting on 10 March 2015 in Tel Aviv, Israel, centred around real-life complexities in the prevention and control of Noncommunicable Diseases (NCDs), and addressed how innovative data-driven approaches can assist in tackling them.

Two key types of complexities were discussed:

- The increasing trend of co-existing multiple risk factors for NCDs;
- complexities associated with NCD multimorbidity, which is becoming the norm among middle-aged adults.

Clalit Research Institute, the newly designated WHO Collaborating Centre for NCD Research, Prevention and Control that co-hosted the meeting, shared data and insights on the prevalence of these two phenomena, as well as hands-on experience in addressing them using data-driven innovative methods. Experts from ten Member States shared their experience and knowledge, and expressed the need for a new set of integrated tools to address these emerging issues.



WHO

We have so much more to do, **together**

“It is not enough to do your best;
you must know what to do, and
then do your best.

W. Edwards Deming





Clalit
Research
Institute

**Thank
you!**

