

Big Data Utilization in Medical Policy making for Primary Medicine Clalit Insights & Future Prospects

Dr. Nicky Liebermann Stockholm - 16/11/2016





Israel's Health System

- >8 million inhabitants (wide diversity of ethnicities)
- National obligatory Health Insurance to all (1995)
- Must be member in 1 of 4 health plans (insurer/provider)
- HP funding by capitation (age, sex and periphery)
- <1% move annually between health plans
 - 90% 'happy' or 'very happy' with their health plan





Clalit Health Services

- Largest HMO in Israel ("2nd Largest HMO in the world")
- 52 Market Share in Israel (>4.2 M members)
 - Overrepresentation of the sick, poor and elderly
- ~2000 community clinics including Child Health Centers, Women Health Centers and large Consultant Medicine Clinics, >3,000 pcp's, >2,000 nurses
- 14 hospitals General, Children, Psychiatric, Rehabilitation & Geriatric
- Electronic information since 1980's today a fully computerized system with a comprehensive EHR





Clalit health services

- >32,000 Employees
- 2013 budget >6 B \$
- 14 Hospitals
- 425 Pharmacies
- 60 Dentist Clinics
- 25 Laboratories
- 54 Medical Imaging Institutes connected by PAX tech. to the EMR
- 17 Research Centers including Central community research





A unique health system

- Healthcare insurer and provider (>54% coverage)
- Primary, Secondary and Tertiary care unified look
- Long term incentives (very low attrition rate)
- Emphasis on innovation and data





Data in Clalit

- Centralized Data Warehouse
 - Inpatient and outpatient detailed data
 - Single EMR Coverage in all community clinics
 - Smoking (willing to quit), BMI, BP measures...
 - Also Labs, Pharmacies, imaging ...
 - Detailed Socio-demographic data, Costs
- Chronic Disease Registries (>180)

Full life-span, ID-tagged, Geo-coded EMR-based data on > 4M people







The Beat For Now Family



The New Concept Data Mining in Clalit

- ≻Prediction, Prevention, as Personalized as possible
- ≻Data gathering from the Data Warehouse
- ≻Using a prediction model for identification of high risk patients
- ≻Distributing the defined patient lists to physicians
- Applying interventional treatment = diagnostic & treatment protocols
- ≻Decision support systems in the EMR
- ≻Feedback and reassessing



Risk Factors in the "Johns Hopkins ACG" Predictive Model



The Best For Your Family

Commited to

Data Mining Predictive tool

Chronic diseases
 Hospitalizations
 Visits to PP, consultant medicine, lab. tests
 Medication use
 Conta Science trende

Costs & cost trends

➤The result - risk level





Examples

- Treating & preventing NCD's at the level of PP's
 - Controlling Diabetes + risk factors
 - Compliance & adherence to diabetes medication
 - Primary prevention of hyperlipidemia
 - Pre-diabetes
 - Prevention of chronic renal failure
- Controlling antibiotic resistance
- Identifying and preventing deterioration of the frail elderly; preventing re-hospitalizations
- Early prediction & prevention in pregnancy





Clalit's Diabetes Program

- Started in 1997/St. Vincent Declaration
 - Treatment in the hands of community teams.
 - Adapting international guidelines
 - Creating a computerized disease management program
 - Adopting a wide basket of drugs
 - Striving to better quality of treatment measured through quality indicators
 - Measure-Share-Improve concept in action





Education – the main engine



The Best For Your Family



The Model

Change in medical policy

- Clinical guidelines on Diabetes type II & implementation to primary care units in Clalit every 2-3 years
- ≻Decision support system in PP's EMR.
- Organization of infrastructure of the project
- Multidisciplinary intervention teams: family physicians, primary care nurses, diabetologists, dietitians, health-ed's
- Establishing communication among representatives of all providers of diabetes care in the community
- ≻Diabetes representative in each primary care clinic





The Model

Organization of work of primary care team

- "Clalit's Policy declaration" Diabetes care in the hands of primary care teams.
- > Register of diabetes patients in primary care clinic
- > Empowerment of the diabetic patient
- Focus on health education for diabetes patients: videos, brochures, website, workshops (Hebrew, Arabic & Russian)
- > Ethnic adaptation of the program
- > Quality indicators Clalit & national
- > Continuous follow up and feedback to the primary teams
- > Yearly educational program for the primary care teams



Preventing & treating hyperlipidemia and other risk factors Computerized Community Cholesterol Control = "4C"

- IHD leading cause of death in Israel
- About 70% of IHD patients need secondary prev. of hyperlipidemia
- Only about 10% reach target LDL levels
- Cost efficacy of secondary prev. proven
- Conclusion We need a community health information network (CHIN) + Computer-based Clinical Decision Support Systems (CDSS)



Committed to

Combined Analysis of demographic data, clinical information, diagnosis, hospitalizations, etc computerized

Qata warehouse

Laboratory Data

Pharmacy D

Computerized Analysis Of clinical events data, Laboratory results (LDL) and drug treatment – Prescribed & purchased

4C Computerized Community Cholesterol Control



Special achievements

- Being the 1st public organization in the word to write special comprehensive guidelines for the treatment of diabetic and chronic wounds and later to introduce new wound therapy technologies (VAC, Macrophages) & a telecare nurse home unit for chronic wounds (2012)
- <u>2011</u> –started insulin at the level of the primary physician
- <u>2011</u> the 1st to start a nationwide program of identifying and treating pre-diabetes.
- <u>2016</u> the 1st to adopt an aggressive medical policy in identifying and treating GDM as measure to slow the growth of the diabetic population.





Diabetes control according to HbA1c 95-11







LDL cholesterol control 01-11







Amputation survey

- By analyzing the Israeli amputation Data from the M.O.H we learn
 - Most of the amputations of diabetics, "moved" from the seventh decade to the eight decade.
 - Improvement of care expressing itself by reduction of amputations

2002 – 0.65 % of diabetic patients

2006 – 0.48 % of diabetic patients

26% improvement





Coronary interventions

- PTCA with stenting/redo down by 18% for "clalit's" members
- CABG down by 22% for "clalit's" members

Clalit procedures survey 2008





The financial impact

 <u>Cost of diabetic</u> <u>patient (median)</u>







Clalit Pre-Diabetes Program

- Prevalence of IFG in Israeli Jews M=29.4% F=22.5%
- Prevalence of IFG in Israeli Arabs M=31.3% F=29.7%
- We have to make a change !!!
- Population for intervention
 - Relatives of diabetic patients
 - Patients with severe overweight & or metabolic syndrome
 - Patients in high risk populations smokers, ischemic heart dis. Patients, hypertension, hyperlipidemia
 - Previous history of GDM or "big babies" in previous pregnancies
 - Women with PCO and BMI > 30
 - Patients using medications that impair glucose metabolism steroids, antipsychotics, e.t.c.





The process

<u>Clinical identification</u>

 Identifying patients at risk/re-testing/ diagnose&treat

- <u>Data mining</u>
 - Identifying population at risk
 - Send lists to physicians
 - Physicians decide to re-test
 - Diagnose and treat





Prevention of type 2 diabetes by changes in life style

- Modifiable risk factors as obesity, food and physical activity are the main non-genetic determinants of diabetes.
- Type 2 diabetes can be prevented by changes of lifestyles of high-risk subjects.
- Patients in very high risk will be medicated either with metformin or DPP4 drugs.

N Engl J Med, 344:1343, 2001













Increased risk of complications after GDM

- 7-fold increase of developing type 2 DM -(Bellamy 2009)
- 4% 1 year after delivery
- 20% 9 years after delivery (Feig 2008)
- CV disease later in life (15.5% vs 12.4%)
 - at a younger age (Carr 2006; Shah 2008)





Diabesity

- Pre-pregnancy weight
- Postpartum weight retention
- RF for type 2 DM (Linne 2002; Metzger 1993)

- GDM identifies women at risk of developing type 2 DM
- Making primary prevention possible





Long-term follow-up after GDM

- Pre-diabetic stages are frequent
- Progressive risk of type 2 DM
- RF for hyperglycemic conditions
 - Waist circumference (P < 0.001)
 - Weight (P = 0.002)
- Risk factors & NCD's
 - Hypertension
 - Hyperlipidemia
 - CV events





Does obesity beget obesity? Developmental Origins of Health and Disease ("The Barker" effect 2002)



EPIGENEITIC CHANGES





What should we do?

- <u>Prevent</u>
 - Identify women at risk and prepare them before preg.
 - Life style modification & medications
- <u>Treat</u>
 - Control weight/exercise
 - Control risk factors
 - Medication
- Post-partum follow up
 - Information to FP & pediatricians strict metabolic follow up for mother and child





Gestational Diabetes

- The HAPO study revised the criteria for diagnosis of GDM women in order to prevent pregnancy complications, birth complications, later T2DM in the mother and Metabolic syndrome and Diabetes in the child.
- By analyzing the Israeli participants data we learned that an intervention will be cost efficient.
- Starting 2016 will test with 75 gr. all population.
- We expect 50% more identification of GDM women lifestyle change of the generation !!!
- Basing treatment decision on a calculated risk factor





The complete Clalit Diabetes Program

- Pre-Diabetes identification, education & treatment by testing high risk patient groups
- Intensive GDM screening, education & treatment
- Diabetes, Lipids, and Hypertension control
- Bariatric surgery to suitable patients with continuous psychological support
- All these combined in a computerized Continuous Quality Improvement Model – testing, checking results and reporting to the primary care teams to adjust their performance





Medication Adherence and its Role in Diabetes Control

- Medication adherence is critical for long-term control of diabetes
- Evidence for the association between adherence and HbA1c control is weak, due to
 - methodological weaknesses of studies
 - imprecise measurement of adherence
- HbA1c control has been found associated with age and disease duration, however, the role of poor medication adherence in this relationship is unclear



Study Aim

- Assess the importance of medication adherence in contributing to poor glycemic control
- Define the role of medication adherence in glycemic control among sub-segments of poorly controlled diabetics





Methods I

- Population
 - All adult diabetics (age 18+) in Clalit Health Services
 - Diabetes according to ADA definitions + Oral Rx
- Data set
 - Clalit DWH
- Adherence measure
 - Validated improved objective medication adherence measurement, over 2 years (2010-2011)
- Outcome
 - Poor glycemic control, (HbA1c >9)





Adherence categories

- Adherence to oral hypoglycemic agents (OHA) categorized as:
 - Good (>80%)
 - Intermediate (50-80%)
 - Poor (< 50%)





Methods II

- Logistic regression for association between
 - medication adherence and
 - poor HbA1c control (HbA1c >9),
 - (controlling for relevant covariates).
- Further analyses were conducted to assess if adherence was a
 - mediator or
 - effect modifier between
 - duration of disease and poor control and
 - <u>age</u> and poor control







N = 220,225





Percent of Study Population with Poor Adherence and Poor Control by Age







Percent of Study Population with Poor Adherence, Poor Control by Disease Duration



Duration

Poor HbA1c control increased (8.7%, 12.4%, 18.9%) with longer disease duration while poor adherence rates decreased (33.0%, 29.0%, and 21.9%)





Conclusions

- Adherence interventions will be most meaningful in younger diabetics and those with disease of shorter duration.
- In patients with disease of longer duration further is investigation is needed to understand causes of poor control.





Conclusions

To enhance adherence & compliance we have to educate the patients – We run two pilot trials, checking feasibility and cost/value -

a. what is the best way to motivate patients – coaches, mode of intervention and/or technology used.
b. who is the most suitable coach – an educated patient ? A member of the primary care team ? or a specially designed and educated coach ?





Prevention of CKD

- Yearly growth of dialysis patients 10-15%
- Etiology DM, Hypertension, obstructive UTD, medications, drug abuse, renal disease e.t.c.
- <u>Primary prevention</u> Healthy patients present with "occult" deterioration of renal function within the normal range; sadly, the PP usually doesn't observe it – the computer will show it - <u>emphasized</u>
- <u>Secondary prevention</u> based on the data-mining process.



The Beat For Your Family



The process

- After identification of the suspected patient
 - The PP uses a diagnostic protocol (lab. tests, imaging, BP monitoring, GTT e.t.c.)
 - Then treatment according to established guidelines.
- Scope to reduce the rise of the dialysis patients.





Prevention and treatment of the frail elderly



11% Of the total expenditure on only less then 0.3% of patient population









Readmission prevention

- At hospitalization every patients risk score for readmission is assessed and then reassessed at discharge.
- A "planned discharge nurse" takes care about the preparations at home, PP visit, and arranged discharge, in order to prevent any reason for deterioration and readnission





Antibiotics

- All "cultures data" is analyzed periodically according to sensitivity and resistance of bacteria.
- Every 3-6 months we issue "dynamic regional guidelines" for antibiotic use.
- Education of PP teams for correct antibiotic use
- Correlating with regional hosp. antibiotic resistance
- Reassessment every 6 months, and feedback to primary clinics and management.



The Vicious Cycle - NCD Epidemic

Obesity , Diabetes, Metabolic Syndrome & Pregnancy

Diagnosis & Management

Pregnancy complicated with Diabesity (Obesity /GDM/PGDM)

Pre-Pregnancy Management

Committed to

Lead

Early T2DM

Obesity

Abnormal Intrauterine Metabolic environment

Offspring of diabetic mothers

Childhood Obesity

Early Metabolic syndrome





Pre-Pregnancy and the First Trimester A Window of Opportunities for Screening of Adverse Perinatal Outcome:

> The incentive to start the <u>Pregnancy Management Project</u>

> > Confronting the NCD Epidemic Prevention Starts in Utero





Changing the Future of 3 Generations



Programming and Imprinting (genotype to phenotype) during Intra Uterine Life







Adding a floor to the Perinatal Pyramid of Care

Maternal Medicine Pre-Preg. Gathering of data Genetic info & testing

Fetal Medicine

The 1st Trimester Triage Biochemistry Nuchal translucency NIPT & genetics Micro-RNA Pre-Pregnancy Evaluation Chronic Disease Non Communicable Diseases







Communicating with the patients

- PMR for all interested patients
 - Empowerment
 - Teaching
 - Alerts
 - Unified DATA
- Info prescription
- Chat rooms
- "On line" services
- Tele-learning through webinars for patients





The emerging future

- Collecting & analyzing data = supporting patient's & physicians' decisions
- Electronic follow-up via sensors
- The "healthy house"
- And finally –

"From phenotype to 'omics' and back" – personalized medical decisions in DM and other NCD's





Why to apply medication prescribing control

- We are living in a world where the country can't afford to give un limited health services for every citizen, so we operate under limited budgets.
- The Drugs and Medical Eq. are 15% from budget expenditure and rising.
- ➤ Drugs and Medical Eq. expenditure in Clalit Health Services id rising in a rate of 11%.
- Clalit Health Services issues 95 million prescription lines in our pharmacy for >2.5 million drugs consumers.
- Our drugs control activity purpose is lowering expenditure rate grow as low as possible, without damaging the medical standard which is offered to our ensurees.







Clalit & Pharma comp.

- ➤ Pharma Ethical agreement
- > Studies/research
- Data inquiry and analytical mining
 Full life-span, ID-tagged, Geo-coded EMR-based data on > 4M people
- ≻ Common projects
 - Educational patients and / or medical teams
 - > Interventional







Clalit Health Services

