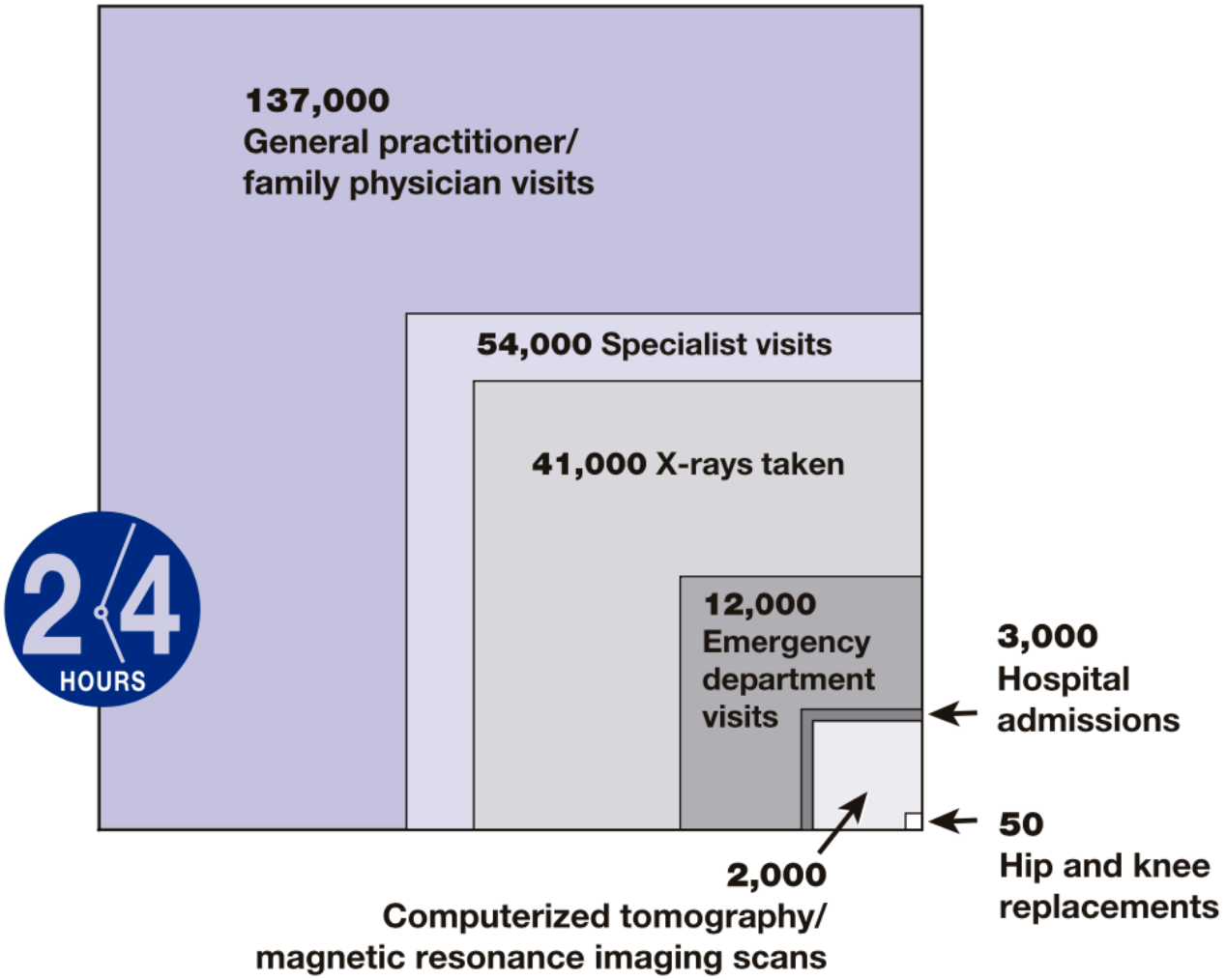
CPCSSN RCSSSP

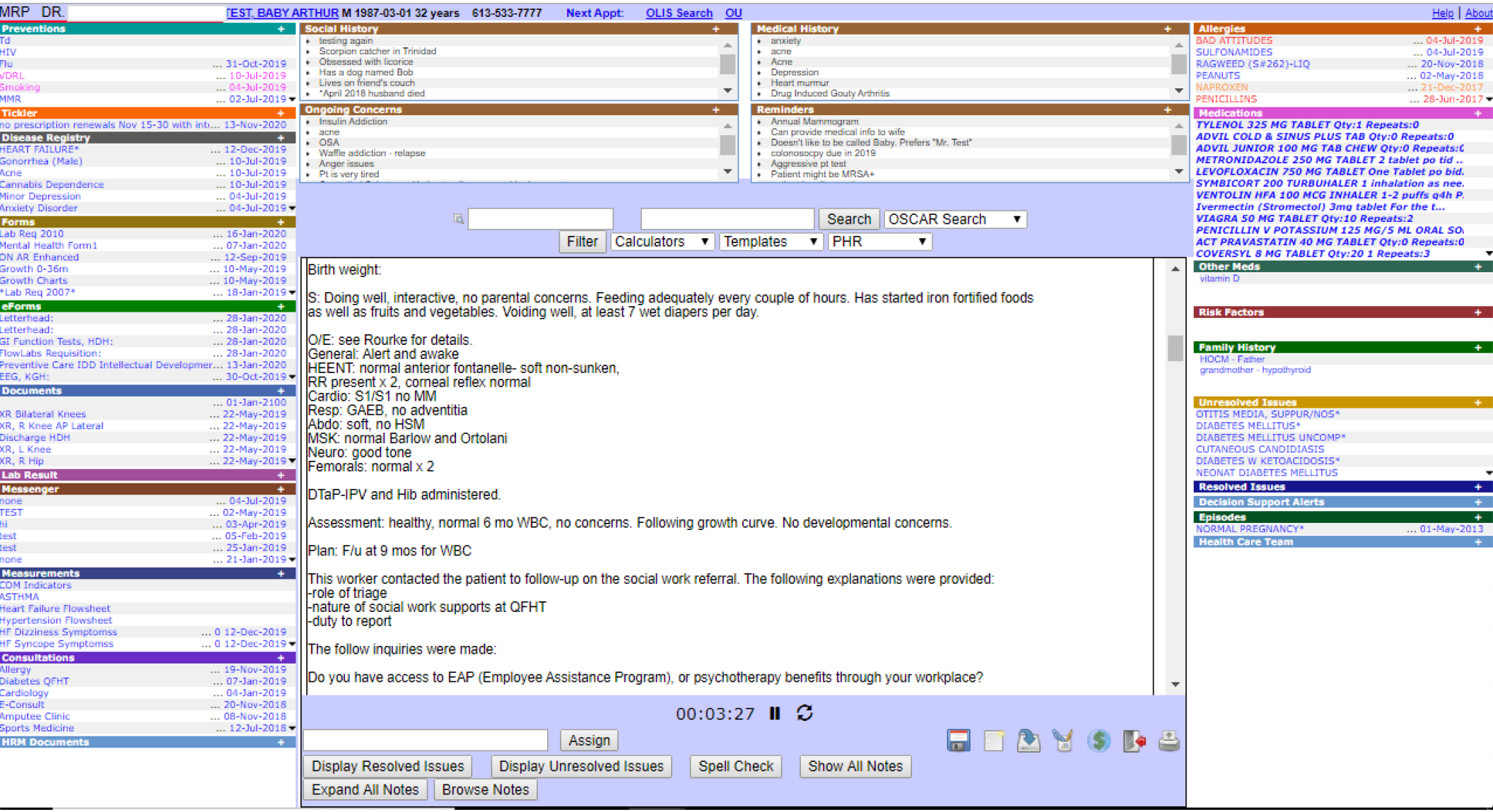
Canadian Primary Care Sentinel Surveillance Network
Réseau canadien de surveillance sentinelle en soins primaires

The Potential of AI in Primary Health Care: How Big Data (e.g. CPCSSN) Could Transform Primary Care

February 3rd,2020



CPCSSN RCSSSP


MRP DR.
TEST, BABY ARTHUR M 1987-03-01 32 years 613-533-7777 Next Appt: OLIS Search OU
Help | About
Preventions
Td
HIV
Flu ... 31-Oct-2019
VDRL ... 10-Jul-2019
Smoking ... 04-Jul-2019
MMR ... 02-Jul-2019
Tickler
no prescription renewals Nov 15-30 with intr... 13-Nov-2020
Disease Registry
HEART FAILURE* ... 12-Dec-2019
Gonorrhea (Male) ... 10-Jul-2019
Acne ... 10-Jul-2019
Cannabis Dependence ... 10-Jul-2019
Minor Depression ... 04-Jul-2019
Anxiety Disorder ... 04-Jul-2019
Forms
Lab Req 2010 ... 16-Jan-2020
Mental Health Form1 ... 07-Jan-2020
ON AR Enhanced ... 12-Sep-2019
Growth 0-36m ... 10-May-2019
Growth Charts ... 10-May-2019
Lab Req 2007 ... 18-Jan-2019
eForms
Letterhead: ... 28-Jan-2020
Letterhead: ... 28-Jan-2020
GI Function Tests, HDH: ... 28-Jan-2020
FlowLabs Requisition: ... 28-Jan-2020
Preventive Care IDD Intellectual Developmer... 13-Jan-2020
EEG, KGH: ... 30-Oct-2019
Documents
... 01-Jan-2100
XR Bilateral Knees ... 22-May-2019
XR, R Knee AP Lateral ... 22-May-2019
Discharge HDH ... 22-May-2019
XR, L Knee ... 22-May-2019
XR, R Hip ... 22-May-2019
Lab Result
Messenger
none ... 04-Jul-2019
TEST ... 02-May-2019
hi ... 03-Apr-2019
test ... 05-Feb-2019
test ... 25-Jan-2019
none ... 21-Jan-2019
Measurements
CDM Indicators
ASTHMA
Heart Failure Flowsheet
Hypertension Flowsheet
HF Dizziness Symptomss ... 0 12-Dec-2019
HF Syncope Symptomss ... 0 12-Dec-2019
Consultations
Allergy ... 19-Nov-2019
Diabetes QFHT ... 07-Jan-2019
Cardiology ... 04-Jan-2019
E-Consult ... 20-Nov-2018
Amputee Clinic ... 08-Nov-2018
Sports Medicine ... 12-Jul-2018
HRM Documents
Social History
testing again
Scorpion catcher in Trinidad
Obsessed with licorice
Has a dog named Bob
Lives on friend's couch
*April 2018 husband died
Medical History
anxiety
acne
Acne
Depression
Heart murmur
Drug Induced Gouty Arthritis
Ongoing Concerns
Insulin Addiction
acne
OSA
Waffle addiction - relapse
Anger issues
Pt is very tired
Reminders
Annual Mammogram
Can provide medical info to wife
Doesn't like to be called Baby. Prefers "Mr. Test"
colonoscopy due in 2019
Aggressive pt test
Patient might be MRSA+
Allergies
BAD ATTITUDES ... 04-Jul-2019
SULFONAMIDES ... 04-Jul-2019
RAGWEED (S#262)-LIQ ... 20-Nov-2018
PEANUTS ... 02-May-2018
NAPROXEN ... 21-Dec-2017
PENICILLINS ... 28-Jun-2017
Medications
TYLENOL 325 MG TABLET Qty:1 Repeats:0
ADVIL COLD & SINUS PLUS TAB Qty:0 Repeats:0
ADVIL JUNIOR 100 MG TAB CHEW Qty:0 Repeats:0
METRONIDAZOLE 250 MG TABLET 2 tablet po tid ..
LEVOFLOXACIN 750 MG TABLET One Tablet po bid.
SYMBICORT 200 TURBUHALER 1 inhalation as nee.
VENTOLIN HFA 100 MCG INHALER 1-2 puffs q4h P.
Ivermectin (Stromectol) 3mg tablet For the t...
VIAGRA 50 MG TABLET Qty:10 Repeats:2
PENICILLIN V POTASSIUM 125 MG/5 ML ORAL SO
ACT PRAVASTATIN 40 MG TABLET Qty:0 Repeats:0
COVERSYL 8 MG TABLET Qty:20 1 Repeats:3
Other Meds
vitamin D
Risk Factors
Family History
HOCM - Father
grandmother - hypothyroid
Unresolved Issues
OTITIS MEDIA, SUPPUR/NOS*
DIABETES MELLITUS*
DIABETES MELLITUS UNCOMP*
CUTANEOUS CANDIDIASIS
DIABETES W KETOACIDOSIS*
NEONAT DIABETES MELLITUS
Resolved Issues
Decision Support Alerts
Episodes
NORMAL PREGNANCY* ... 01-May-2013
Health Care Team
Search
OSCAR Search
Filter
Calculators
Templates
PHR
Birth weight:
S: Doing well, interactive, no parental concerns. Feeding adequately every couple of hours. Has started iron fortified foods as well as fruits and vegetables. Voiding well, at least 7 wet diapers per day.
O/E: see Rourke for details.
General: Alert and awake
HEENT: normal anterior fontanelle- soft non-sunken,
RR present x 2, corneal reflex normal
Cardio: S1/S1 no MM
Resp: GAEB, no adventitia
Abdo: soft, no HSM
MSK: normal Barlow and Ortolani
Neuro: good tone
Femorals: normal x 2
DTaP-IPV and Hib administered.
Assessment: healthy, normal 6 mo WBC, no concerns. Following growth curve. No developmental concerns.
Plan: F/u at 9 mos for WBC
This worker contacted the patient to follow-up on the social work referral. The following explanations were provided:
-role of triage
-nature of social work supports at QFHT
-duty to report
The follow inquiries were made:
Do you have access to EAP (Employee Assistance Program), or psychotherapy benefits through your workplace?
00:03:27
Assign
Display Resolved Issues
Display Unresolved Issues
Spell Check
Show All Notes
Expand All Notes
Browse Notes

CPCSSN creates

A pan-Canadian standardized, high quality, de-identified primary care database

CPCSSN RCSSSP

CPCSSN-Established 2008

- **10+ years** of R & D
- A resource for quality improvemer disease/condition surveillance, research, health system planning
- 2M patients, 1260 clinicians, federates data from 17 EMRs

CPCSSN RCSSSP

Unique pan-Canadian primary care database

- 11 PBRNs in 7 provinces, 1 territory
- Strong partnerships with:
  - College of Family Physicians
  - Public Health Agency of Canada
  - Diabetes Action Canada
  - Canadian Institute for Military & Veteran Health Research
  - Canadian Frailty Network

B.C. (BCPCReN), **Alberta** (SAPCReN, NAPCReN), **NWT, Manitoba** (MaPCReN), **Ontario** (DELPHI, UTOPIAN, EON, MUSIC)**, Quebec** (RRSPUM)**, Nova Scotia/New Brunswick** (MaRNet), **Newfoundland** (APBRN)

CPCSSN data quality

- Clean and recode:
  - Billing, Encounter, and Problem List Diagnoses (ICD-9)
  - Medications & Vaccines (ATC)
  - Allergies and Intolerances
  - Lab results (LOINC)
  - Referrals (SNOMED CT)
  - Physical signs (weight, height, BP, unit conversion, calculate BMI)
  - Risk factors (smoking, alcohol, diet)

CPCSSN RCSSSP

National infrastructure

EMR Vendors (and products)**:**

Telus (Kinlogix, Med Access, Medesync, Nightingale, Practice Solutions, Telin, Wolf)

QHR (Accuro, Jonoke, Healthscreen, xwave)

OSCAR

Da Vinci

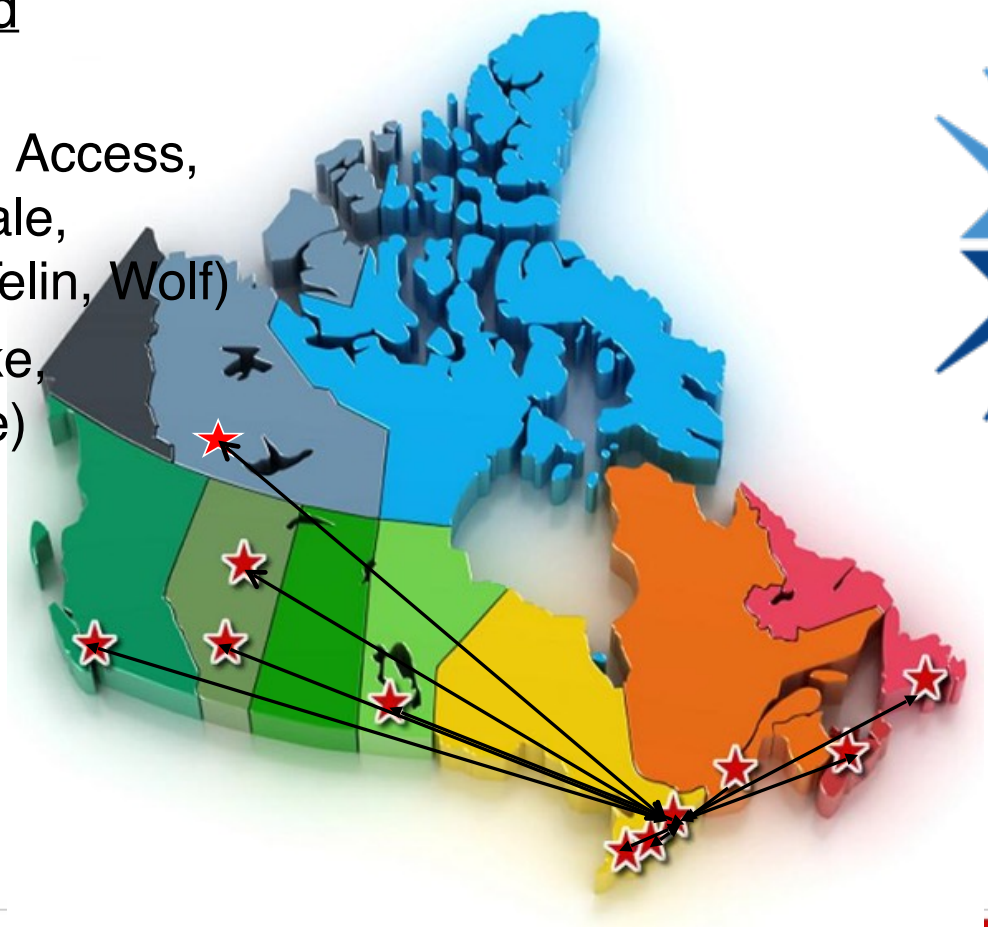
Healthquest

InputHealth

IntraHealth

Purkinje

P&P



Centre for Advanced Computing

CPCSSN data holdings (Q2 2018)

	British Columbia	Southern Alberta	Northern Alberta	Manitoba	South Western Ontario	Southern Ontario	Greater Toronto Area	South Eastern Ontario	Ottawa Area	Quebec	Maritimes	Newfoundland & Labrador	North West Territories	National
Sites	15	35	18	18	0	2	96	11	4	6	28	12	7	252
Providers	55	246	77	77	0	37	376	124	47	89	61	49	24	1,262
Patients	91,100	305,993	91,525	145,593	0	75,080	572,311	232,157	45,156	29,248	130,642	49,959	25,594	1,794,358
Encounters	1,755,030	6,659,097	1,935,561	4,338,487	0	995,189	15,457,412	4,792,935	1,230,355	448,307	2,274,185	1,218,398	406,013	41,510,969
Health Conditions	167,910	751,798	223,689	1,186,993	0	32,632	2,379,201	729,098	307,350	208,247	235,158	121,604	39,492	6,383,172
Encounter Diagnoses	1,688,314	7,300,865	2,137,066	2,535,202	0	553,121	702,317	1,069,081	932,897	206,912	3,132,053	1,530,593	505,445	22,293,866
Billings	1,753,451	5,807,286	2,397,048	4,431,098	0	3,577,834	17,471,475	3,920,295	549,655	19,167	42,898	357,508	26	40,327,741
Lab Results	7,741,105	27,958,252	7,565,223	8,646,863	0	3,847,461	31,821,749	16,065,794	1,831,618	318,835	0	1,750,911	617,935	108,165,746
Medications	1,212,852	4,394,423	2,317,565	2,622,523	0	1,229,114	12,741,423	5,615,024	1,044,573	362,872	2,811,702	1,456,409	241,008	36,049,488
Allergies/Intolerances	31,500	123,318	43,418	34,992	0	18,008	449,219	120,814	31,951	16,586	1,875	9,076	11,596	892,353
Physical Signs	883,264	5,706,543	1,689,602	2,152,314	0	264,039	7,865,486	3,486,080	1,111,154	175,814	1,580,293	489,117	414,704	25,818,410
Medical Procedures	777,244	180,591	72,277	375,176	0	1,224,311	621,387	346,077	777,244	25,652	97,588	53,984	0	4,004,708
Referrals	347,055	1,129,084	470,648	94,245	0	299,408	1,139,557	326,027	64,210	0	15,258	127,142	44,514	4,057,148
Risk Factors	59,090	384,500	271,305	67,321	0	7,288,510	714,002	333,324	153,869	96,846	24,790	114,423	23,773	9,531,753
Family History	41,175	332,813	106,646	54,690	0	0	1,048,097	270,173	90,711	0	3,284	54,703	0	2,002,292
Vaccines	155,997	173,958	57,097	340,707	0	493,931	2,111,873	992,504	217,027	12,716	348,865	52,849	256	4,957,780
Diseased Patients	30,881	119,473	42,242	43,160	0	17,883	194,531	81,463	12,430	10,255	29,303	16,480	5,747	603,848
Disease Cases	54,003	202,707	76,374	72,045	0	27,356	307,535	148,110	18,896	15,851	44,211	25,379	7,995	1,000,462
Disease Indicators	609,948	1,882,677	878,899	963,267	0	244,848	4,408,482	1,054,618	120,154	114,846	572,657	290,529	34,142	11,175,067
# Database Records	17,399,989	63,413,659	20,376,280	28,104,771	0	20,188,764	100,006,529	39,583,709	8,539,301	2,062,249	11,344,851	7,719,125	2,378,271	320,570,675

Chronic disease: Patients in national database (mid-2018)

Chronic Obstructive Lung Disease	37,808
Depression	170,238
Diabetes	100,042
Hypertension	211,030
Osteoarthritis	120,666
Dementia	20,265
Epilepsy	13,373
Parkinson’s Disease	3,601

CPCSSN RCSSSP

CPCSSN after 10+ years of R&D

- 11 case definitions
- Machine learning algorithms
- Data used in >100 projects
- >133 peer-reviewed publicatior

Contents lists available at ScienceDirect

Canadian Journal of Diabetes

journal homepage: www.canadianjournalofdiabetes.com

ELSEVIER

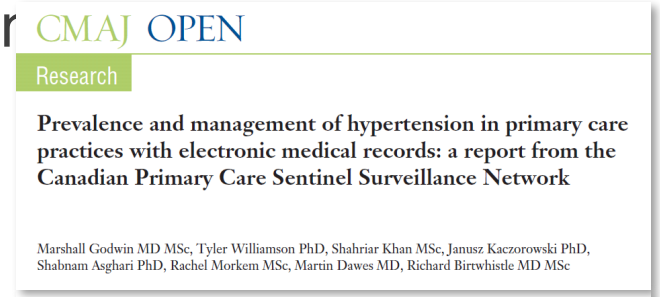
Canadian Diabetes Association

CJD

Original Article

Prevalence and Epidemiology of Diabetes in Canadian Primary Care Practices: A Report from the Canadian Primary Care Sentinel Surveillance Network

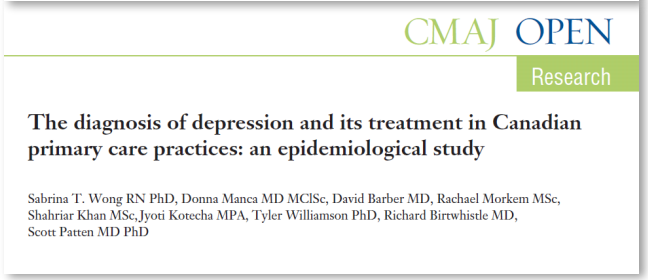
Michelle Greiver MD[a,b,*], Tyler Williamson PhD[c,d], David Barber MD[c], Richard Birtwhistle MD[c,d], Babak Aliarzadeh MD[a,b], Shahriar Khan MSc[c], Rachael Morkem MSc[c], Gayle Halas MA[e], Stewart Harris MD[f], Alan Katz MB, ChB[e]


CMAJ OPEN

Research

Prevalence and management of hypertension in primary care practices with electronic medical records: a report from the Canadian Primary Care Sentinel Surveillance Network

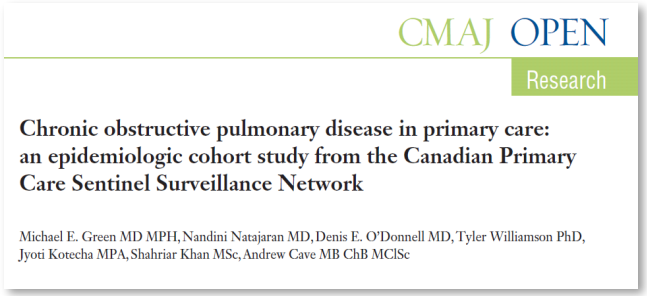
Marshall Godwin MD MSc, Tyler Williamson PhD, Shahriar Khan MSc, Janusz Kaczorowski PhD, Shabnam Asghari PhD, Rachel Morkem MSc, Martin Dawes MD, Richard Birtwhistle MD MSc


CMAJ OPEN

Research

The diagnosis of depression and its treatment in Canadian primary care practices: an epidemiological study

Sabrina T. Wong RN PhD, Donna Manca MD MClSc, David Barber MD, Rachael Morkem MSc, Shahriar Khan MSc, Jyoti Kotecha MPA, Tyler Williamson PhD, Richard Birtwhistle MD, Scott Patten MD PhD


CMAJ OPEN

Research

Chronic obstructive pulmonary disease in primary care: an epidemiologic cohort study from the Canadian Primary Care Sentinel Surveillance Network

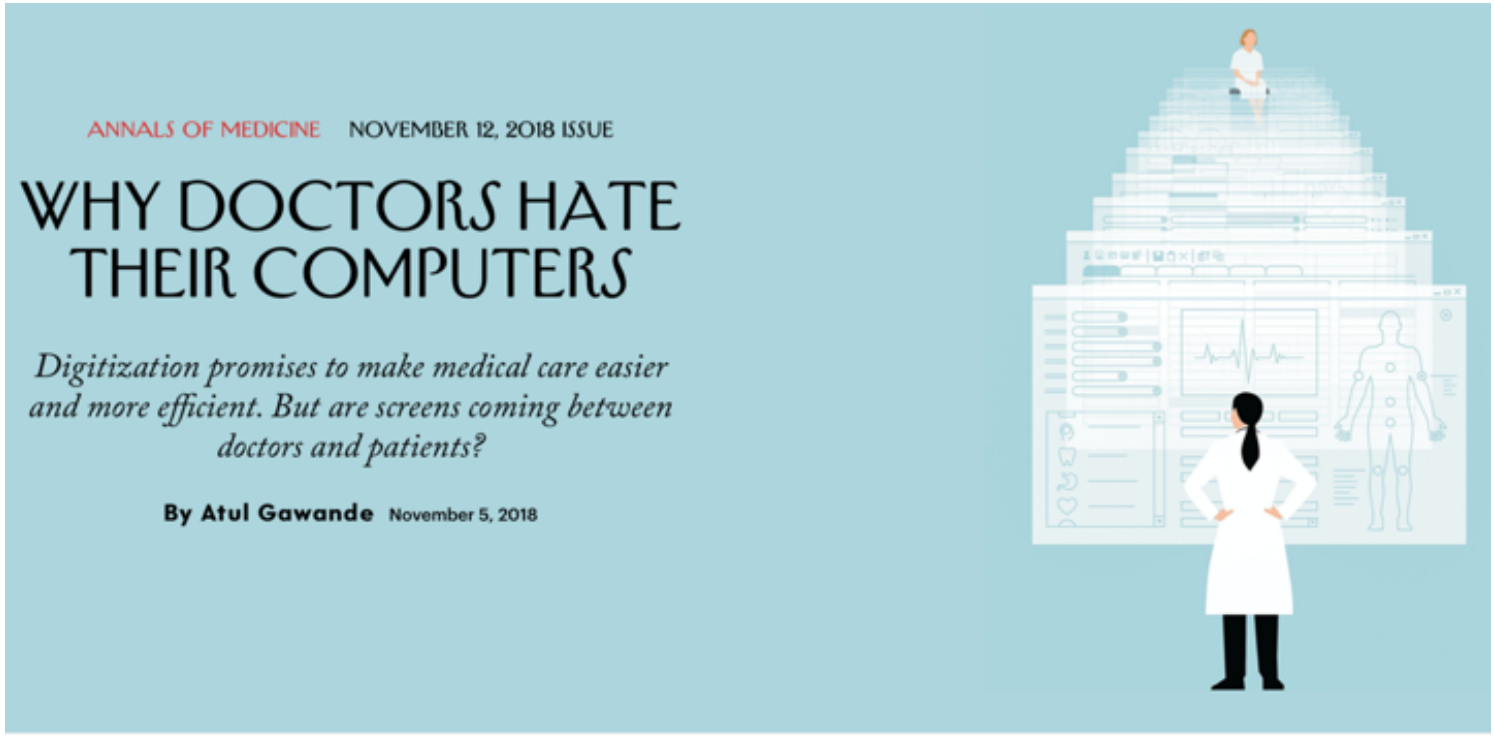
Michael E. Green MD MPH, Nandini Natajaran MD, Denis E. O'Donnell MD, Tyler Williamson PhD, Jyoti Kotecha MPA, Shahriar Khan MSc, Andrew Cave MB ChB MClSc

CPCSSN RCSSSP

HOW COULD AI IMPROVE PRIMARY CARE

CLINICAL & ADMINISTRATION

ADMINISTRATIVE AREAS



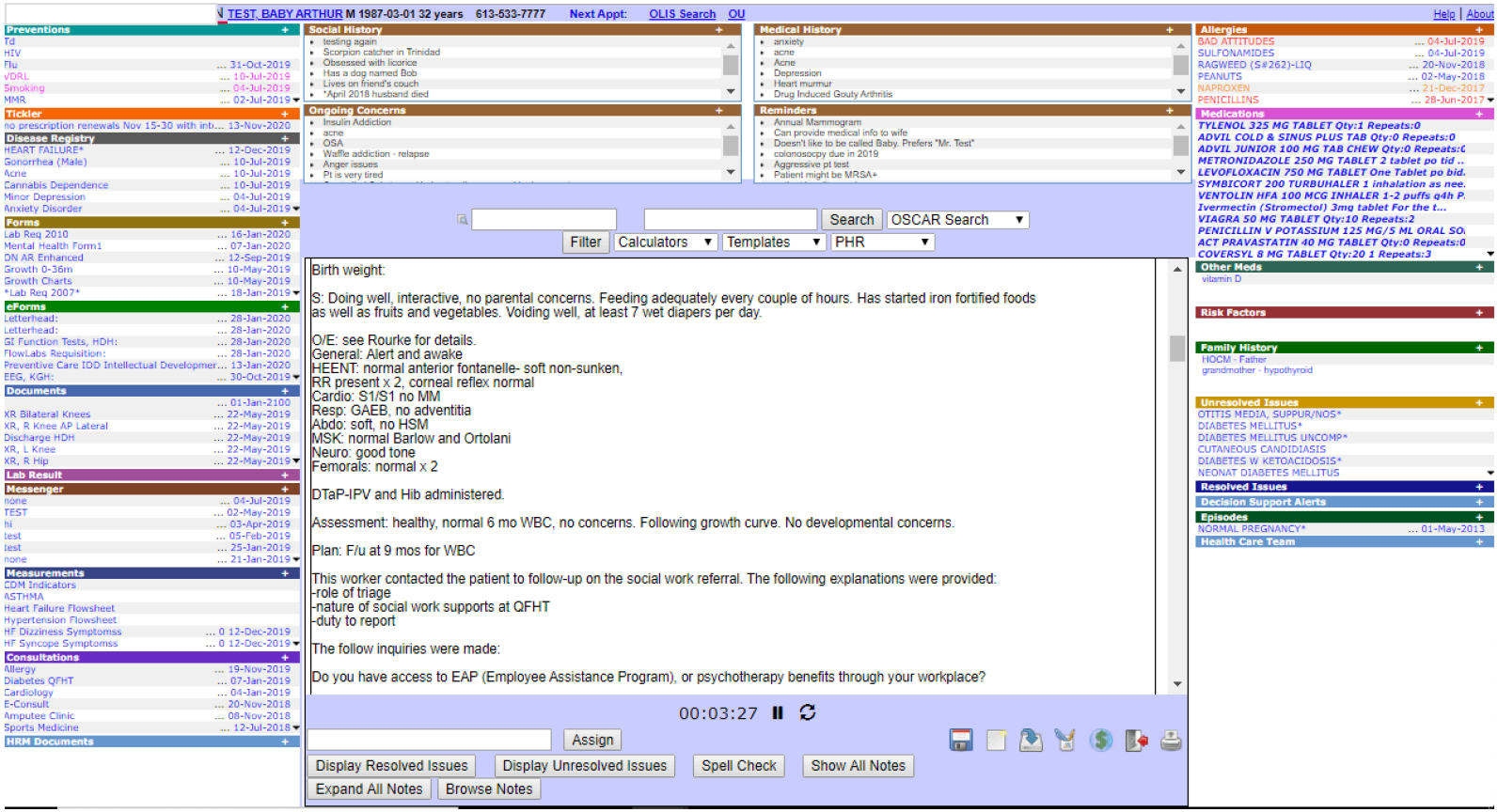
Digitization promises to make medical care easier and more efficient; instead, doctors feel trapped behind their screens.

ADMINISTRATIVE TASKS

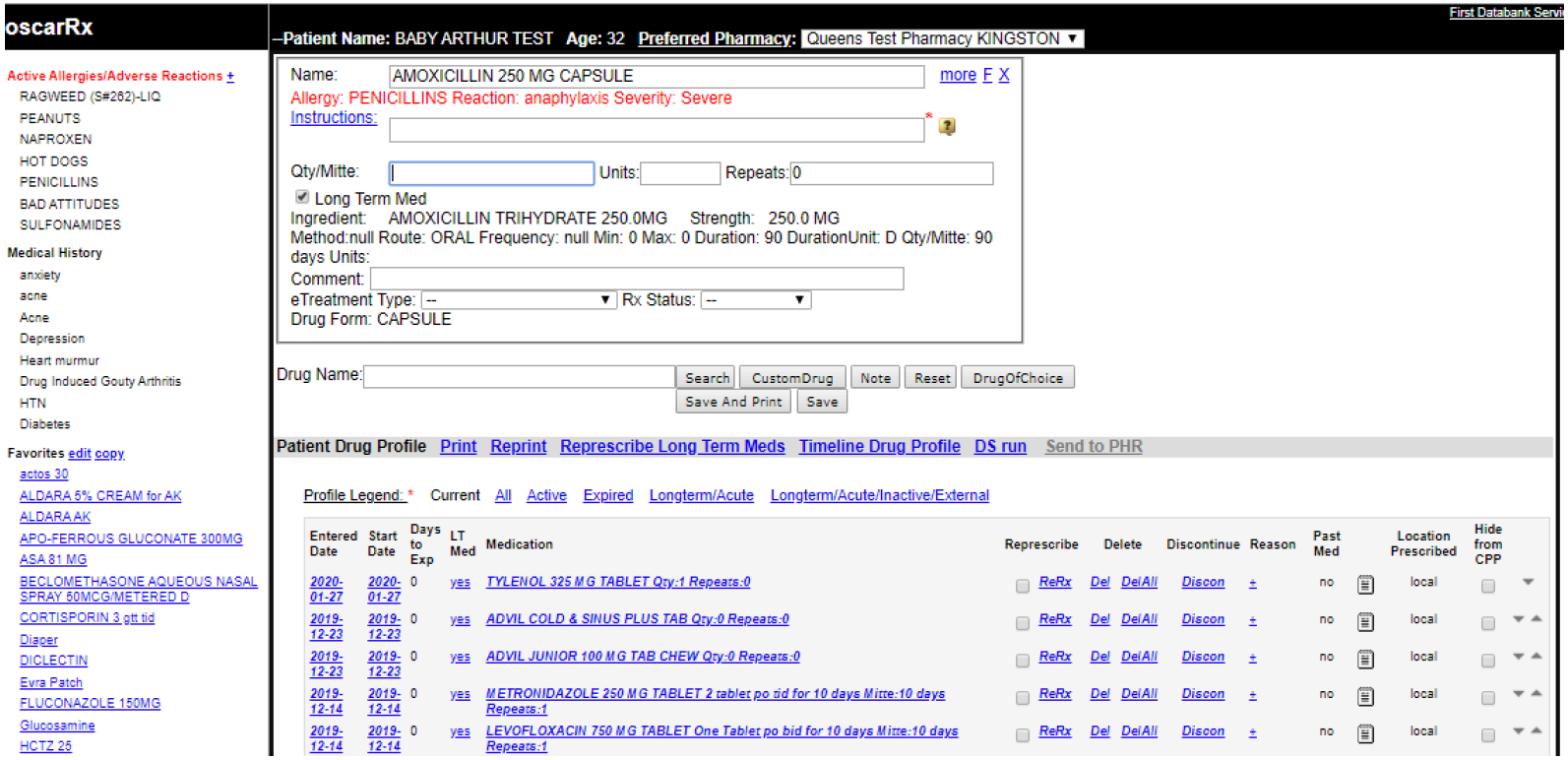
- Charting with NLP
- Patient interaction- eg determining and arranging appointments- includes assessing/triaging patients
- Populating chart areas– patient conversation, incoming documents
- Managing wait times (predicting visit load etc)
- Billing
- Filling out forms

AI

ADMINISTRATIVE TASKS

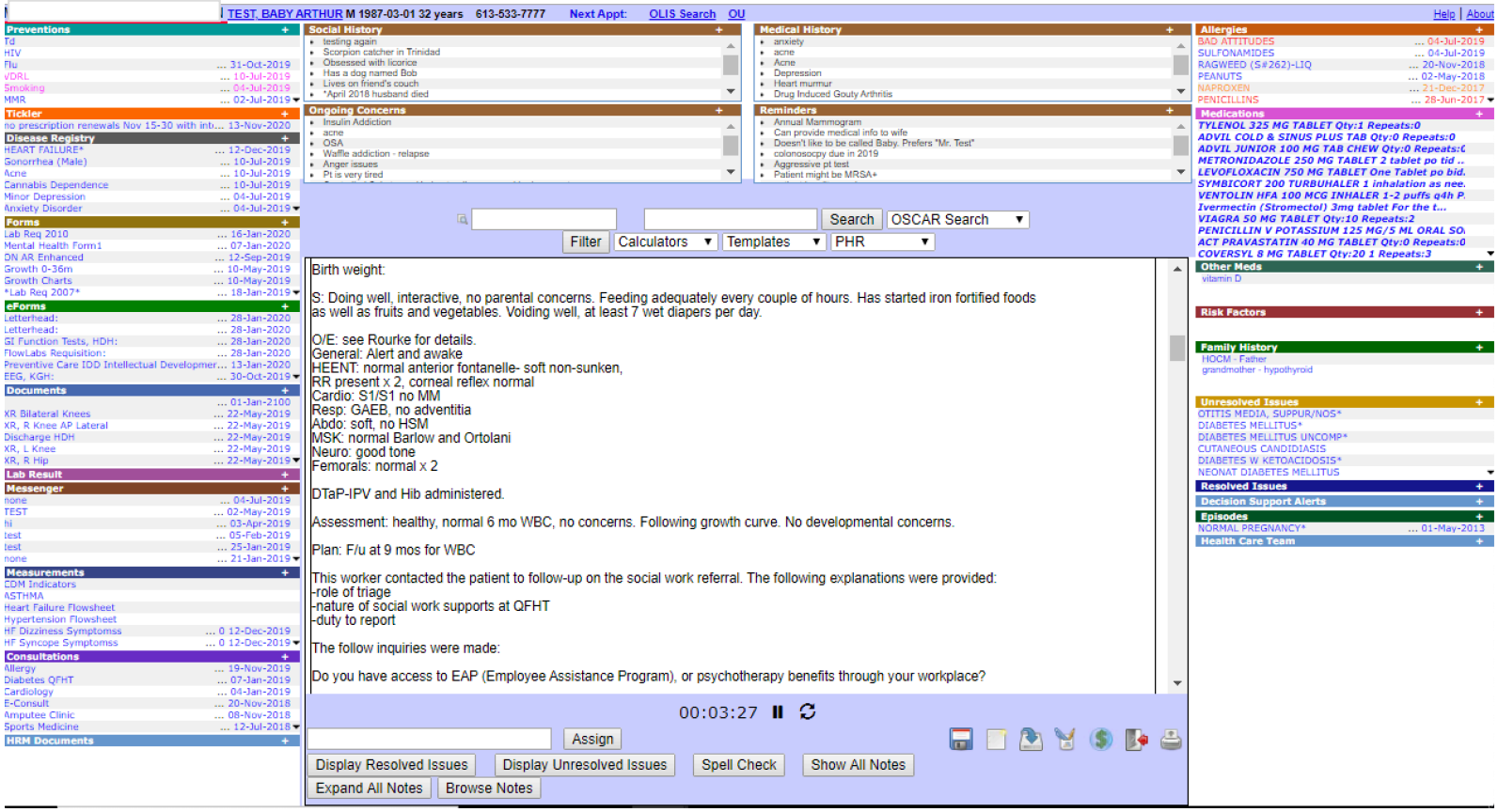


ADMINISTRATIVE TASKS-



AI

ADMINISTRATIVE TASKS- CHARTING



ADMINISTRATIVE TASKS- CHARTING

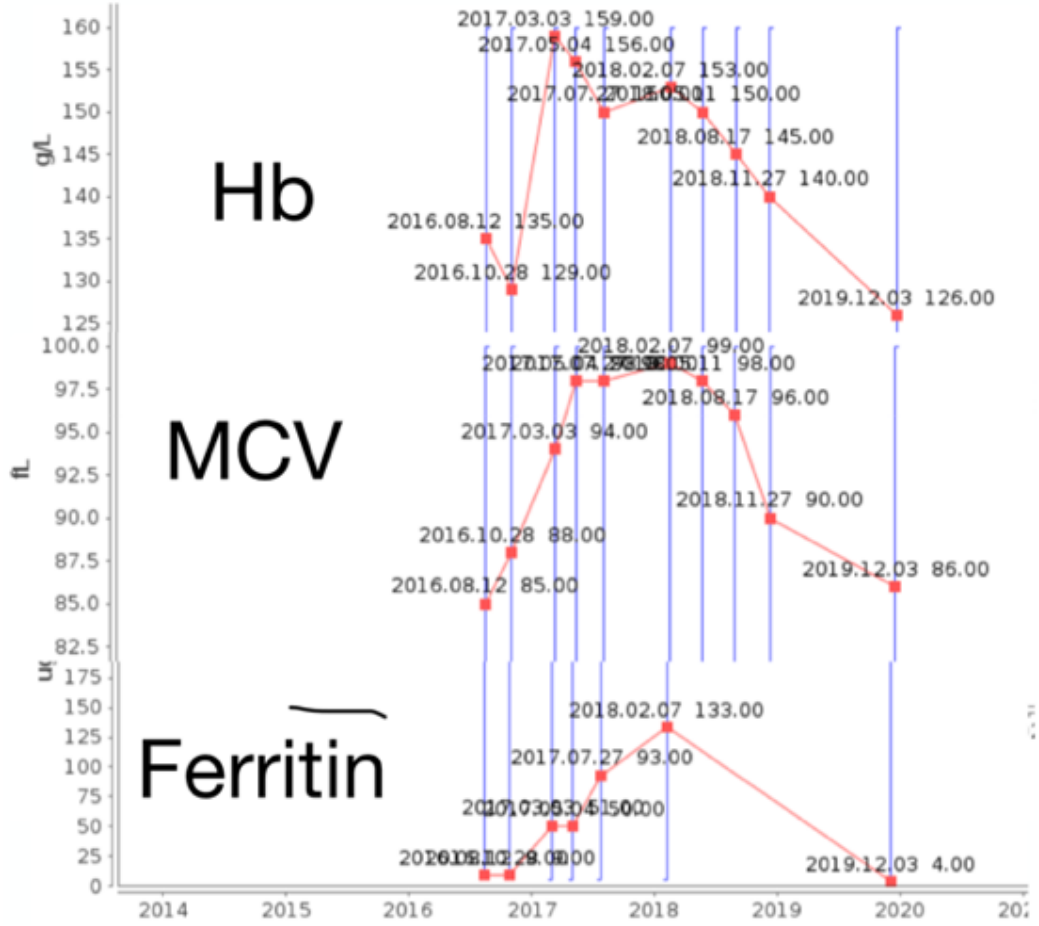
robin™
HEALTHCARE

Home Product Company

CLINICAL AREAS (COGNITIVE OVERLOAD)

- Intelligence from longitudinal data (labs,measurements, etc)
- Aiding/generating diagnosis
- Decision support
- Predicting disease- eg. Diabetes
- Recommend screening (Fhx, medication, surgical hx, etc)
- Recommend services for specific populations (socially/ materially deprived, mental health, disease specific)

CLINICAL AREAS- LONGITUDINAL DATA



CLINICAL AREAS- AIDING DIAGNOSIS

Sections

The Washington Post
Democracy Dies in Darkness

Medical Mysteries

All his life, his health was poor. It took more than 50 years to find out why.

Home
Share
599

CLINICAL AREAS- DIAGNOSIS

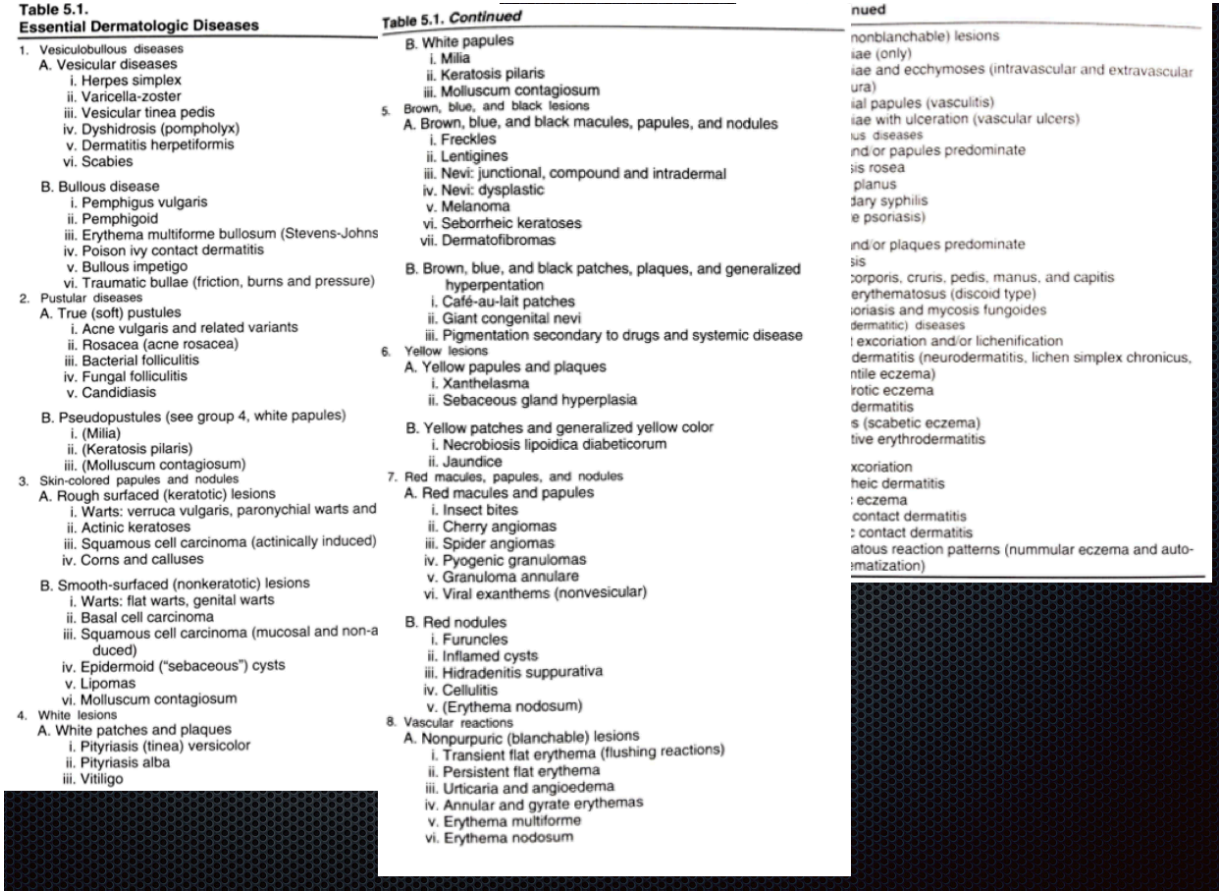


Table 5.1.
Essential Dermatologic Diseases

1. Vesiculobullous diseases
   - A. Vesicular diseases
     - i. Herpes simplex
     - ii. Varicella-zoster
     - iii. Vesicular tinea pedis
     - iv. Dyshidrosis (pompholyx)
     - v. Dermatitis herpetiformis
     - vi. Scabies
   - B. Bullous disease
     - i. Pemphigus vulgaris
     - ii. Pemphigoid
     - iii. Erythema multiforme bullosum (Stevens-Johns
     - iv. Poison ivy contact dermatitis
     - v. Bullous impetigo
     - vi. Traumatic bullae (friction, burns and pressure)
2. Pustular diseases
   - A. True (soft) pustules
     - i. Acne vulgaris and related variants
     - ii. Rosacea (acne rosacea)
     - iii. Bacterial folliculitis
     - iv. Fungal folliculitis
     - v. Candidiasis
   - B. Pseudopustules (see group 4, white papules)
     - i. (Milia)
     - ii. (Keratosis pilaris)
     - iii. (Molluscum contagiosum)
3. Skin-colored papules and nodules
   - A. Rough surfaced (keratotic) lesions
     - i. Warts: verruca vulgaris, paronychial warts and
     - ii. Actinic keratoses
     - iii. Squamous cell carcinoma (actinically induced)
     - iv. Corns and calluses
   - B. Smooth-surfaced (nonkeratotic) lesions
     - i. Warts: flat warts, genital warts
     - ii. Basal cell carcinoma
     - iii. Squamous cell carcinoma (mucosal and non-a duced)
     - iv. Epidermoid ("sebaceous") cysts
     - v. Lipomas
     - vi. Molluscum contagiosum
4. White lesions
   - A. White patches and plaques
     - i. Pityriasis (tinea) versicolor
     - ii. Pityriasis alba
     - iii. Vitiligo

Table 5.1. *Continued*

   - B. White papules
     - i. Milia
     - ii. Keratosis pilaris
     - iii. Molluscum contagiosum
5. Brown, blue, and black lesions
   - A. Brown, blue, and black macules, papules, and nodules
     - i. Freckles
     - ii. Lentigines
     - iii. Nevi: junctional, compound and intradermal
     - iv. Nevi: dysplastic
     - v. Melanoma
     - vi. Seborrheic keratoses
     - vii. Dermatofibromas
   - B. Brown, blue, and black patches, plaques, and generalized hyperpentation
     - i. Café-au-lait patches
     - ii. Giant congenital nevi
     - iii. Pigmentation secondary to drugs and systemic disease
6. Yellow lesions
   - A. Yellow papules and plaques
     - i. Xanthelasma
     - ii. Sebaceous gland hyperplasia
   - B. Yellow patches and generalized yellow color
     - i. Necrobiosis lipoidica diabeticorum
     - ii. Jaundice
7. Red macules, papules, and nodules
   - A. Red macules and papules
     - i. Insect bites
     - ii. Cherry angiomas
     - iii. Spider angiomas
     - iv. Pyogenic granulomas
     - v. Granuloma annulare
     - vi. Viral exanthems (nonvesicular)
   - B. Red nodules
     - i. Furuncles
     - ii. Inflamed cysts
     - iii. Hidradenitis suppurativa
     - iv. Cellulitis
     - v. (Erythema nodosum)
8. Vascular reactions
   - A. Nonpurpuric (blanchable) lesions
     - i. Transient flat erythema (flushing reactions)
     - ii. Persistent flat erythema
     - iii. Urticaria and angioedema
     - iv. Annular and gyrate erythemas
     - v. Erythema multiforme
     - vi. Erythema nodosum

nued

nonblanchable) lesions
iae (only)
iae and ecchymoses (intravascular and extravascular
ura)
ial papules (vasculitis)
iae with ulceration (vascular ulcers)
us diseases
nd/or papules predominate
is rosea
planus
dary syphilis
e psoriasis)

nd/or plaques predominate
sis
corporis, cruris, pedis, manus, and capitis
erythematosus (discoid type)
oriasis and mycosis fungoides
dermatitic) diseases
excoriation and/or lichenification
dermatitis (neurodermatitis, lichen simplex chronicus,
ntile eczema)
rotic eczema
dermatitis
s (scabetic eczema)
tive erythrodermatitis

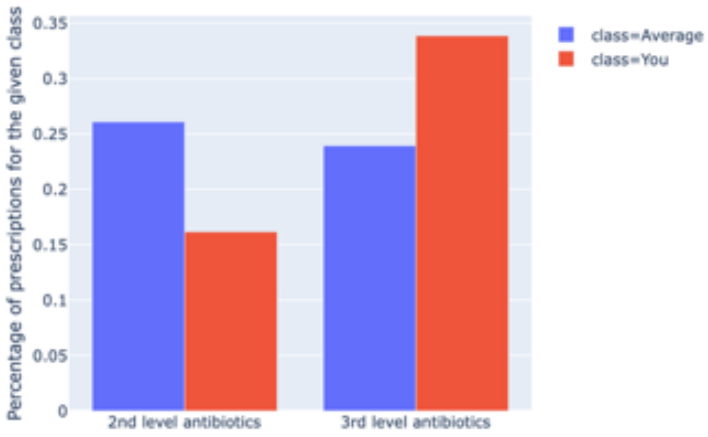
xcoriation
heic dermatitis
eczema
contact dermatitis
contact dermatitis
atous reaction patterns (nummular eczema and auto-
matization)

CLINICAL AREAS- DECISION SUPPORT

Your diagnosis

Acute Cystitis Females >12 years old,Uncomplicated Pneumonia- Adult: Community acquired, mild to moderate, Outpatient without comorbidity/modifying factors

Your prescription behavior for 2nd and 3rd line antibiotics



escriptions for female patients between 20-30 years for the same diagnosis

Your treatment options

Recommended antibiotics for your area

1st level - TMP/SMX 1 DS tab po bid for 3 days

GENERATE PRESCRIPTION

SEND PRESCRIPTION

CONCLUSIONS

- Major opportunities for AI in primary care
- AI components can help to deliver more efficient and better care
- Could be a major player in addressing clinician burnout
- Challenges include getting EMR vendors to develop and implement AI solutions
- Data from CPCSSN can help to develop AI solutions

TEXT

WE ALWAYS OVERESTIMATE THE CHANGE THAT WILL OCCUR IN THE NEXT TWO YEARS AND UNDERESTIMATE THE CHANGE THAT WILL OCCUR IN THE NEXT TEN.

Bill Gates