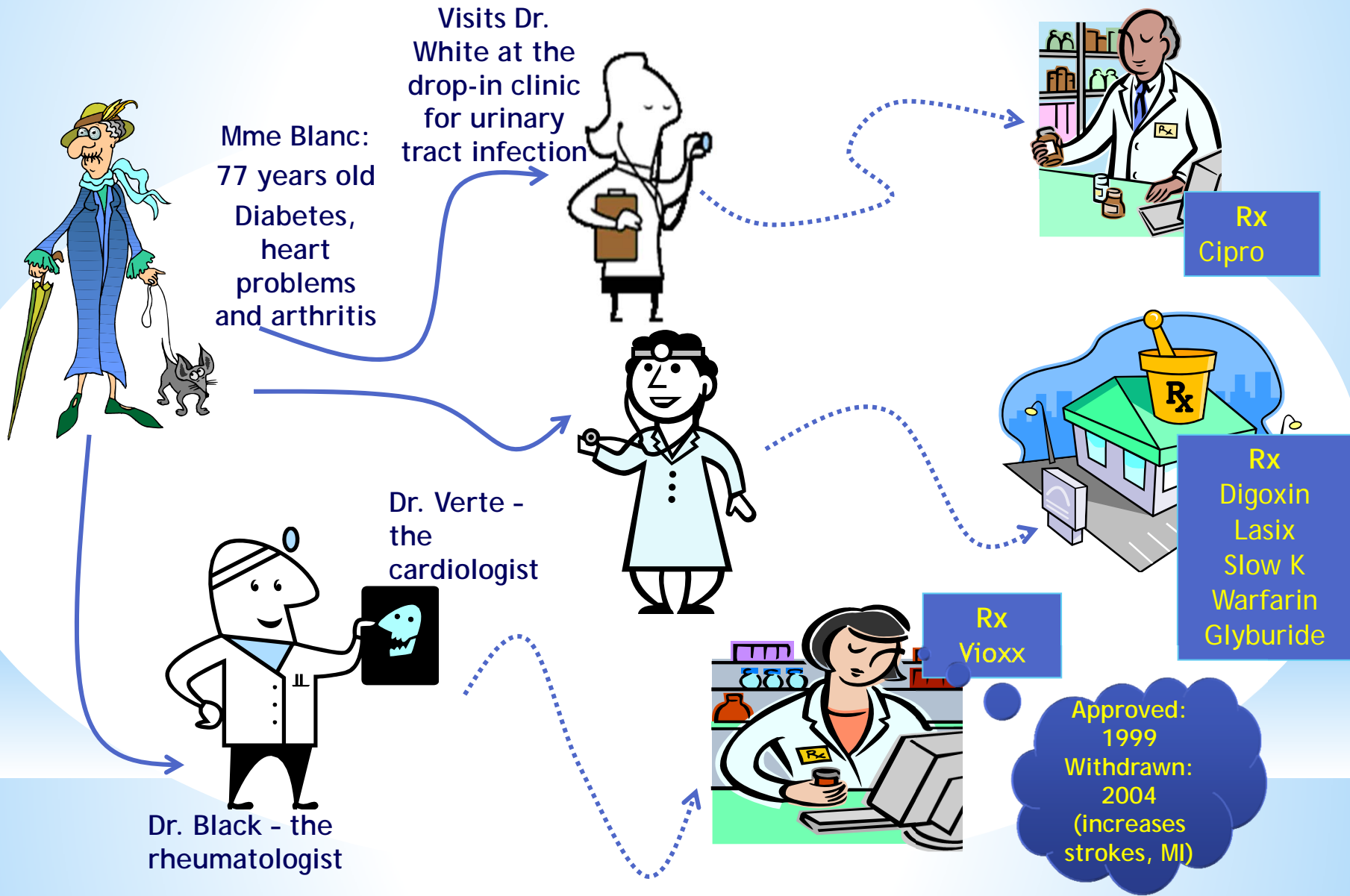


## The Use of Health Information Technologies:

New Opportunities for Research and Improvement in the Safety and Effectiveness of Prescription Drugs

# The Rx Road



# The Rx Road

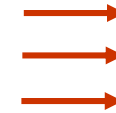
Mme Blanc puts all her meds in her new bottle (Vioxx) for convenience



Unrecognized drug interaction that increases the risk of bleeding [Cipro + Warfarin, Glyburide]



Mme Blanc develops a headache and sudden weakness on her left side

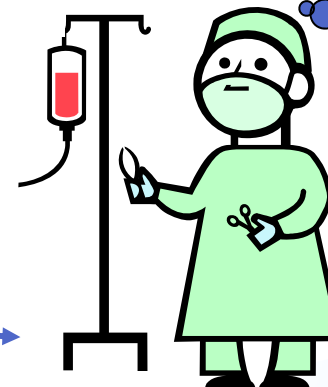


Mme Blanc diagnosed with hemorrhagic stroke with seizures.

Sorry, we only have a record of Vioxx.



Call pharmacist for medication list. Get a neurology consult

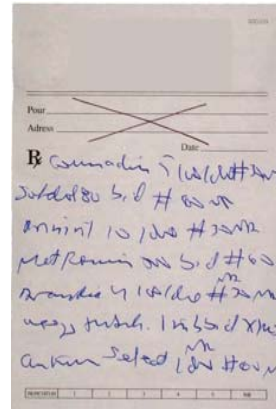


# The Rx Road

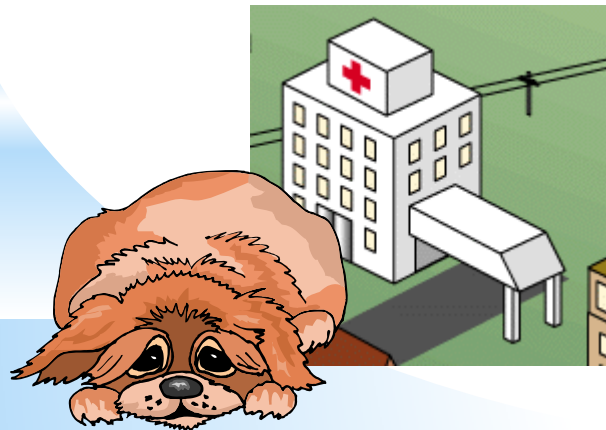
Dr Grad, the neurologist starts Mme Blanc on Dilantin for seizures.



The pharmacist has trouble reading the rx and dispenses 400 mg of Dilantin—200 mg per day was prescribed



Mme Blanc is hospitalized for her hip fracture for surgery and rehab



Mme Blanc is dizzy from too high a dose of Dilantin, falls down her steps, and fractures her hip



# The Expected Benefits of Health Information Technologies

---

## ➤ Safety

- Reduce Prescribing + Transcription Errors
- Improve Follow-up Monitoring

## ➤ Quality

- Improve Appropriateness
- Improve Adherence

## ➤ Drug Costs

- Improve Cost-Effective Prescribing

## ➤ Post-Market Surveillance

- Provide New Tools for Pharmacosurveillance



# Safety



"I can tell this prescription is a phony.  
The doctor's signature is legible."

# Computerizing Prescribing

Reduce Potential Errors By Providing Menus for Dose Selection

New Prescription Print Blank Rx

Add New Drug: prinivil

The new prescription: **PRINIVIL** TABLET 2.5MG

**PRINIVIL** TABLET 5MG

**PRINIVIL** TABLET 10MG

**PRINIVIL** TABLET 20MG

Close

New Prescription Print Blank Rx

Add New Drug:

Select: [All](#) [None](#) Save Save and Print Delete

<input type="checkbox"/>	Drug	Posology	Quantity/Duration	Indication(s)	Stop/Change Reason
<input type="checkbox"/>	<b>PRINIVIL</b> TABLET 5MG Sample: <input type="checkbox"/>	1.00 TABLET qAM with meal(s)	30 Day(s) 12 Refills Qty: 30.00 Auto: <input checked="" type="checkbox"/>	<input type="text"/> Essential (primary) hypertension Heart failure Hypertension in Scleroderma Hypertensive heart disease Hypertensive renal disease Migraine Post-infarction	

Note:

# Computerizing Prescribing

## Handwritten Vs. Computer-Generated Prescriptions

800309

Pour \_\_\_\_\_  
 Adress \_\_\_\_\_  
 Date \_\_\_\_\_

**R** Coumadin 5 (10/10) # 30m  
 Jutdol 80 5/d # 60 m  
 Anvint 10 1/d # 30m  
 Metformin 500 5/d # 60  
 Coumadin 5 (10/10) # 30m  
 upo 250. 1 (5/d) # 10  
 Antur Select 1 (5/d) # 60

REPETATUR	1	2	3	4	5	NR
-----------	---	---	---	---	---	----

MOXXI Rx no: 28584200 Lundi, 23 février, 2009

Dr. Training User 6 M.D.  
 Test Establishment for test patients  
 1140 Pine West, Montreal, Quebec, H3A-1A3

PETRELLI, ANTOINE [PETA47060836, Age: 61]

**PRESCRIPTION**

1 / 4 -	CENTRUM SELECT COMP.CROQ. #30x30 Jour(s) 1 COMP.CROQ. die Note: --	Rép:8
2 / 4 -	COUMADIN 5MG COMPRIME #30x30 Jour(s) 1 COMPRIME die Note: --	Rép:8
3 / 4 -	HYDROCHLOROTHIAZIDE 12.5MG COMPRIME #30x30 Jour(s) 1 COMPRIME qAM avec le(s) repas Note: --	Rép:8
4 / 4 -	METFORMIN 500MG COMPRIME #90x30 Jour(s) 1 COMPRIME tid avec le(s) repas Note: --	Rép:8

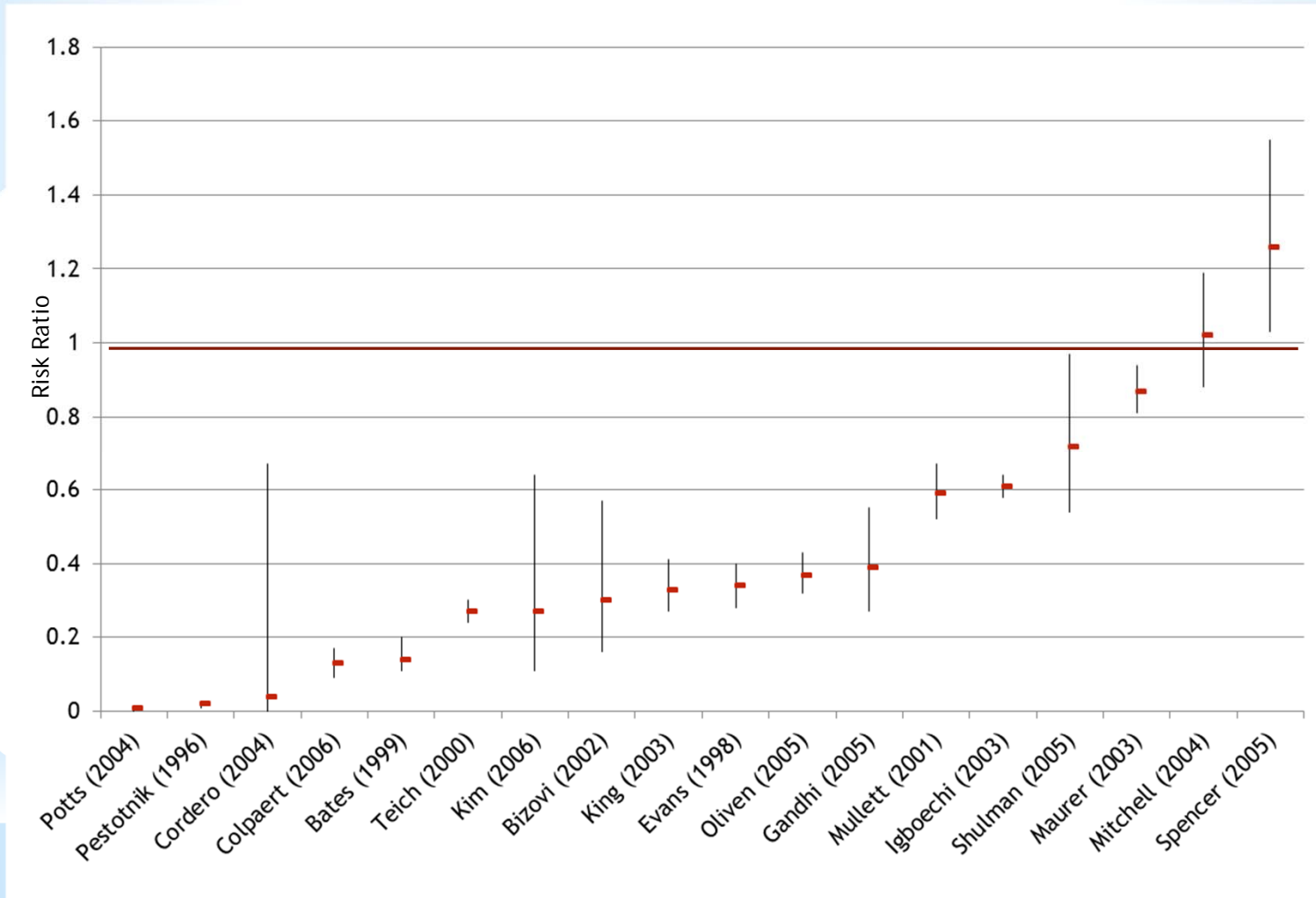
Training User 5  
 Licence: 55550 Pg. 1



# Computerizing Prescribing

## Typed Prescriptions Reduce Prescribing & Transcription Errors



Ammenworth et.al. Vol 15, No 5, JAMIA, 2008 (figure 6)



# Computerized Decision Support

## Providing Automated Alerts for Prescribing Problems

### Suppress Alerts

Type ▾	Drug(s)	Level ▾	Suppress
Diabetes: use with caution, may mask some symptoms	<ul style="list-style-type: none"><li>METOPROLOL 24H-TABLET 200MG</li></ul>	 (Moderate)	<input type="text"/> <input checked="" type="radio"/> Suppress for this patient only <input type="radio"/> Suppress for all patients
<a href="#">antagonism</a>	<ul style="list-style-type: none"><li>METOPROLOL 24H-TABLET 200MG</li><li>™VENTOLIN HFA METERED INH. 100MCG</li></ul>	 (Serious)	<input type="text"/> <input checked="" type="radio"/> Suppress for this patient only <input type="radio"/> Suppress for all patients

# Computerized Decision Support

## On-Demand vs. Automated Drug Alerts

Tamblyn et al. JAMIA. July/August, 2008

% Seen and Revised in 3,449 Patients		
Characteristic	On Demand Alerts	Automated Alerts
Number of Patients	1,550	1,899
Number of Alerts	4,445	6,506
% Seen	0.9%	10.3%
% Revised that were Seen	75.6%	12.1%



# However Most Drug Alerts from Commercial Systems are Ignored!

---

Weingart et.al. Archives Int Med, 2003

- Physicians over-ride 49% to 96% of alerts for drug-allergy, drug-drug and drug-disease contraindications
- Experienced physicians more likely to over-ride alerts than trainees
- Incorrect data explains most allergy and pregnancy alerts
- “Benefit greater than risk” reason for most over-rides

# Incorporating Epidemiological Science into Risk-Benefit Assessment

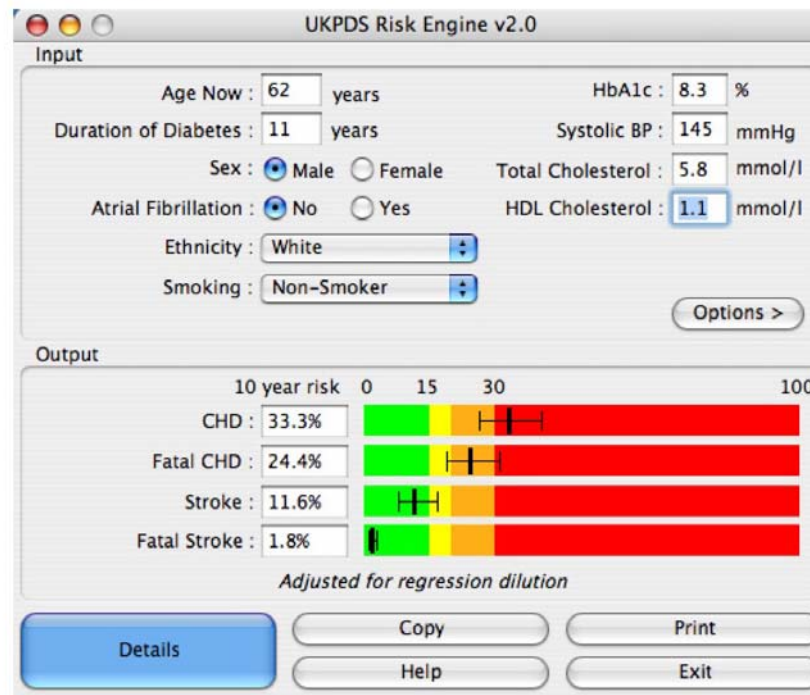
## UKPDS Risk Engine



Home page

### Background

Risk calculators based on equations from the Framingham Heart Study tend to underestimate risks for people with diabetes as this study included relatively few diabetic subjects. The UKPDS Risk Engine is a type 2 diabetes specific risk calculator based on 53,000 patients years of data from the UK Prospective Diabetes Study, which also provides an approximate 'margin of error' for each estimate.



# Designing New Smart Alerts that Provide Person-Specific Risk Assessment

Select: [All](#) [None](#) + Represent

Go to: 2009-02 | 2009-03 | 2009-04

$$\begin{aligned}
 \text{hazard\_total} = & \text{hazard\_nm} * \text{EXP} (0.304 * \text{class\_2} + 0.035 * \text{class\_3} + \\
 & 0.253 * \text{class\_4} + 0.105 * \text{class\_5} + \\
 & 0.088 * \text{class\_6} + 0.088 * \text{class\_7} \\
 & + 0.225 * \text{class\_9} + 0.056 * \text{class\_11} + \\
 & 0.008 * \text{class\_13} + 0.106 * \text{class\_15} + \\
 & 0.099 * \text{class\_16} + 0.047 * \text{class\_17} \\
 & + 0.147 * \text{class\_18} + 0.07 * \text{class\_23} )
 \end{aligned}$$

hazard\_nm =  $\beta * \text{gb} +$

101 6/14 0/0 0/0

$$\text{risk\_total} = 100 * \left( 1 - \left( 1 - \frac{\text{baseline}}{100} \right)^{\text{hazard\_total}} \right)$$

$$\text{risk\_nm} = 100 * \left( 1 - \left( 1 - \frac{\text{baseline}}{100} \right)^{\text{hazard\_nm}} \right)$$

**Risk Factors**

- Age: 78
- Gender (F)
- Cognitive impairment
- Gender
- Fall-related injuries
- Psychotropic Drugs
- [Learn more](#)
- [Tapering benzodiazepine](#)

**Lowest risk (3.56)**

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 100

out of 100 people with the same profile will fall

- Age, sex, and physical condition risk
- Medication risk
- Recalculated medication risk - reduction
- Recalculated medication risk - increase

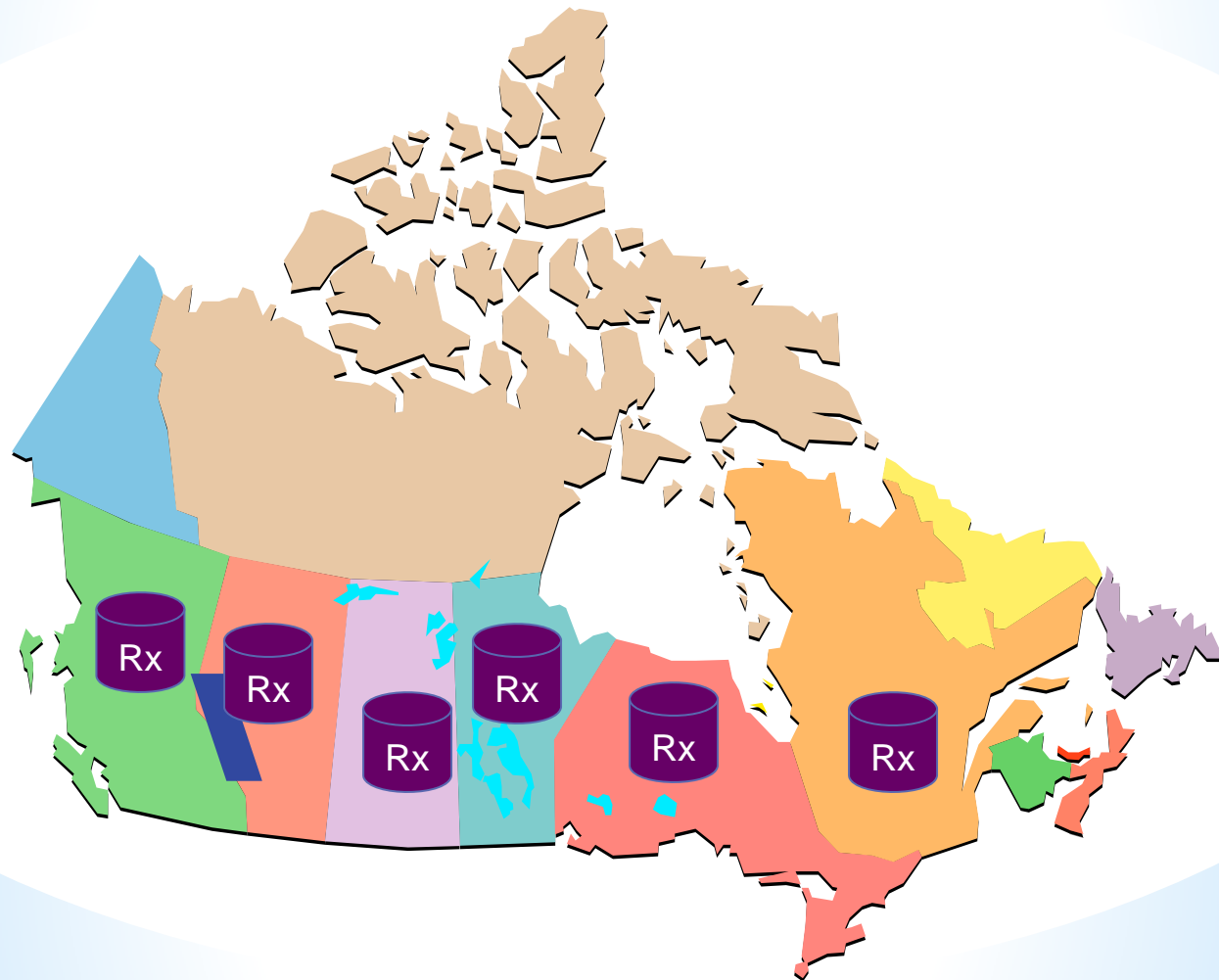
**No planned reduction in risk. Reason:**

\* Risk for this patient may be under-estimated because of incomplete data

# Integrating Computerized Prescribing with Drug Dispensing Information

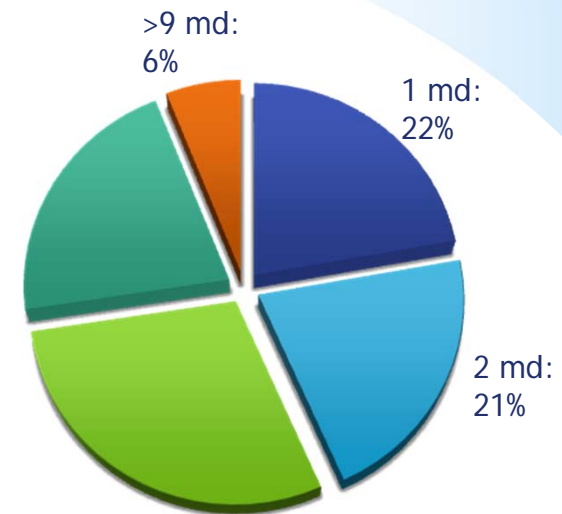
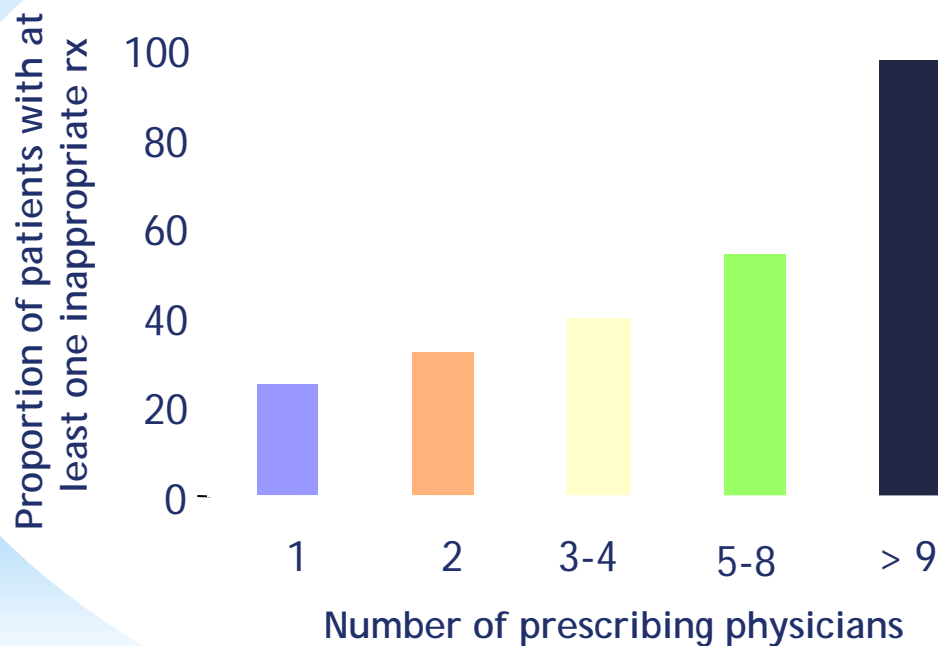
---

Coming Soon to Canada!



# Multiple Prescribing Physicians Increase the Risk of Inappropriate Prescriptions

Tamblyn et. al., CMAJ, 1993



MOXXI: 198,051 eligible patients insured by the RAMQ drug insurance from Jan. 2006 to Jan. 2007



# Improving Safety

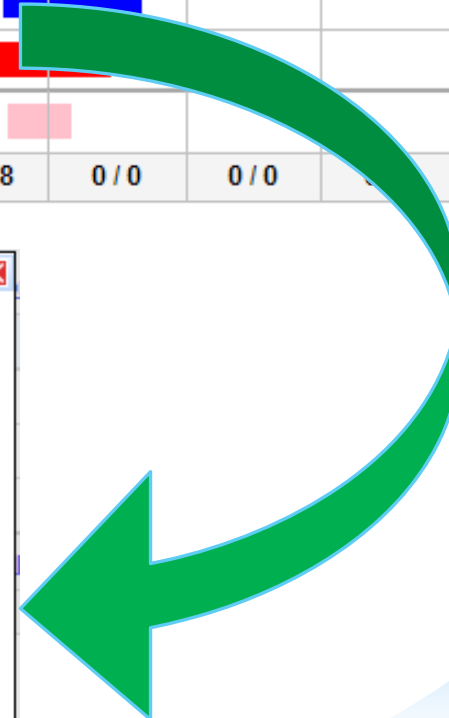
## Retrieving a Complete Drug Profile from an Integrated Drug Management System

Select: [All](#) [None](#)   [Represcribe](#)   [Stop](#)   [Prescription History](#)   [Legend](#)   [Print](#)

<input type="checkbox"/>	Drug	2008-09	2008-10	2008-11	2008-12
<input type="checkbox"/>	<u>TM</u> CENTRUM SELECT				
<input type="checkbox"/>	<u>TM</u> COUMADIN 5MG				
<input type="checkbox"/>	<u>TM</u> GEN METFORMIN 500MG				
	<a href="#">ER Visits / Hospitalizations:</a>				
	<b>Patient \$ / RAMQ \$:</b>	<b>7 / 18</b>	<b>0 / 0</b>	<b>0 / 0</b>	

**Legend**

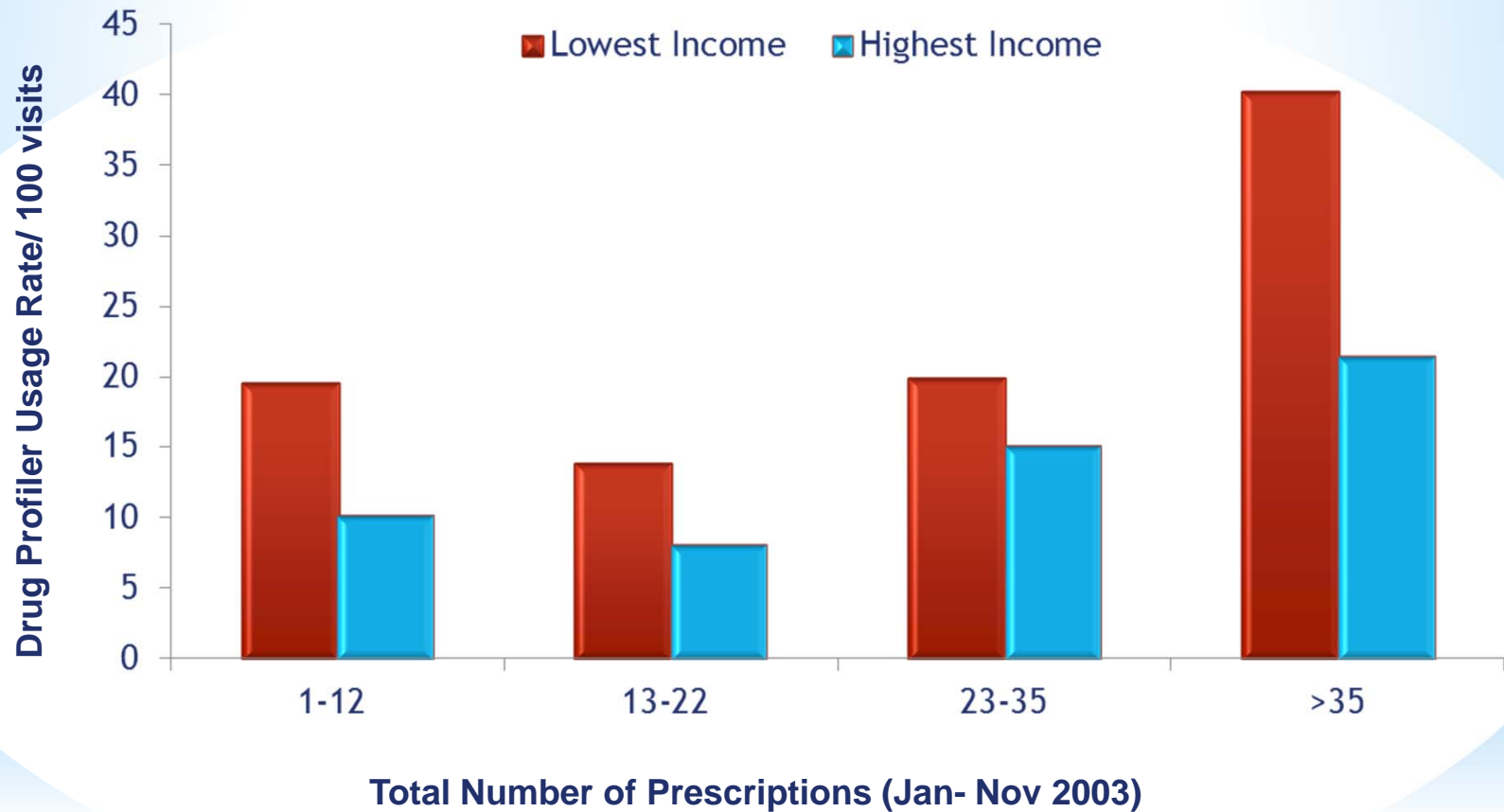
- Prescribed by you with MOXXI-NG but not yet dispensed
- Prescribed by you and dispensed
- Prescribed by another physician (dispensed)
- Sample  
(Darker colours represent a drug overlap)
- ER Visits / Hospitalizations
- Today's date
- Prescription Stopped
- Change of dose
- Drug associated with an alert



# Physicians Using the Integrated Drug Profiler

For Patients with Multiple Drugs and Low Income

Yuko Kawasami et.al. International Journal of Medical Informatics, 2007



# Evidence-Based Treatment

---

Bring me some  
terbutaline--  
I'm brewing a  
potion to halt  
premature  
labor.



But that's an  
off-label use!

stus.com

# Computerized Decision Support

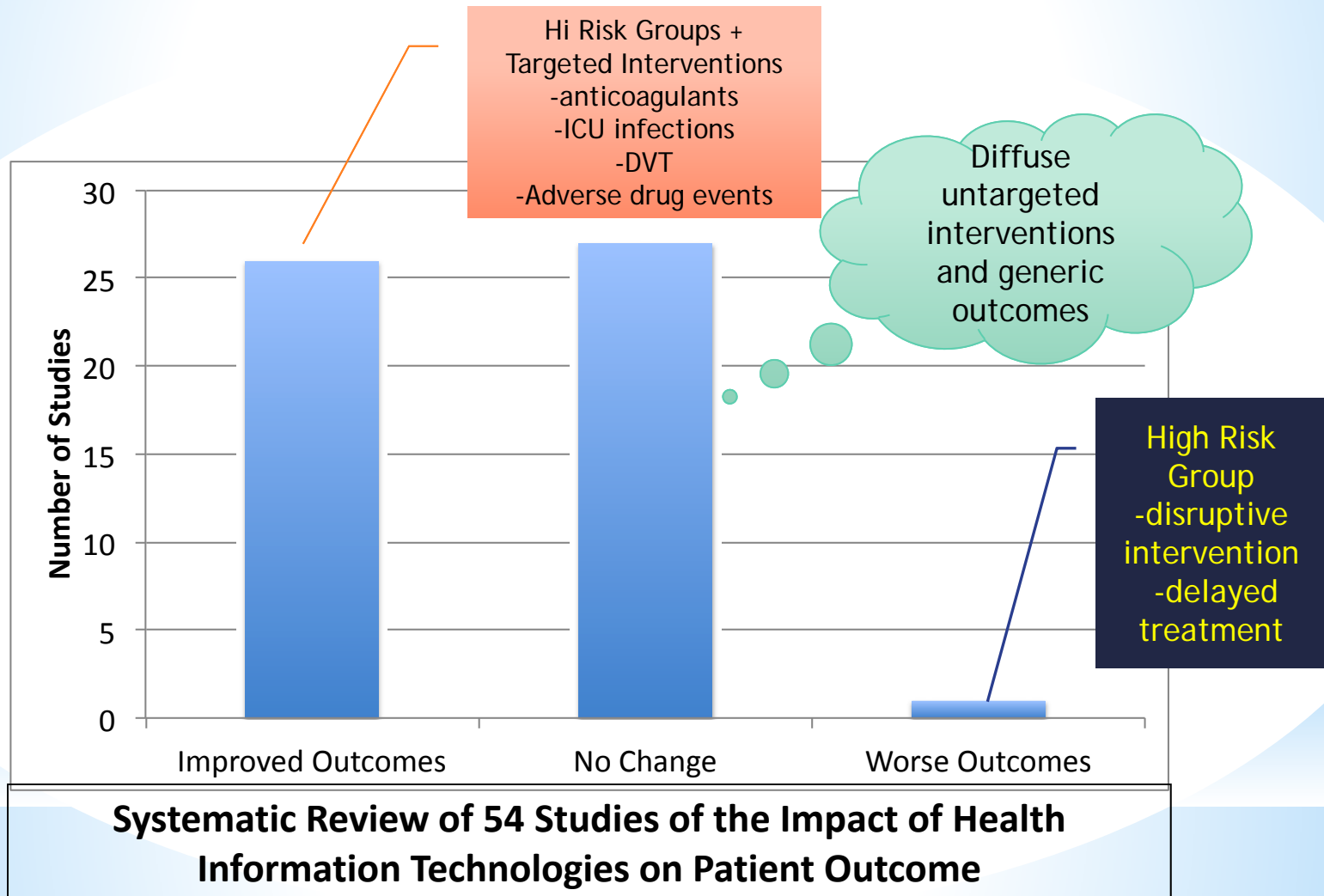
To Improve Quality of Care and Patient Outcomes

Systematic Review; Garg et.al. JAMA, March 9, 2005

<b>Improvement in Quality of Care</b>	<b>Number of Trials</b>	<b>Success Rate</b>
Diagnostic Decision-Making	10	40%
Patient Care Reminder Systems	21	76%
Disease Management Decision-Support	37	62%
Drug Dosing	29	66%
<b>Improvement in Patient Outcomes</b>	<b>Number of Trials</b>	<b>Success Rate</b>
All systems	52	13%

# Health Information Technologies that Improve Outcomes Target High-Risk Populations

AHRQ, McGibbon, Tamblyn et.al, 2010



# Daily Surveillance of ER Visits and Rescue Medication to Assess Asthma Control

**Alert!**  
Analysis of Daily Downloads of Information from the Provincial Insurance Billing Data

The screenshot shows a patient profile for LISA SIMPSON in the MOXXI-NG system. The browser address bar shows the URL: https://moxxi.irisquebec.ca/moxxi/views/pati. The patient's name is LISA SIMPSON (SIML80031416). The profile includes tabs for Summary, Problems, Allergies, Medications, Patient Monitoring, Asthma, and Notes. A green arrow points from the alert box to a warning message that says: "Since the last time you accessed this record, new information is available. The patient's asthma appears to be OUT OF CONTROL." Below the warning are buttons for "Close Asthma Warning" and "Open Asthma Profile". The general information section lists: NAM: SIML80031416, First Name: LISA, Age: 31, Birth Date: 1980-03-14, Weight, Gender: Female, Email: iphigenia.symeonidis@mcgill.ca, Telephone(s): Residence: (514) 555-5555, Cell: (514) 555-5555. There are also "Edit" and "Remove consent" buttons.

MOXXI-NG - Patient Profile- LISA SIMPSON (3  
https://moxxi.irisquebec.ca/moxxi/views/pati  
My Patients My Practice Monographs Rola El Halabieh  
Summary Problems Allergies Medications Patient Monitoring Asthma Notes  
Print Print Full Record Printable Forms  
General Information  
NAM: SIML80031416  
First Name: LISA  
Age: 31  
Birth Date: 1980-03-14  
YYYY-MM-DD  
Weight:  
Gender: Female  
Email: iphigenia.symeonidis@mcgill.ca  
Telephone(s): Residence: (514) 555-5555  
Cell: (514) 555-5555  
Edit Remove consent  
Close

Since the last time you accessed this record, new information is available.  
The patient's asthma appears to be  
**OUT OF CONTROL**  
Close Asthma Warning Open Asthma Profile

# Computerized Decision Support for Evidence-Based Asthma Management

The screenshot displays a clinical decision support system interface for asthma management. The top navigation bar includes 'My Patients', 'My Practice', and 'Monographs'. The user is identified as 'ARTHUR LAROCHE'. The main content area is titled 'Asthma Profile' and indicates that the patient's asthma is 'OUT OF CONTROL'. The interface is divided into several sections:

- 1. Please validate drugs and posologies:** A table with columns for 'Drug' and 'Posology'.

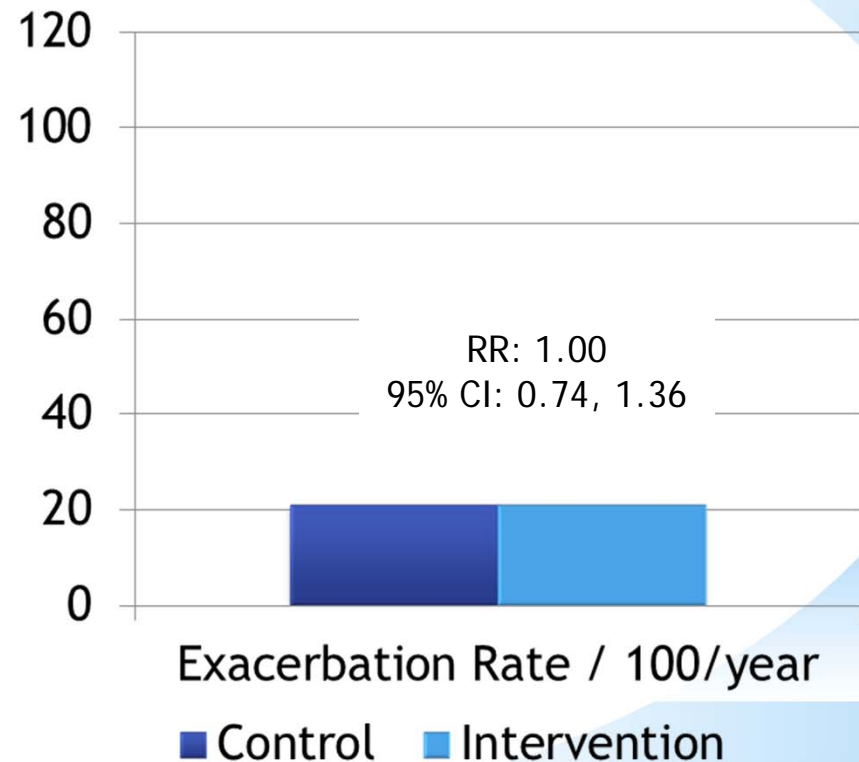
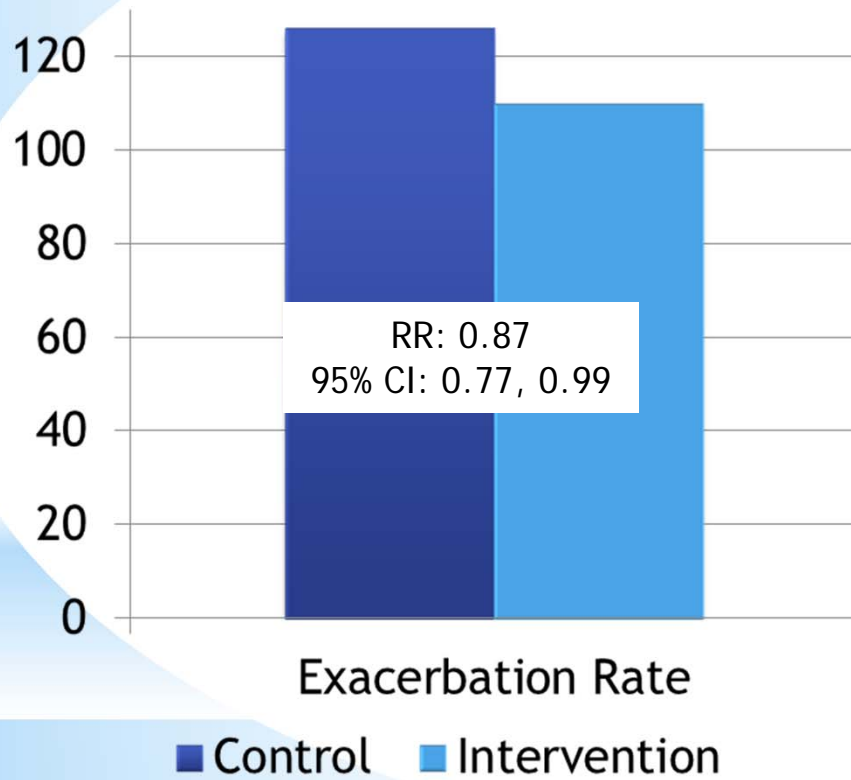
Drug	Posology
<input checked="" type="checkbox"/> THEVENTOLIN HFA 100MCG	1-2 INH
<input checked="" type="checkbox"/> THEFLOVENT DISKUS 100MCG	1 INH BID
- 2. Respiratory-related ER Visits & Faba Medication Usage:** Includes checkboxes for 'Respiratory-related ER visits in the past 3 months: 1 visit(s)' and 'Dispensed FABA medications in the past 3 months: dose >= 250'.
- 3. In the last week, the patient has:** A list of symptoms with checkboxes, including 'Had an urgent medical visit for asthma' which is highlighted in yellow.
- 4. Update:** A button labeled 'Update Suggested Treatment'.
- Suggested Treatment:** A section with a green border containing:
  - 5. Select Recommendation:** A list of recommendations with checkboxes. The option 'Determining Drug: ( FLOVENT DISKUS 100MCG 1 INH BID )' is highlighted in green.
  - 6. Prescribe Fast Acting B Agonist (FABA) if needed:** Includes checkboxes for 'SALBUTAMOL MDI 100 1-2 INH AS NEEDED' and 'TERBUTALINE 500 1 INH AS NEEDED'.
  - 7. Apply Changes:** Includes buttons for 'Proceed with Changes' and 'Proceed with Changes And Print'.

# Computerized Decision Support for Evidence-Based Asthma Management

Tamblyn, Ernst, Winslade: CIHR RCT## NCT00170248

Out-of-Control at First Visit: 704  
(15.8%)

In-control at First Visit: 3,743  
(84.2%)





# Providing Patients with Self-Management Tools within a Personal Health Record

Dr. Sara Ahmed, McGill University: CIHR Research in Progress

My Asthma Portal - My Asthma Target - Mozilla Firefox

File Edit View History Bookmarks Tools Help

mcgill.ca https://map.moxi.mcgill.ca/awp/views/patient/asthmaprofile/asthmaprofile001.seam

Most Visited MOXXI-NG Work Java Web Dev Dictionnaire McGill Bus Tools Oracle AHCA Javascript bak Flex Solaris Linux

View Issues - M... 0000745: Make ... 0000884: Make ... 0001047: Adjus... 0000969: Pop-u... 0001172: asthm... 0000901: A nu... 0001408: Make ... 0002117: Only ... My Asthm... x

**My Goal:**  
faire + de sport

See how well you are doing in taking control of your asthma!

By using your Asthma Action Plan, exercising regularly, and taking your asthma medications as recommended, your asthma is less likely to prevent you from doing the things you want to do. When you are in good asthma control, you will have fewer symptoms, sleep through the night without coughing, make fewer unscheduled visits to the doctor or emergency room (ER), and improve your overall quality of your life.

**Remember:** the closer you are to the center of the target, the better you are doing!

**update your asthma target**

[Update your asthma target](#)

**Quick tips**

Review your [action plan](#)

Be aware of [your triggers](#)

Check the weather, pollution and pollen index each day.

**My Asthma Health Status**

Last updated: Monday, May 24, 2010

**Legend**

Be careful! Needs improvement Keep up the good work!

**Rescue/Reliever Puffer USE**

**Symptoms** **Control/ Preventive Puffer USE**

**Smoking** **Exercise**

**Action Plan USE**

**Advice from your Health Care Team**

Symptoms	No data available at this time.
Rescue/Reliever Puffer USE	No data available at this time.
Control Preventive/Puffer	No data available at this time.
Exercise	No data available at this time.
Action Plan	No data available at this time.
Smoking	No data available at this time.

**Current Weather**

**18 °C**  
A few clouds

Feels Like: 18  
Rel. Humidity: 83%  
Pressure: 100.5 kPa rising

**Air Quality (Montréal):**  
Main Pollutant: Fine particulate matter  
Index: 21 [Good]

Montréal, Québec, CA  
Updated: 06/29/2010 07:00

[Detailed Forecast](#)  
[Pollen index](#)

Click on a section of the target to view your history for that section.

Done

# Providing Patients with Self-Management Tools within a Personal Health Record

Dr. Sara Ahmed, McGill University: CIHR Research in Progress

My Asthma Portal - Patient Details - General - Mozilla Firefox  
File Edit View History Bookmarks Tools Help  
mcgill.ca https://map.moxxi.mcgill.ca/awp/views/nurse/patient-details/patient-details001.seam  
Most Visited MOXXI-NG Work Java Web Dev Dictionnaire McGill Bus Tools Oracle AHCA Javascript bak Flex Solaris Linux

View Issues - M... 0000745: Make ... 0000884: Make ... 0001047: Adjus... 0000969: Pop-u... 0001172: asthm... 0000901: A nu... 0001408: Make ... 0002117: Only ... My Asthm... x

take control of your asthma and live a healthy life

[Back to Patient List](#) Lisa Simpson  
SIML80031416 [Print](#) [Compose Mail](#) [Add Note](#)

General Medical Action Plan / Medication List My Asthma Target Patient Mail Notes Activity Log

Health Care Team Information  Patient Generated Information

### Patient Summary

**OOO Status:**  
OOO since 2010-05-17

**Current Alerts:**

- Create patient AP
- Review patient AP
- Change to control med usage
- AP not started
- Patient not logging in

**Next Contact:**  
None recorded

**Patient Meds:**

- Flovent Diskus Powder Inh. 100mcg
- Ventolin Hfa Metered Inh. 100mcg
- Ventolin Hfa Metered Inh. 100mcg

**Setting/Physician:**  
Clinique médicale de McGill  
Dr. Rola El Halabieh

**Start Date:**  
2007-12-07 (133 weeks)

**Preferred language:**  
French

**Last updated:**  
2010-05-24

### Basic Information

<b>NAM:</b>	SIML80031416	<b>Age:</b>	30	<b>Gender:</b>	Female
<b>Last Name:</b>	Simpson	<b>Weight:</b>	62.00 Kilogram(s)	<b>Height:</b>	179.00 Centimetre(s)
<b>First Name:</b>	Lisa	<b>Special needs:</b>	None		
<b>Address:</b>	No address entered				

### Contact Information

<b>Email Address:</b>	jonathan.richard@mcgill.ca	<b>Telephone(s):</b>	No telephone numbers entered		
-----------------------	----------------------------	----------------------	------------------------------	--	--

Copyright © 2009 by the Clinical and Health Informatics Research Unit of McGill University. All rights reserved.

Done

# Treatment Adherence

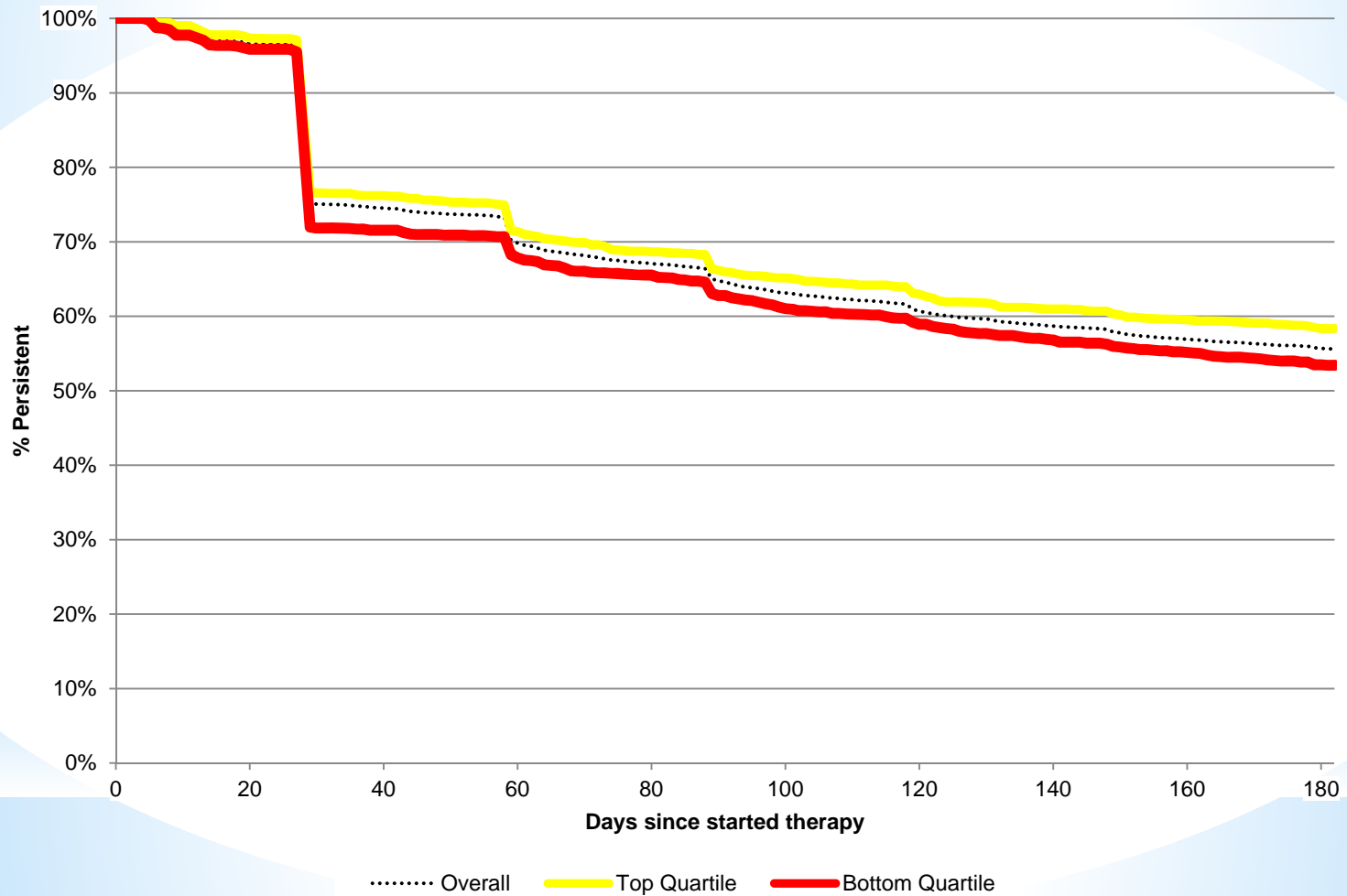
© Original Artist  
Reproduction rights obtainable from  
[www.CartoonStock.com](http://www.CartoonStock.com)



"Mr. Fillechock, it's time for your 8 p.m. pills. Please choose the pills that match these shapes, sizes and colors..."

# Medication Non-adherence Reduces the Benefits of Treatment for Stroke and Myocardial Infarction Prevention

Tamblyn et. al. Archives of Internal Medicine, 2010



# Treatment Adherence

LEVJ24121711 Age: 83 Refresh

LAST NAME: LEVASSEUR  
FIRST NAME: JEAN

PROBLEMS ALLERGY DRUG PROFILE ALERTS ASTHMA

Trademark/Generic	FEB	MAR	APR	MAY	JUN	JUL
COSOPT						
COUMADIN						
FLONASE						
LANOXIN						
LIPITOR						
PREDNISOLONE ACETA						
PULMICORT						
RATIO SALBUTAMOL H						
SYNTHROID						
THIAZAC XC						
TRAVATAN						
PATIENT/RAMQ(S):	58/162	60/167	75/349	83/209	56/229	75/266
HOSPITALISATION						
ER						

LEGEND:

- Prescribed by you with MOXXI but not yet dispensed
- Prescribed by you and dispensed
- Prescribed by another physician (dispensed)
- Sample

(Darker colors represent a drug overlap)

- Today's date
- Prescription Stopped
- Change of dose
- Drug associated with an alert

Print

MOXXI Back

Click on alert message for more details

- JUL. 24, 2008 - AUG. 23, 2008
  - TRAVATAN (TRAVOPROST)
  - 0.004% EYE DROPS
  - #2.50 x30D NR
  - PATIENT/RAMQ(S): \$ 0.00/36.48
- JUN. 7, 2008 - JUL. 7, 2008
- APR. 25, 2008 - MAY. 25, 2008
- MAR. 13, 2008 - APR. 12, 2008
- JAN. 25, 2008 - FEB. 24, 2008

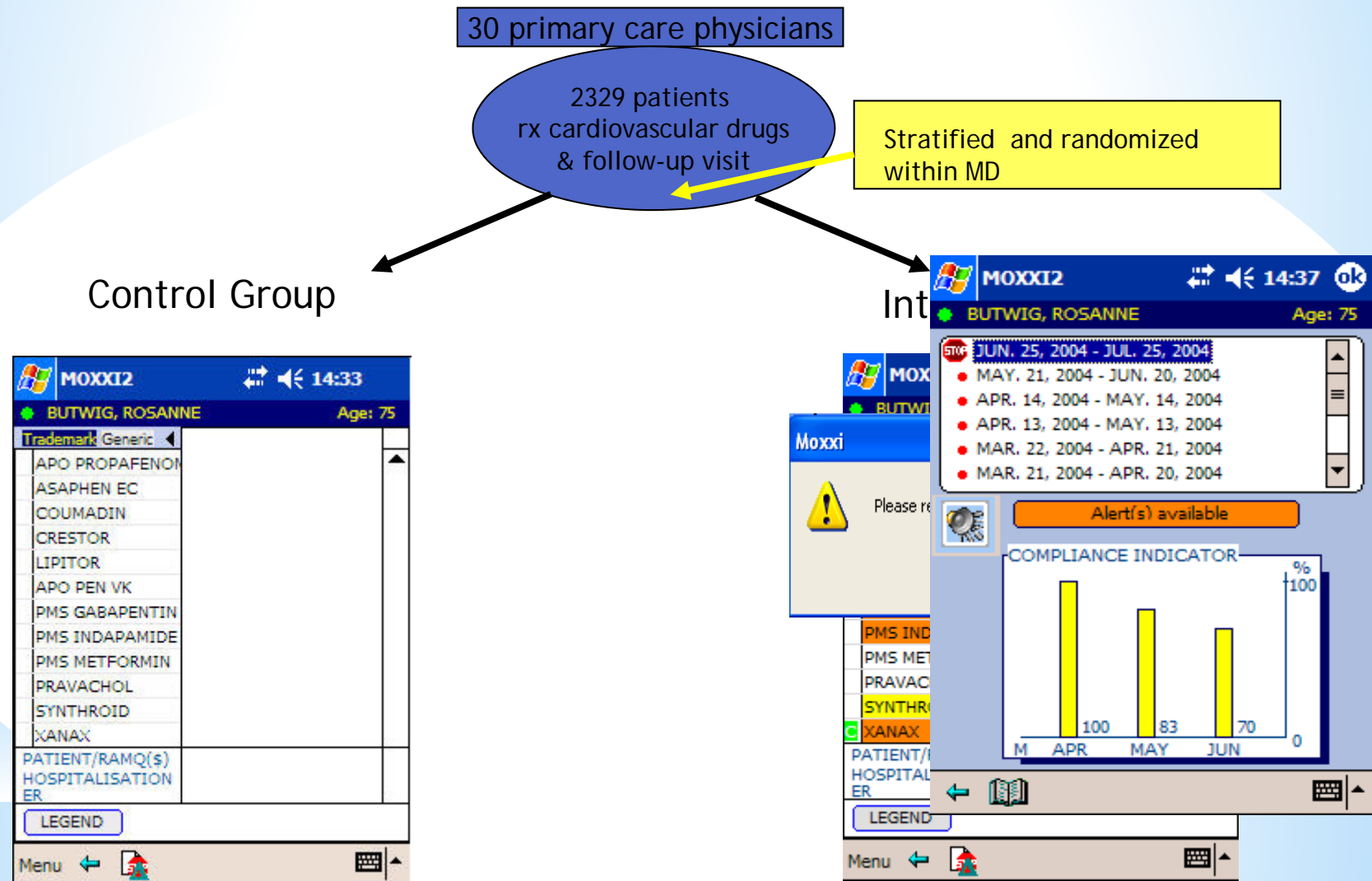
COMPLIANCE INDICATOR

Alert

Monography

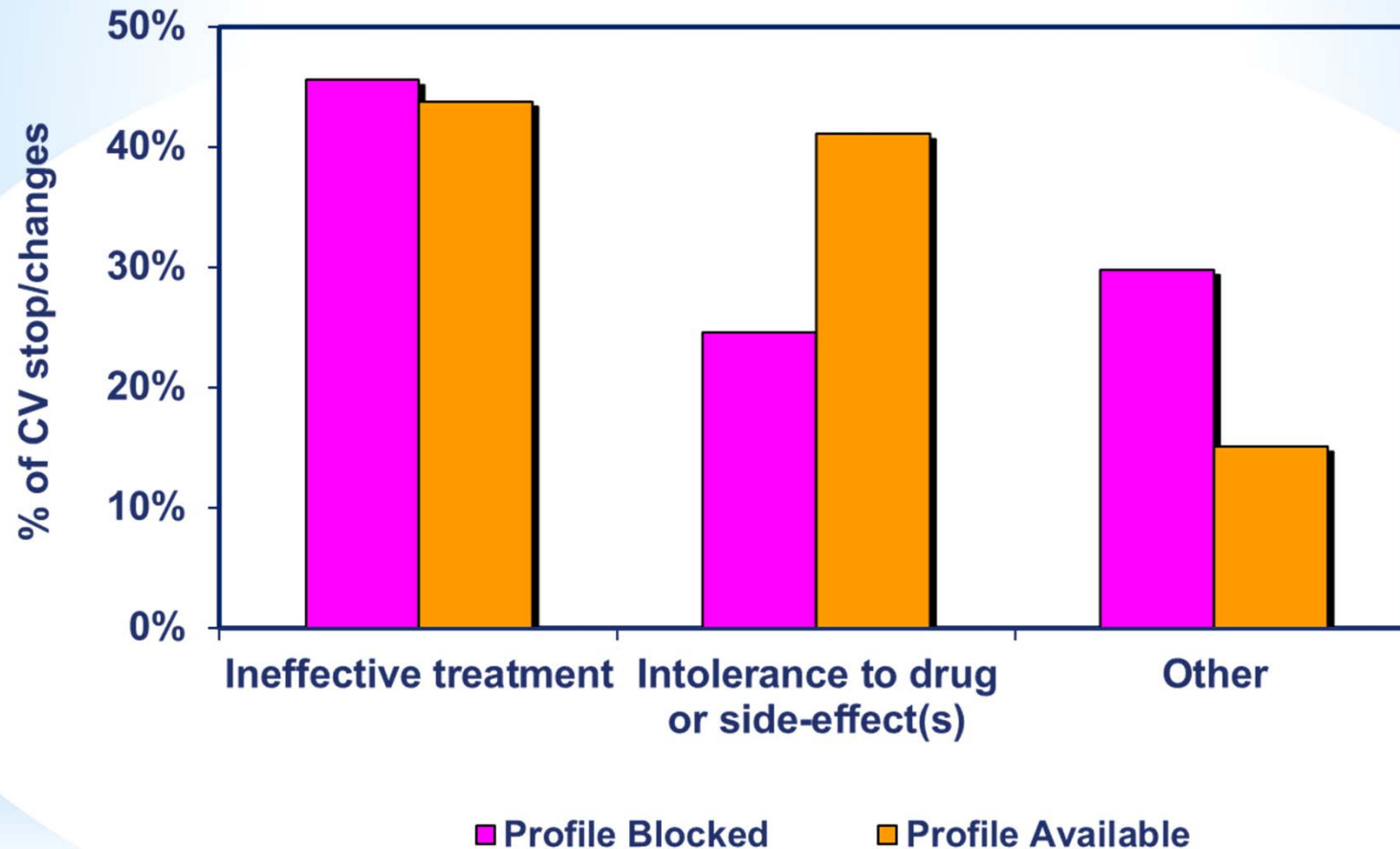
# Increasing the Detection and Response to Adherence Problems with Cardiovascular Medication in Primary Care through Computerized Drug Management Systems: A Randomized Controlled Trial

Tamblyn et. al., Med Decis Making 2010;30:176-188



# Reasons for stopping/changing cardiovascular medications

Tamblyn et.al. Medical Decision-Making, 2009



# Opportunities to Prevent or Ameliorate Adverse Drug Events

Ghandi et al. NEJM, April 2003

N = 661

**Table 3. Rates of Adverse Drug Events.\***

Variable	Adverse Drug Events (no./%)	no./100 patients
Total adverse drug events	181 (27.4)	27.4
Severity		
Fatal or life-threatening	—	—
Serious	3 (3)	3.6
Significant	157 (87)	23.8
Preventability		
Ameliorable	51 (28)	7.7
Preventable	20 (11)	3.0
Not preventable	110 (61)	16.6
Serious and preventable or ameliorable	11 (6)	1.7

## Ameliorable ADE's (51)

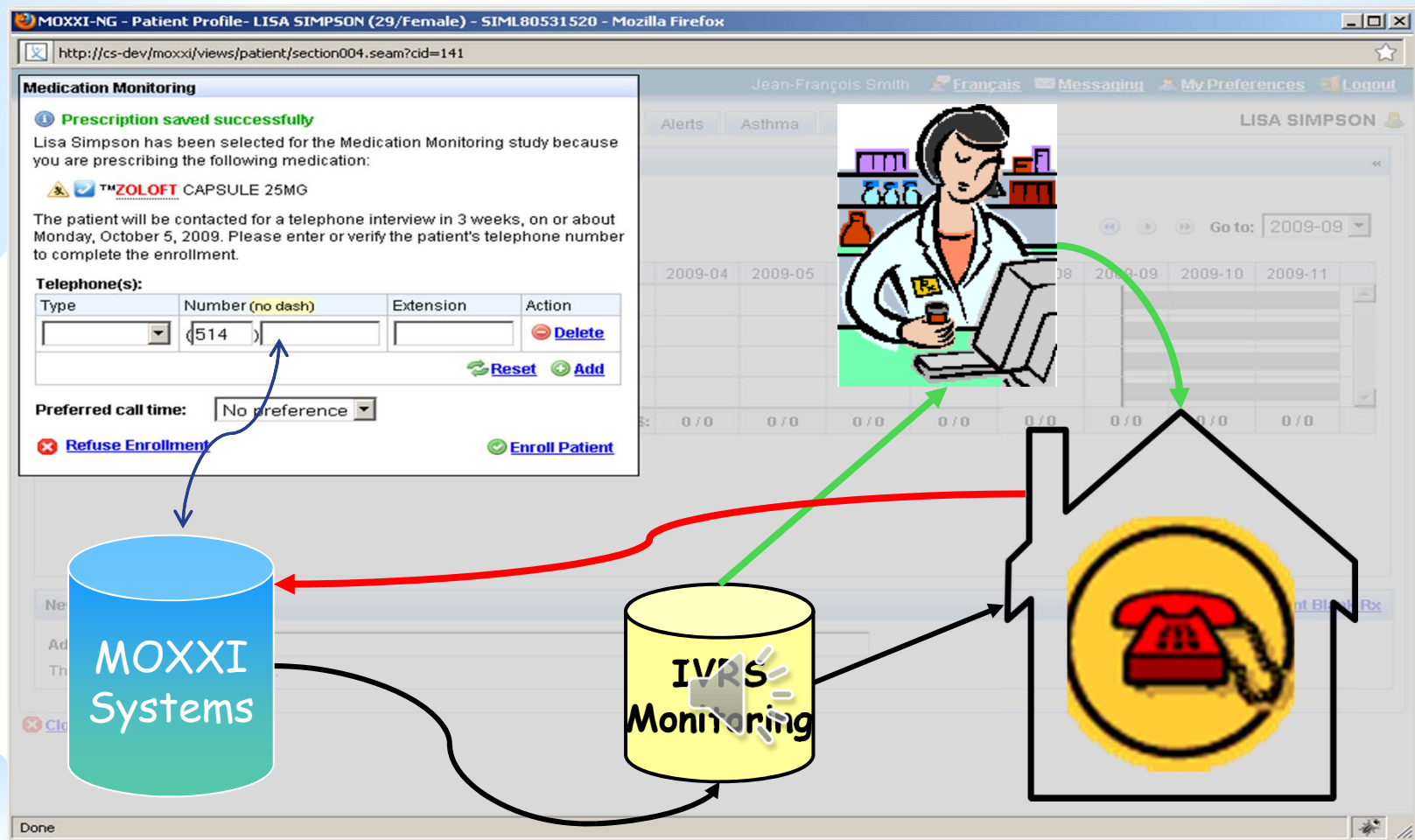
- Failure of physician to respond to medication-related symptoms - 32 (63%)
- Failure of patient to inform physician of symptoms - 19 (37%)

## Preventable ADE's (20)

- Selection of wrong drug - 9 (45%)
- Wrong dosage - 2 (10%)
- Wrong frequency of use - 2 (10%)
- Preventable by advanced systems of medication ordering - 7 (35%)



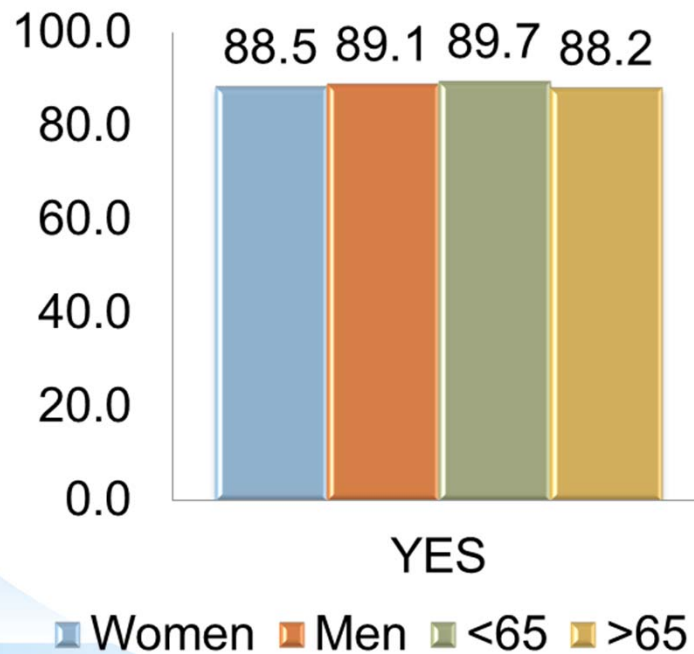
# IVRS: Monitoring the Early Effects of Medication



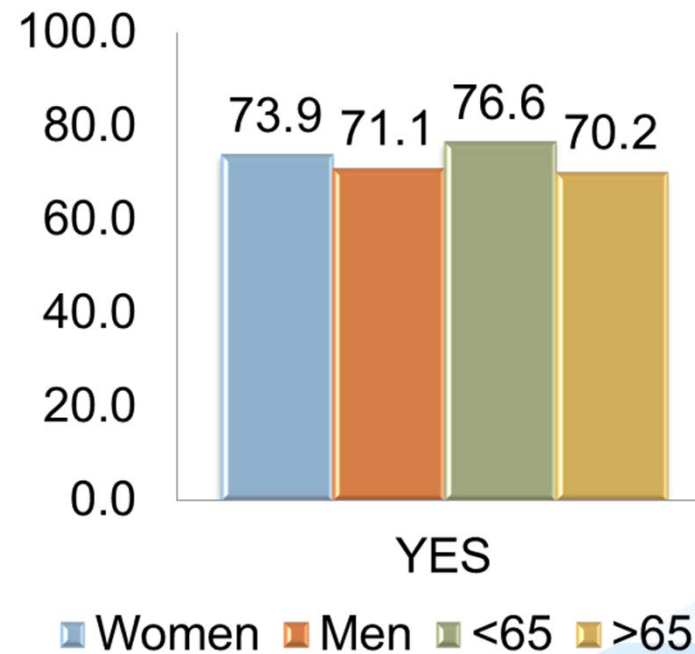
# Feasibility and Acceptability of IVRS

n=496

Was the calling system easy to use?

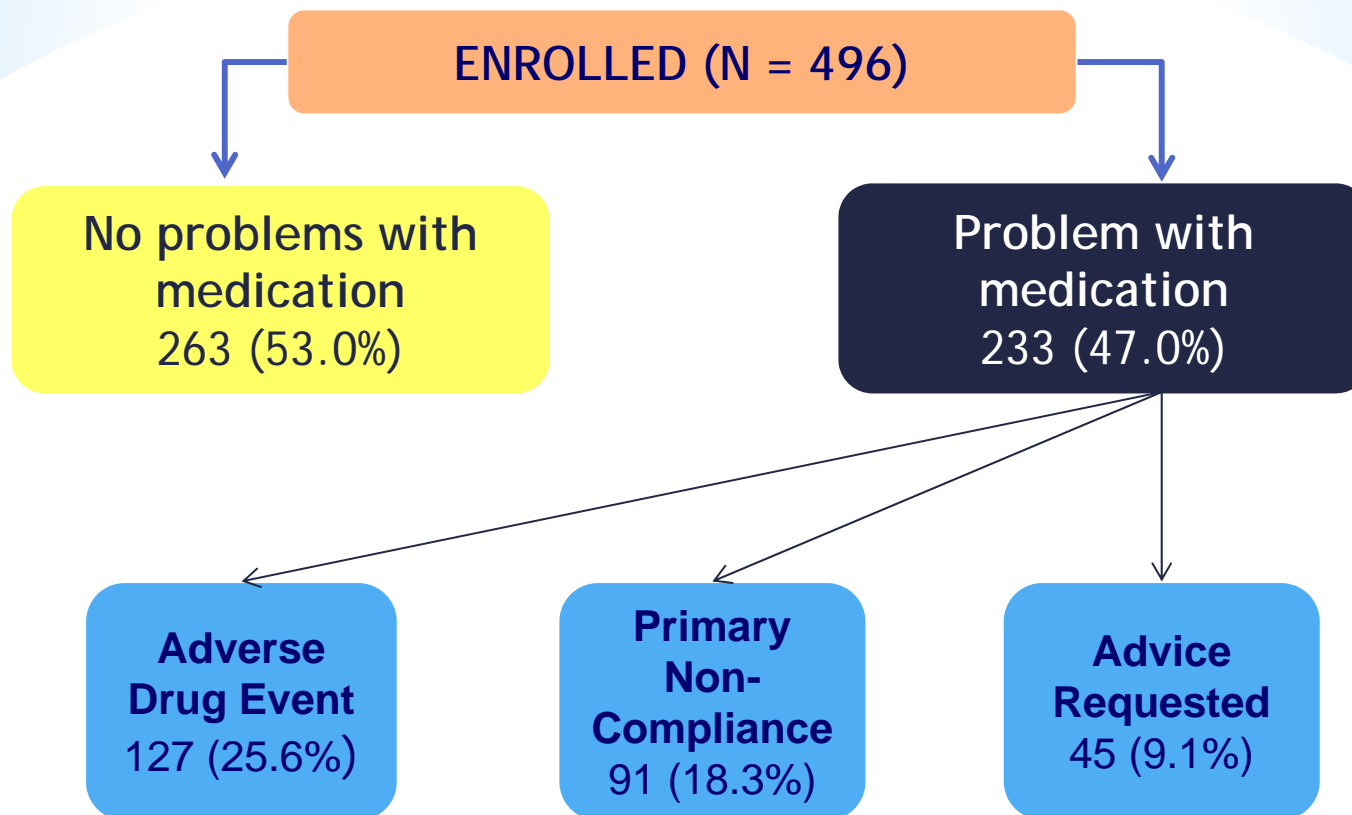


If this type of calling system were provided by your doctor, would you continue to use it?



# Detection of Adverse Drug Events and Prescription Issues Using IVRS

Forster et. al CIHR grant #2456 2010



# Practice Monitoring Tools: Alerting Physicians about New Problems with Medications

The screenshot shows a web browser window titled "MOXXI-NG - My Patients - Mozilla Firefox". The address bar shows "http://cs-dev/moxxi/views/patient/search001.seam". The page has a navigation bar with "My Patients", "My Practice", and "Monographs" on the left, and "Jean-François Smith", "Français", "Messaging", "My Preferences", and "Logout" on the right. A blue notification bar at the top reads "Patient Monitoring - Important new information available! [Click this bar to minimize]".

Below the notification, a message states: "The following patient(s) have reported adverse drug reactions with their recently prescribed drug(s):". A table displays the following data:

First Name	Last Name	Age	Gender	Drugs	Reaction and Severity	Date Reported
NICOLAS	SANTERRE	43	Male	™PAXIL	trembling & shaking of fingers & hands (MODERATE) increase sleep or drowsiness (MILD)	September 14, 2009

The "Reaction and Severity" column is highlighted with a green box. Below this section is a "Patient Search" area with a search box containing "lachute", a "Search" button, a "Clear" button, a "Create a New Patient" button, and a "Reset My Training Patients" button. Below the search area is a table titled "Patients (1)" with the following data:

NAM	First Name	Last Name	Birth Date	Age	Gender	File No	Consented
<a href="#">LACT30560373</a>	THÉRÈSE	LACHUTE	1930-06-03	79	Female		Yes

The status bar at the bottom of the browser window shows "Done".

# Practice Monitoring Tools: Alerting Physicians about New Problems with Medications

MOXXI-NG - Patient Profile - NICOLAS SANTERRE (43/Male) - SANN66082151 - Mozilla Firefox

http://cs-dev/moxxi/views/patient/section008.seam?cid=155

Summary Problems Allergies Medications Patient Monitoring Alerts Asthma Notes **NICOLAS SANTERRE**

Blood Pressure Medication Monitoring

Adverse Drug Reactions				
Source	Date Reported	Drug	Indication	Adverse Reaction
<input checked="" type="checkbox"/>	September 14, 2009	™PAXIL TABLET 20MG	Obsessive-compulsive disorder	trembling & shaking of fingers & hands (MODERATE) increase sleep or drowsiness (MILD)

**Adverse Reaction Details - Medication Monitoring Telephone Interview**

Prescription Date: 2009-08-17  
™PAXIL - Start Date: 2009-08-19 [Close Details](#)

Interview Date: September 14, 2009

Since starting the medication, has the patient developed any event including new symptoms, change in their condition, abnormal changes in laboratory tests, failure of therapeutic effect, accidents, falls etc?  
**Yes - mains qui tremblent**

Has the patient been in hospital or emergency department for any reason after starting this drug?  
No

Has the patient identified any symptoms since starting the medication?

Symptom	Severity	Duration
trembling & shaking of fingers & hands	MODERATE	less than 2 weeks
increase sleep or drowsiness	MILD	less than 2 weeks

Has the patient mentioned these symptoms to their physician?  
none

Has the patient stopped taking their medication?

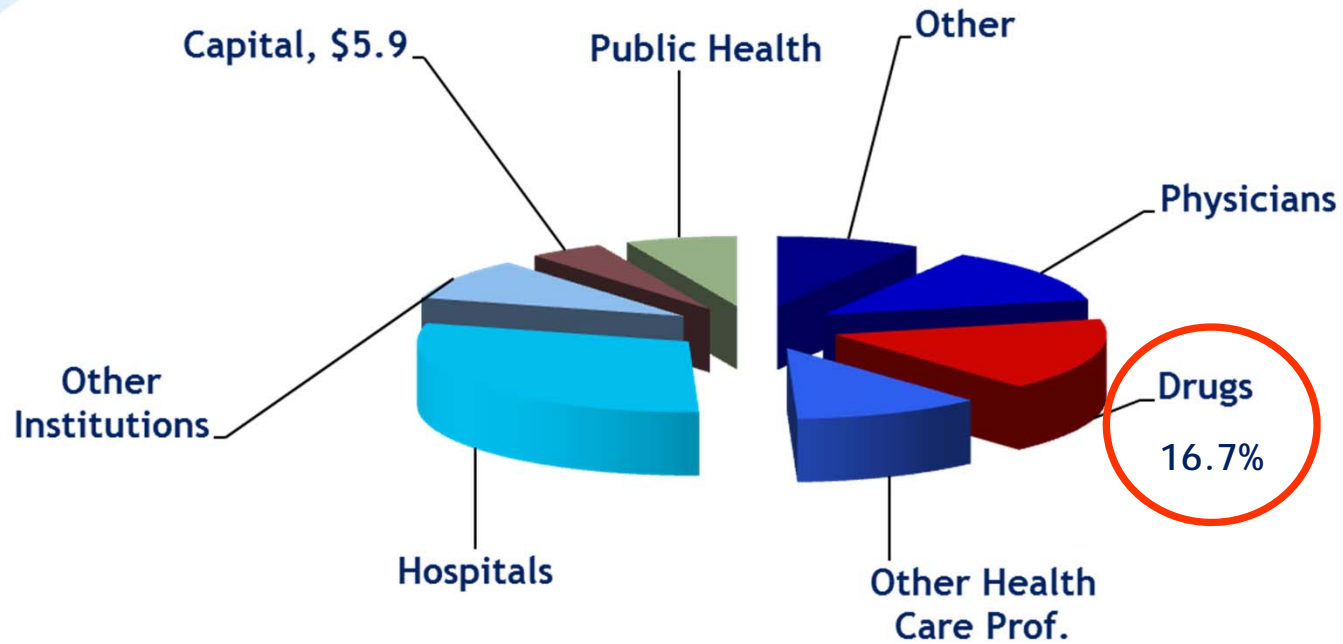
Drug	Stopped?	Date Stopped	Reason
™PAXIL	Yes	2009-09-12	I decided to stop because I was having problems with it

Have one or more of the mentioned symptoms gone away?  
increase sleep or drowsiness

Done

# New Opportunities to Enhance Cost-Effectiveness

Drug Costs in Canada, 2004: \$130 Billion



# Drug Costs and Adverse Effects are the Most Common Causes of Non-Adherence

The screenshot displays a patient management interface with a blue header bar containing navigation links: Patient Management, Messaging, My Profile, Monographs, and Logout. The language is set to Français. Below the header, there are tabs for Summary, Problems, Allergies, Medications, Alerts, and Asthma. The Summary tab is active, showing options to Print or Print Full Record. The main content area is divided into two columns. The left column contains a 'General Information' section with patient details: NAM (SIMH58111112), Age (49), First Name (HOMER), File No (1234), Last Name (SIMPSON), and Gender (Male). Below this are links for Edit and Remove consent. The right column shows '0 New Problem(s)'. Below the general information is a 'Patient Out-of-Pocket Savings Recommender' section, which provides a table of savings opportunities for anti-hypertensive therapy. The table shows a current annual expense of \$867.00, a potential expense with a diuretic of \$671.00, and a total annual savings of \$196.00. A link to 'Optimize Patient OoPS' is provided at the bottom of this section. A 'Close' button is located at the bottom left of the main content area. The footer of the interface includes the word 'Terminé' on the left and the URL 'moxxi.irisquebec.ca' on the right.

Patient Management Messaging My Profile Monographs Logout Français

Summary Problems Allergies Medications Alerts Asthma

Print Print Full Record

**General Information**

NAM	SIMH58111112	Age	49
First Name	HOMER	File No	1234
Last Name	SIMPSON	Gender	Male

Edit Remove consent

**0 New Problem(s)**

**Patient Out-of-Pocket Savings Recommender**

Patient Out-Of-Pocket Savings (OoPS) opportunity for anti-hypertensive therapy is shown below:

Current annual Out-Of-Pocket Expense	\$867.00
Annual Out-Of-Pocket Expense with a diuretic	\$671.00
<b>Total annual Out-Of-Pocket Savings</b>	<b>\$196.00</b>

Optimize Patient OoPS

Close

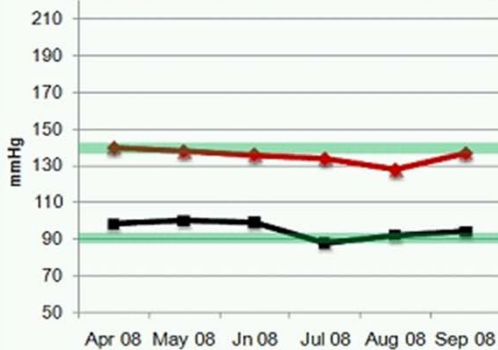
Terminé moxxi.irisquebec.ca

# Drug Costs and Adverse Effects are the Most Common Causes of Non-Adherence

Patient OoPS can be optimized

Blood pressure (last 6 months) History

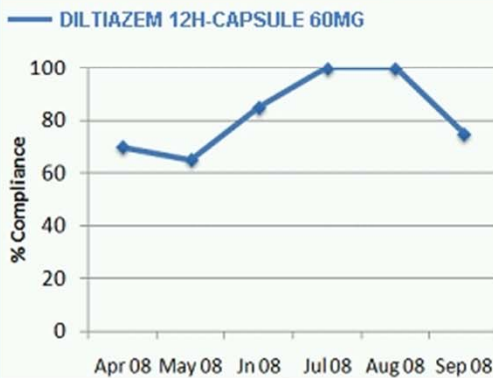
— Treatment Target (140 / 90) Print



Record today's blood pressure:

Systolic:  Diastolic:  Save

Compliance with anti-hypertensives



Higher Out-of-Pocket Expense (OoPE) is associated with [decreased compliance](#).  
Diuretics are [equally effective](#), and can reduce Patient's OoPE by 90%.

Rx		Drug name	Patient Annual OoPE	Total Annual Cost	Total Out-Of-Pocket Savings
<input type="radio"/>	<input checked="" type="radio"/>	DILTIAZEM 12H-CAPSULE 60MG	\$ 165.00	\$ 220.80	\$ 0.00
<input checked="" type="radio"/>	<input type="radio"/>	HYDROCHLOROTHIAZIDE TABLET 25MG	\$ 14.40	\$ 14.40	\$ 150.60
<input type="radio"/>	<input type="radio"/>	HYDROCHLOROTHIAZIDE TABLET 50MG	\$ 20.40	\$ 20.40	\$ 144.60

To change prescription, select drug and then click "Apply Changes".  
To keep the current prescription, please select a reason below.

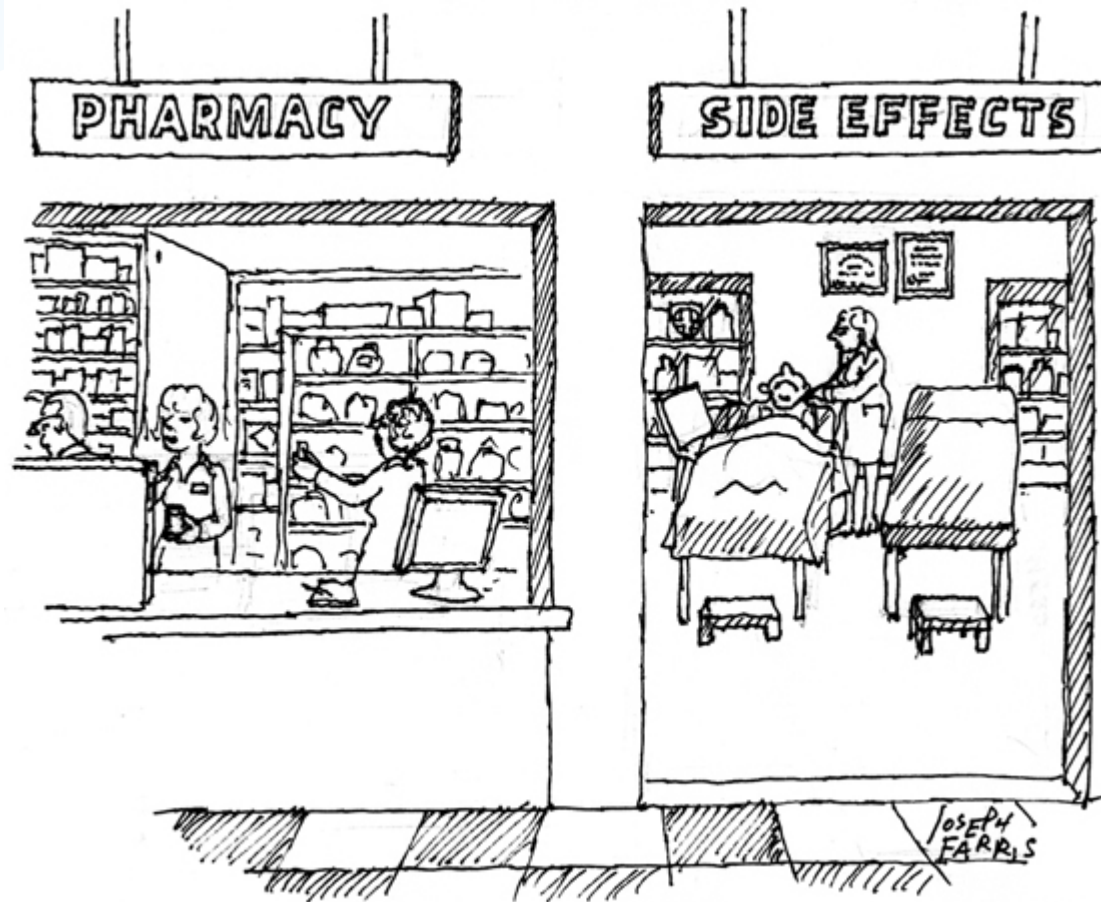
Apply changes

Keep original prescription. Reason:



# Surveillance

---



# Using electronic prescribing to collect drug indication and treatment outcome (MOXXI)

## New Prescription

Add New Drug:

 [Print Blank Rx](#)

Select: [All](#) [None](#)






[Save](#)



[Save and Print](#)




[Delete](#)

<input type="checkbox"/>	Drug	Posology	Quantity/Duration	Indication(s)	Stop/Change Reason
<input type="checkbox"/>	GABAPENTIN 100MG CAPSULE <input type="button" value="v"/> Sample: <input type="checkbox"/>	1.00 <input type="button" value="v"/> CAPSULE  tid <input type="button" value="v"/> <input type="button" value="v"/>	30 <input type="button" value="v"/> Day(s) <input type="button" value="v"/> 6 Refills <input type="button" value="v"/> Qty 90.00	<input type="button" value="v"/> Aggressive/Antisocial Behavior  Bipolar affective disorder  Diabetic Neuropathy Epilepsy Essential Tremor	

## Stop Drug(s)

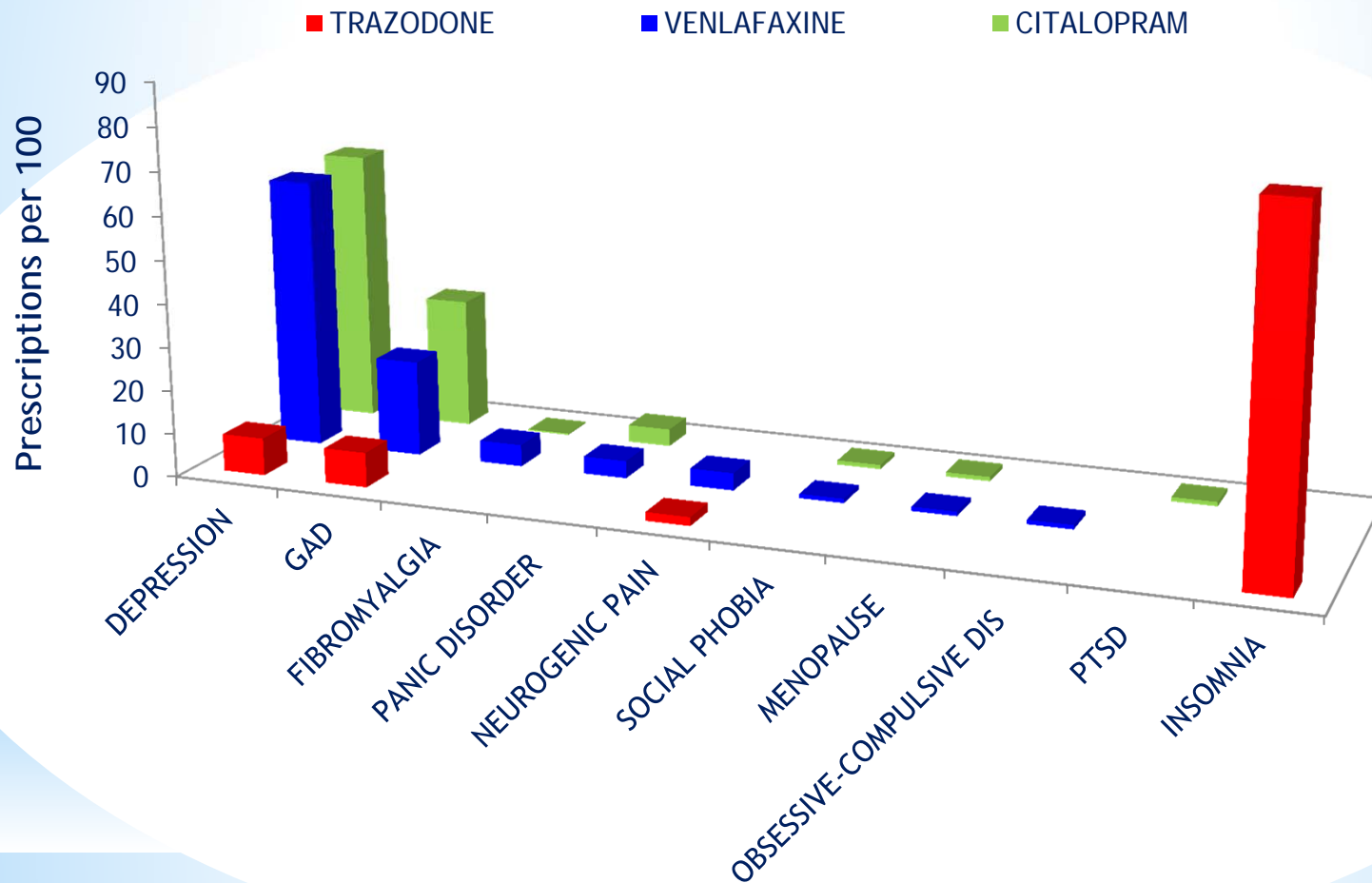
You selected to stop the following drug(s). Please select a stop reason for each of them.

Drug	Posology	Quantity/Duration	Reason
GABAPENTIN 100MG	1.00 CAPSULE tid	#90.00 x 30 Day(s), 6 refills	<input type="button" value="v"/> 

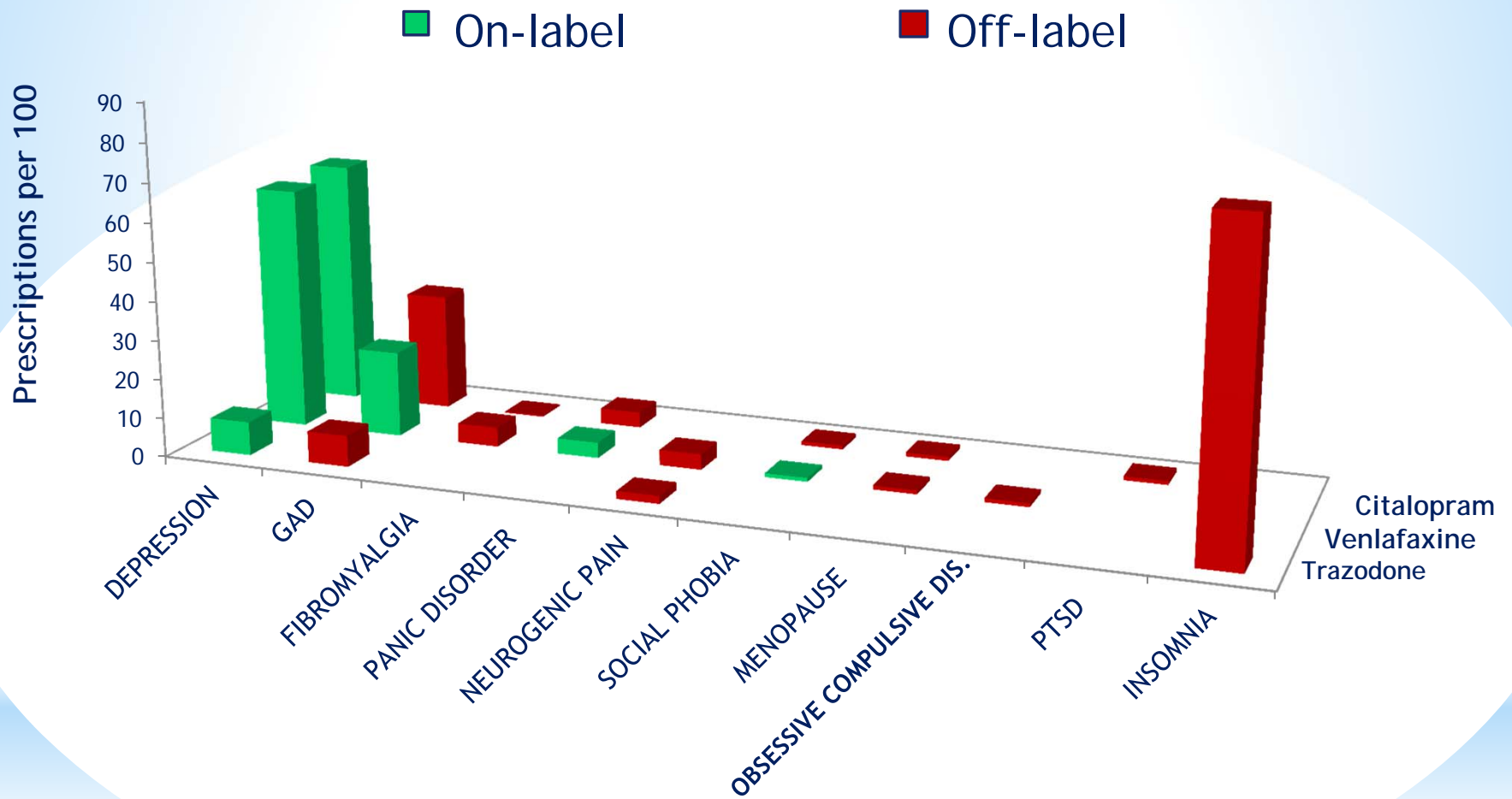
 [Save](#)  [Cancel](#)

Safety: Adverse drug reaction  
Safety: Allergic response  
Safety: Drug interaction  
Error: Prescribing  
Error: Dispensing  
Effectiveness: Ineffective treatment  
Effectiveness: No longer necessary  
External factor: New evidence  
External factor: Discontinued by another physician  
External factor: Patient request  
Adherence: Simplifying treatment  
Adherence: Substitution of less expensive drug

# Can you guess the treatment indication for these antidepressants from the drug?



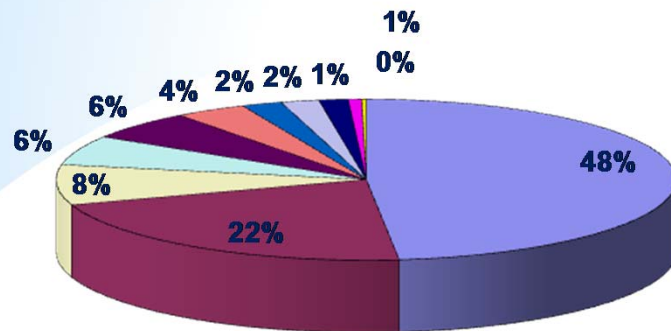
# Monitoring Off-Label Use



Treatment indications

# Why are Drugs Discontinued?

Reasons for Drug Discontinuation Orders written for 857 of 3889 MOXXI Patients Seen Between Nov, 2005- Jan, 2006



Adverse  
drug effects

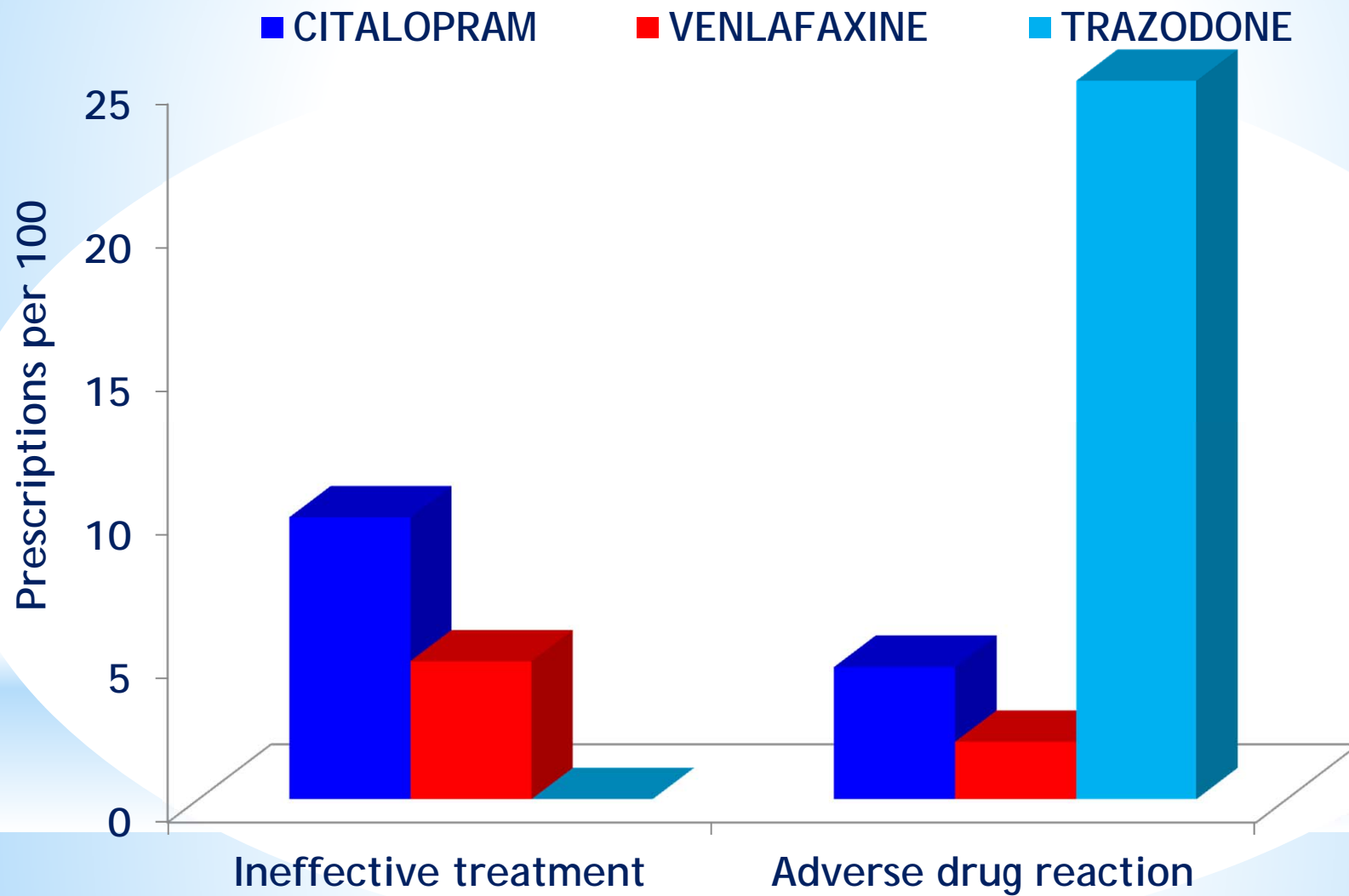
Ineffective  
treatment



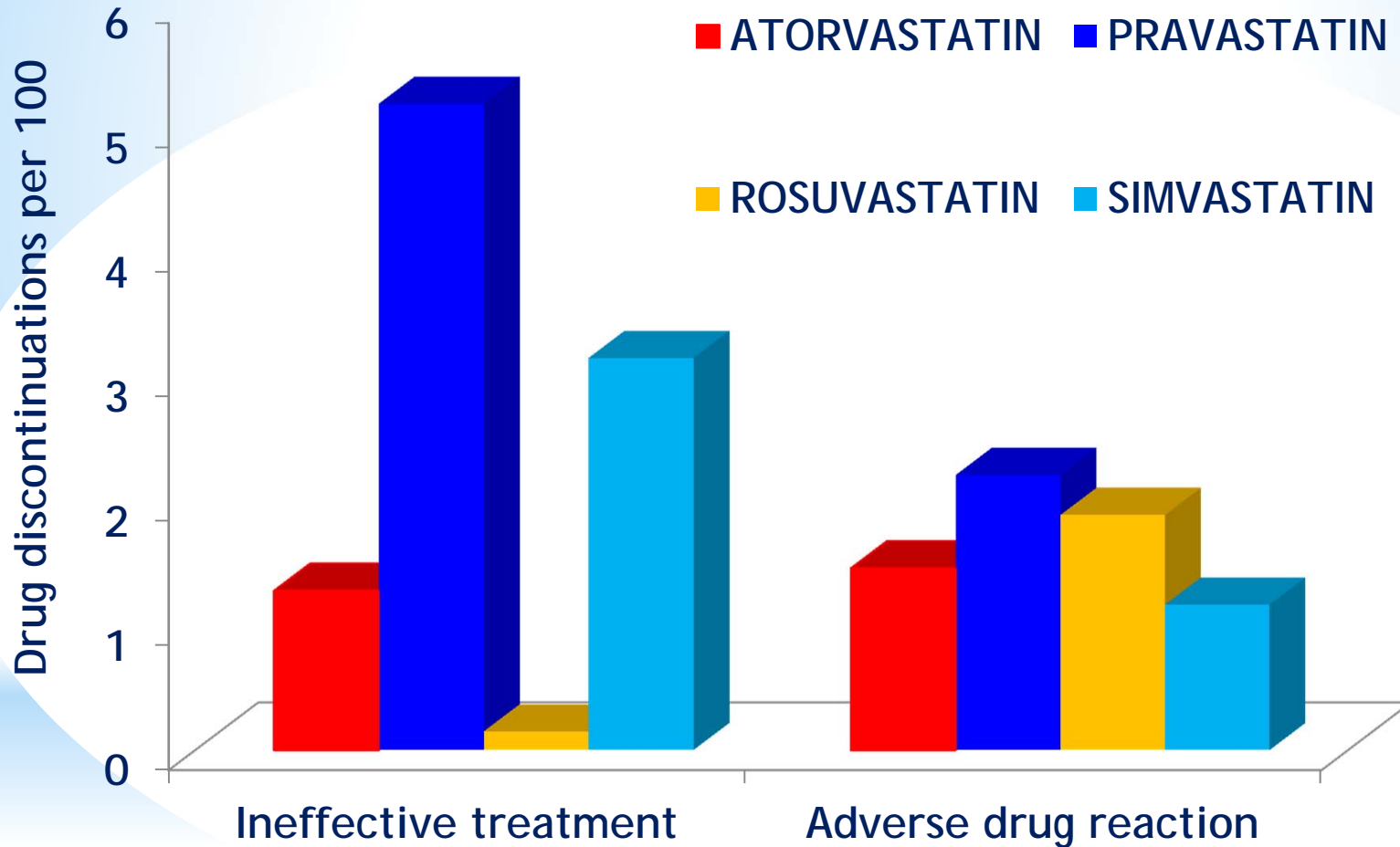
New Methods of  
Pharmaco-  
Surveillance

Reasons for Drug Discontinuation Orders written for 857 of 3889 MOXXI Patients Seen Between Nov, 2005- Jan, 2006

# Comparative effectiveness of anti-depressants

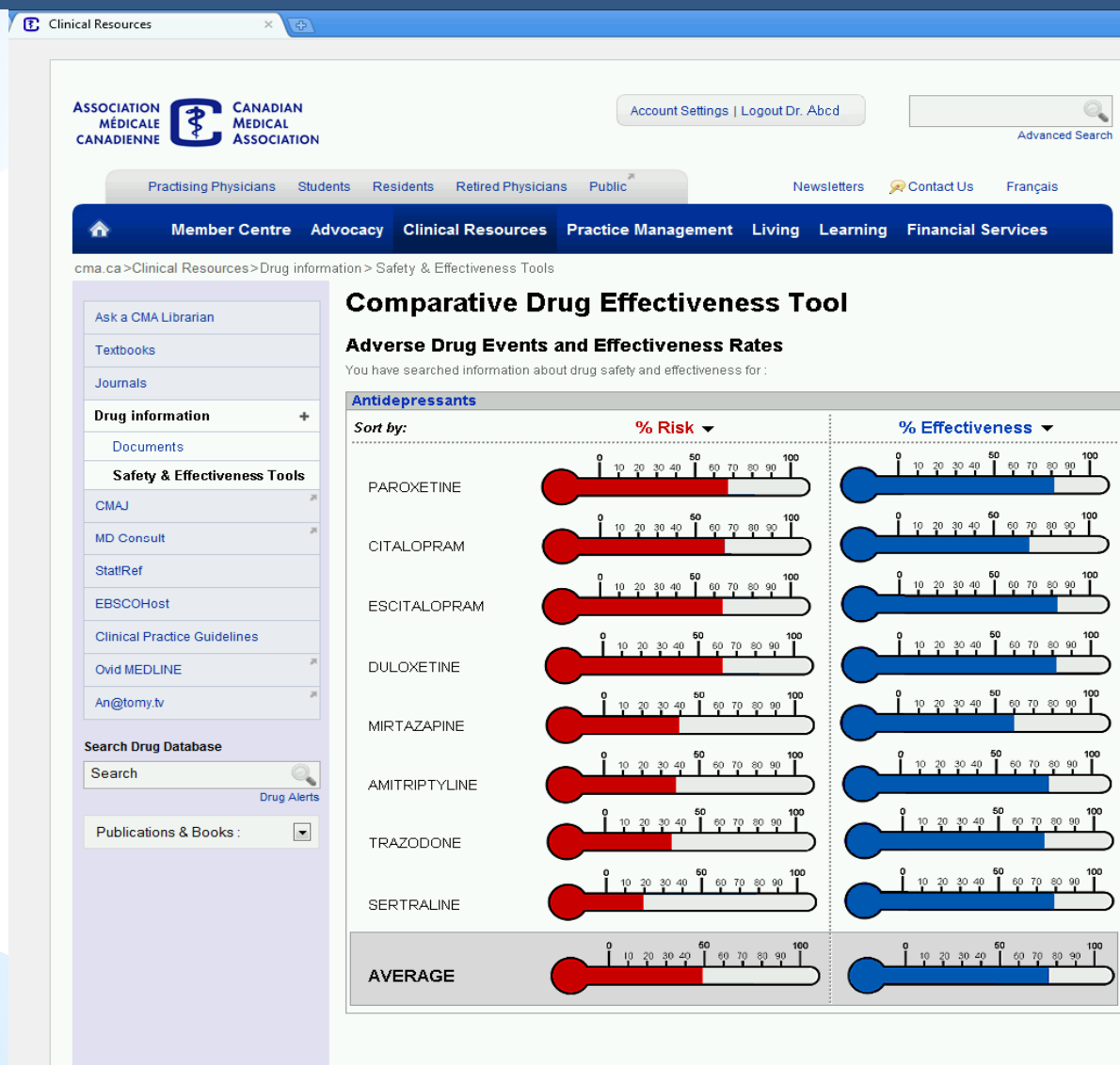


# Which statin do you avoid (or prescribe)?



# The Future?? Real-Time Monitoring and Feedback from Analysis of International Computerized Prescribing Systems

Tamblyn, Abrahamowicz, Wolfson, Bates, Dixon: CIHR International Pharmacosurveillance





∴ WELL... THE GLAXO PILL PROTECTS MY HEART FROM THE SIDE EFFECTS OF THE PFIZER PILL THAT PREVENTS POTENTIAL LIVER FAILURE DUE TO THE MERCK PILL THAT MINIMIZES THE RISK OF STROKE POSED BY THE NOVARTIS PILL THAT REDUCES BLOOD CLOTS CAUSED BY THE GLAXO PILL..

∴ THE DEVIL OF IT IS I CAN'T REMEMBER THE ILLNESS THAT STARTED ALL THIS...



JOANDE  
NETTAS TUDOME  
© 2000/01/02

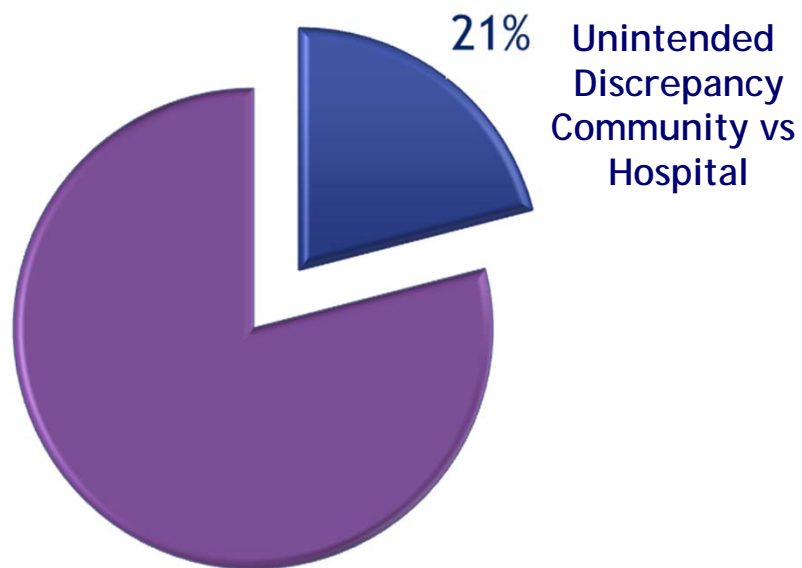
# Thank you!

robyn.tamblyn@mcgill.ca

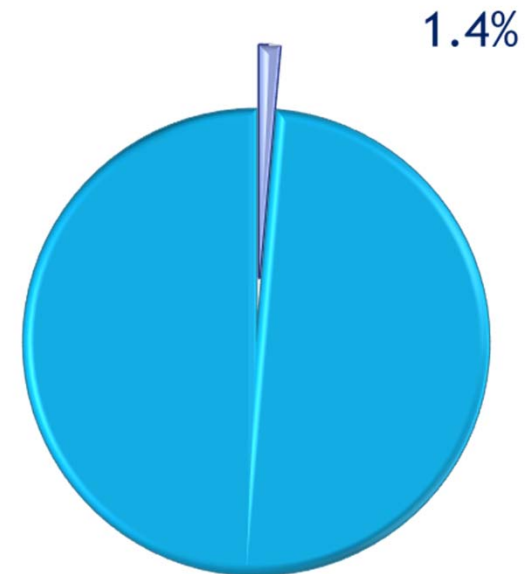
# Medication Reconciliation Made Easy

Agrawal et.al. Joint Commission Journal on Quality and Patient Safety, Vol 35, No 2, 2009

Discrepancies before Automated MedRec (n=120 admissions)



Discrepancies after Automated MedRec (n=19,356 admissions)

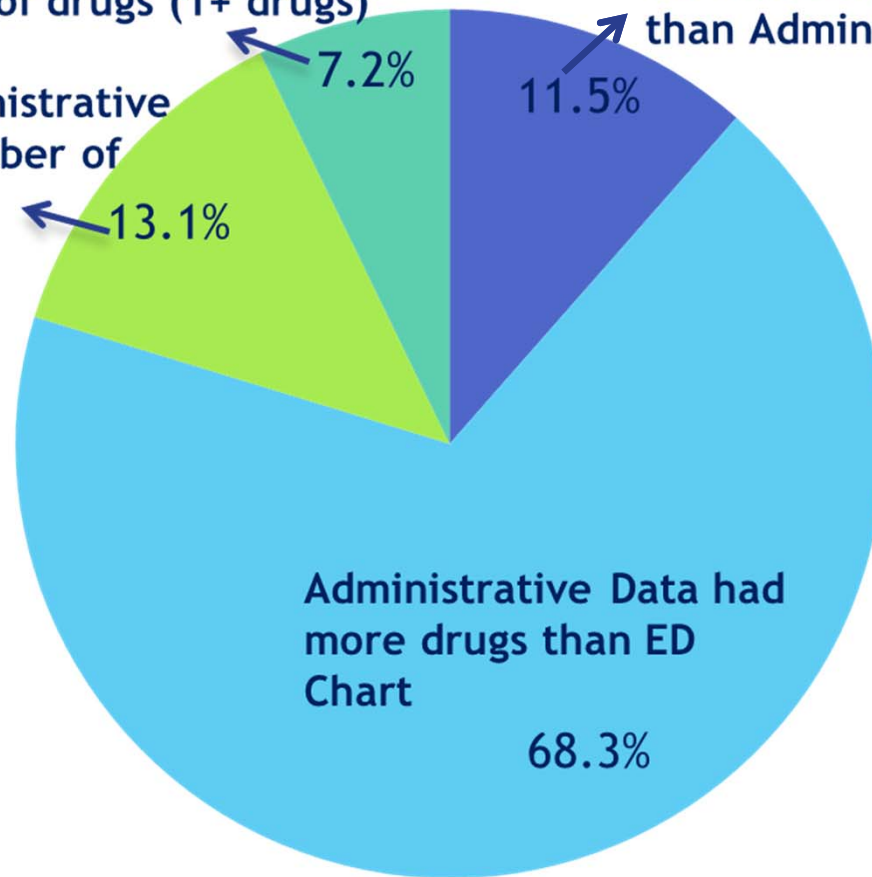


# Unintended Discrepancies in Community Medications Charted for 838 Patients seen in the MUHC Emergency Department

ED Chart and Administrative Data had  
same number of drugs (1+ drugs)

ED Chart and Administrative  
Data had same number of  
drugs (0 drugs)

ED Chart had more drugs  
than Administrative Data



Administrative Data had  
more drugs than ED  
Chart

68.3%

# Legibility of Drugs in Emergency Department Charts for 838 Patients Seen in the MUHC

