



Use of Electronic Patient Management Systems and the Impact of Drug Interaction Warnings: the General Practice Research Network

Geoffrey P Sayer BSc(Psychol) MCH PhD, Susan D Whicker BSc PhD
and Phil D Marshall BSc MSc PhD

Speaker

Geoffrey Sayer BSc(Psychol) MCH PhD
Director



- Co-founder of BEACH (University of Sydney: 1996-2000)
- Founder of General Practice Research Network (HCN: 2000-2005)
- General Manager – Product Strategy and Research (HCN: 2000-2005)
- Director (**data**workshop Pty Ltd: 2005+)
- General Manager – Australia (HealthLink: 2006+)

E: geoff.sayer@dataworkshop.com.au

History lesson

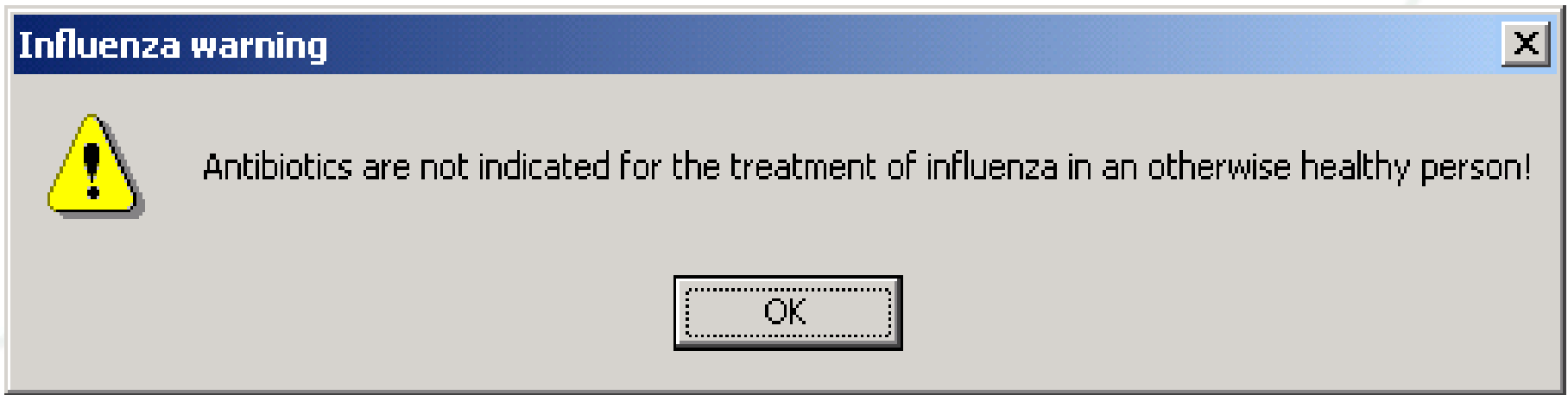
“Tenets of decision support through electronic patient management systems:

- Decision support can be a simple reminder, drug-drug interaction check or use of a guideline in the diagnosis and management of a condition.*
- Decision support should be valued and not automatically dismissed by the clinician without consideration.*
- Decision support does not replace the experience and training of a critically thinking clinician.*
- Effective decision support requires good medical record keeping.”*

Sayer (circa 2002)

The power of the prompt

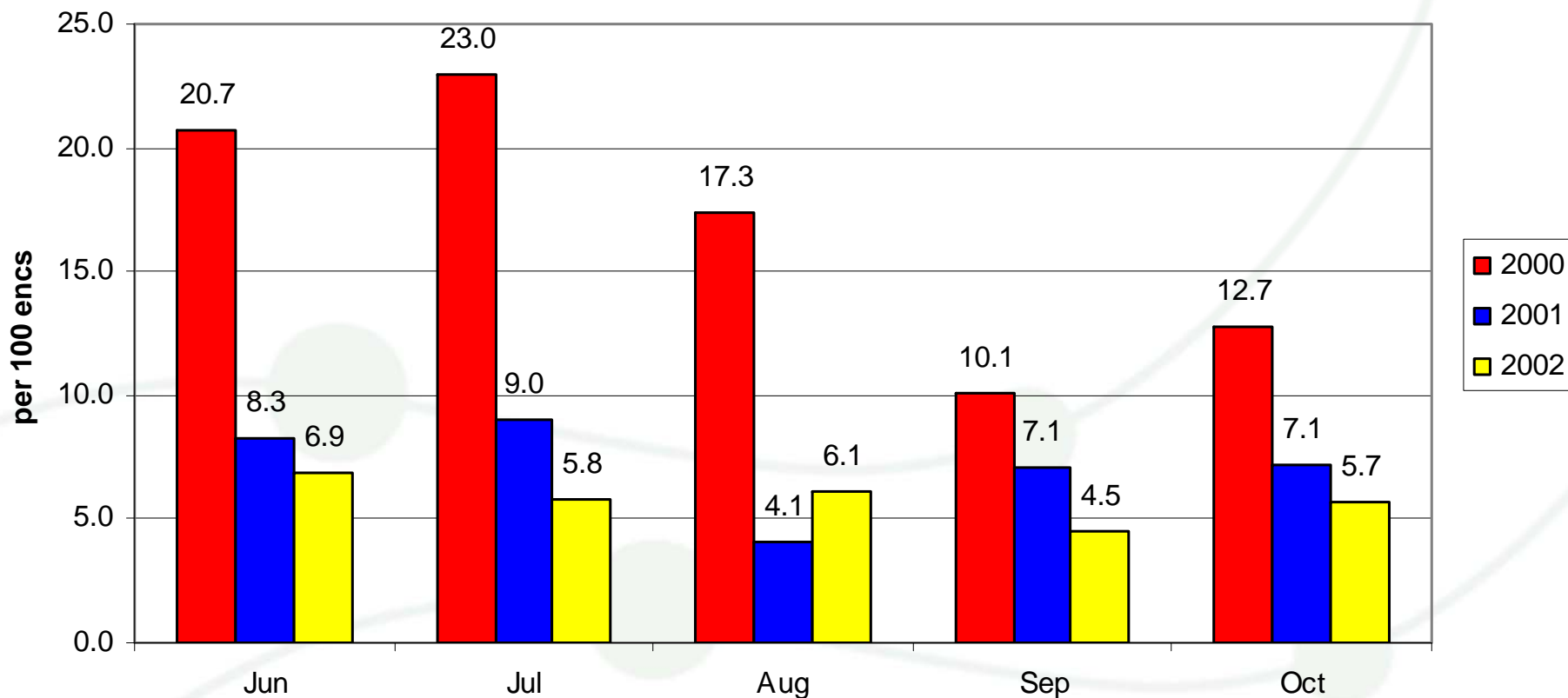
Was initiated in the May 2001 release of Medical Director to over 14,500 GPs nationally.



Activated when reason for antibiotic prescription was influenza.

Medication Change after Rx Warning

Antibiotic use amongst influenza - QUM prompt May 2001



Background

- *“Medicines are intended to increase the probability of positive patient outcomes and reduce the likelihood of negative patient outcomes on average across the population of patients.”*
- Yet there is a culture that electronic decision support systems in medical care are deterministic.
- Electronic decision support systems are also intended to increase the probability of positive patient outcomes and reduce the likelihood of negative patient outcomes on average across the population of the users and patients cared for through their use.

Background

- It has been argued that computerized drug prescribing alerts can improve patient safety, but are often overridden because of poor specificity and alert overload or user fatigue (Shah et al., 2006).
- The factors that lead physicians to override drug alerts are complex (Tamblyn et al., 2008).
- However, there has been no evidence previously published on the actual level of exposure to drug interaction warnings in Australian General Practice, although there has been debate about its usefulness in preventing patient harm (Ahearn & Kerr 2003; Sweiden et al. 2009).

Aim and Methods

Aim


1. Quantify the use of electronic patient management system functions.
2. Quantify the frequency of drug interaction warnings and the possible impact these have on changing prescribing behaviours.

Method

1. Cohort of GPs who provided data to the GPRN for the 2008 calendar year and who provided historical data (2003-2008) directly from their electronic patient management system.

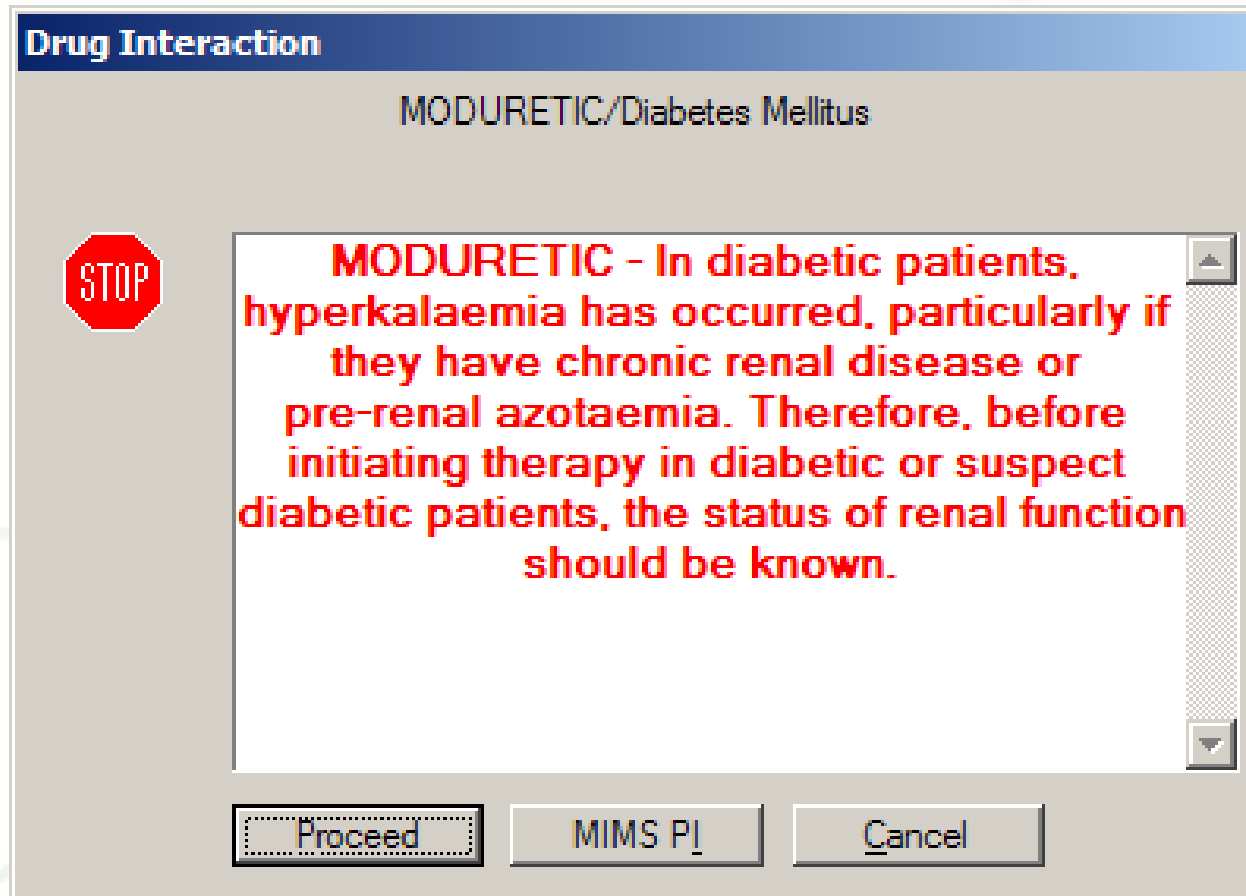
Drug-Allergy

Allergy

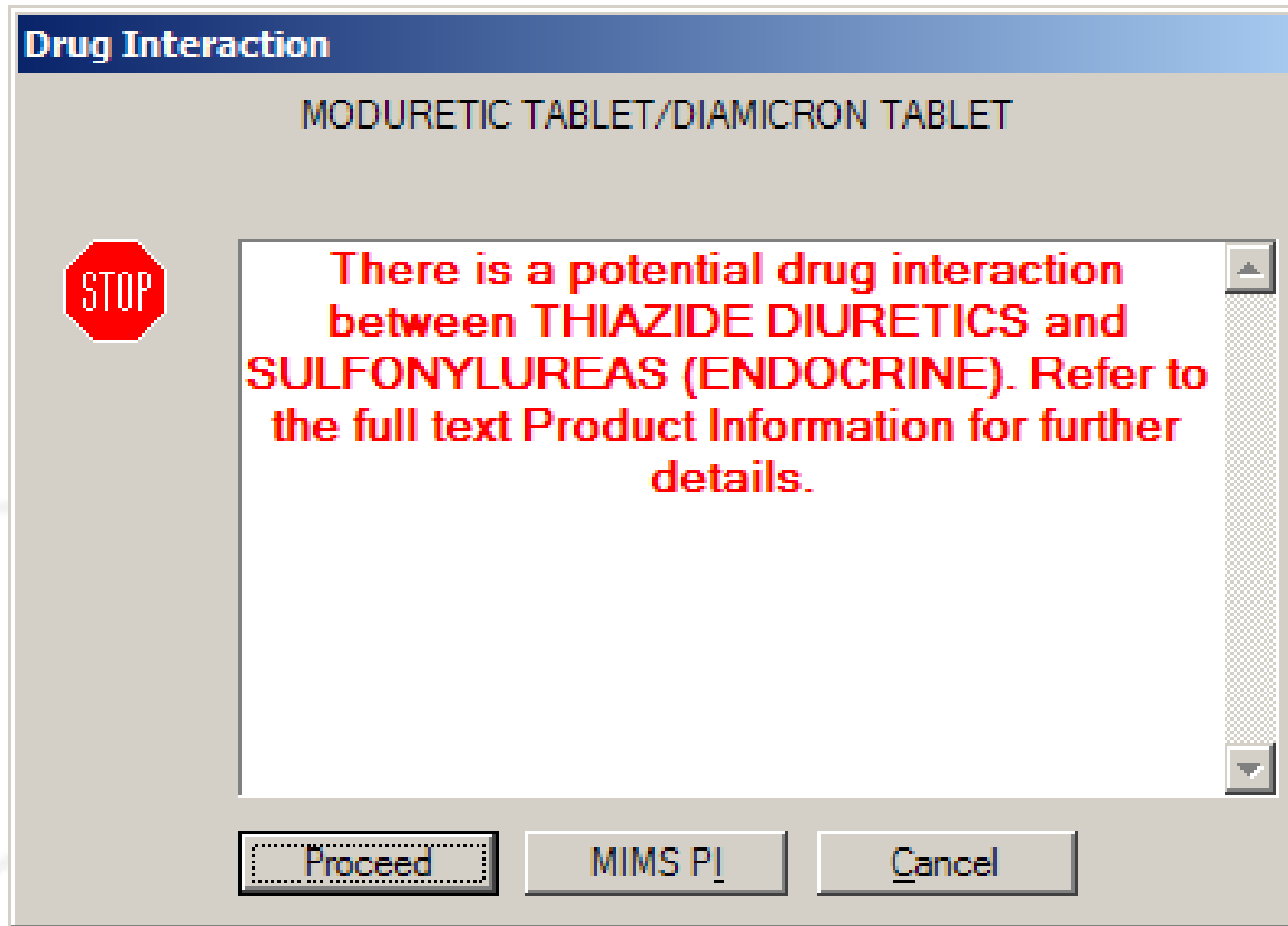


This patient is noted to be allergic to Penicillins.
Do you wish to continue?

Drug-Disease



Drug-Drug



Data for the cohort

For 2008:	GPRN
No. of GPs	321
Cluster size (visits)	4,913
Patients	399,565
Total visits	1,577,160
Number of prescriptions	1,596,700
per 1,000 visits	1,012
Number of problems, diagnoses and reasons	1,965,241
per 1,000 visits	1,246

Representativeness

1. If the characteristics of the primary sampling units are similar to the characteristics (e.g. demographics) of the target population then one will have greater confidence in the generalisation process.
2. If the data collection process is reflective of the behaviour under investigation then one will have greater confidence in the generalisation process.

GPs

	GPRN - 2007		Australia - 07/08	
	n	%	n	%
Gender				
Female	109	34.0	9,636	38.7
Male	212	66.0	15,267	61.3
Age				
<35 years	26	8.7	2,370	9.5
35-44 years	80	24.9	6,080	24.4
45-54 years	110	34.3	8,076	32.4
55+ years	105	32.7	8,377	33.6

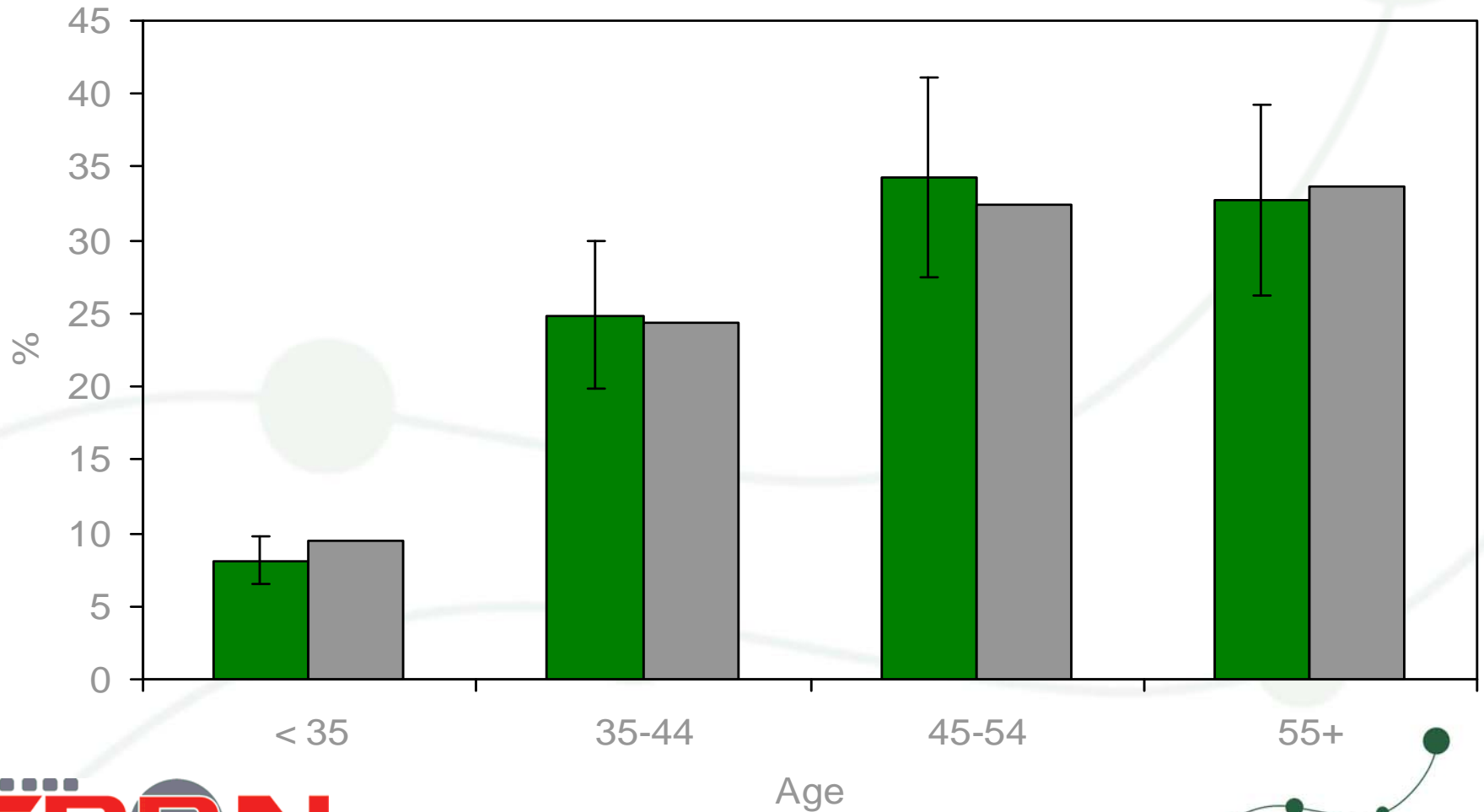
a. Gender: $X^2 = 3.00$; $p = 0.083$

b. Age: $X^2 = 1.11$; $p = 0.774$

c. Age-gender: $X^2 = 5.88$; $p = 0.554$

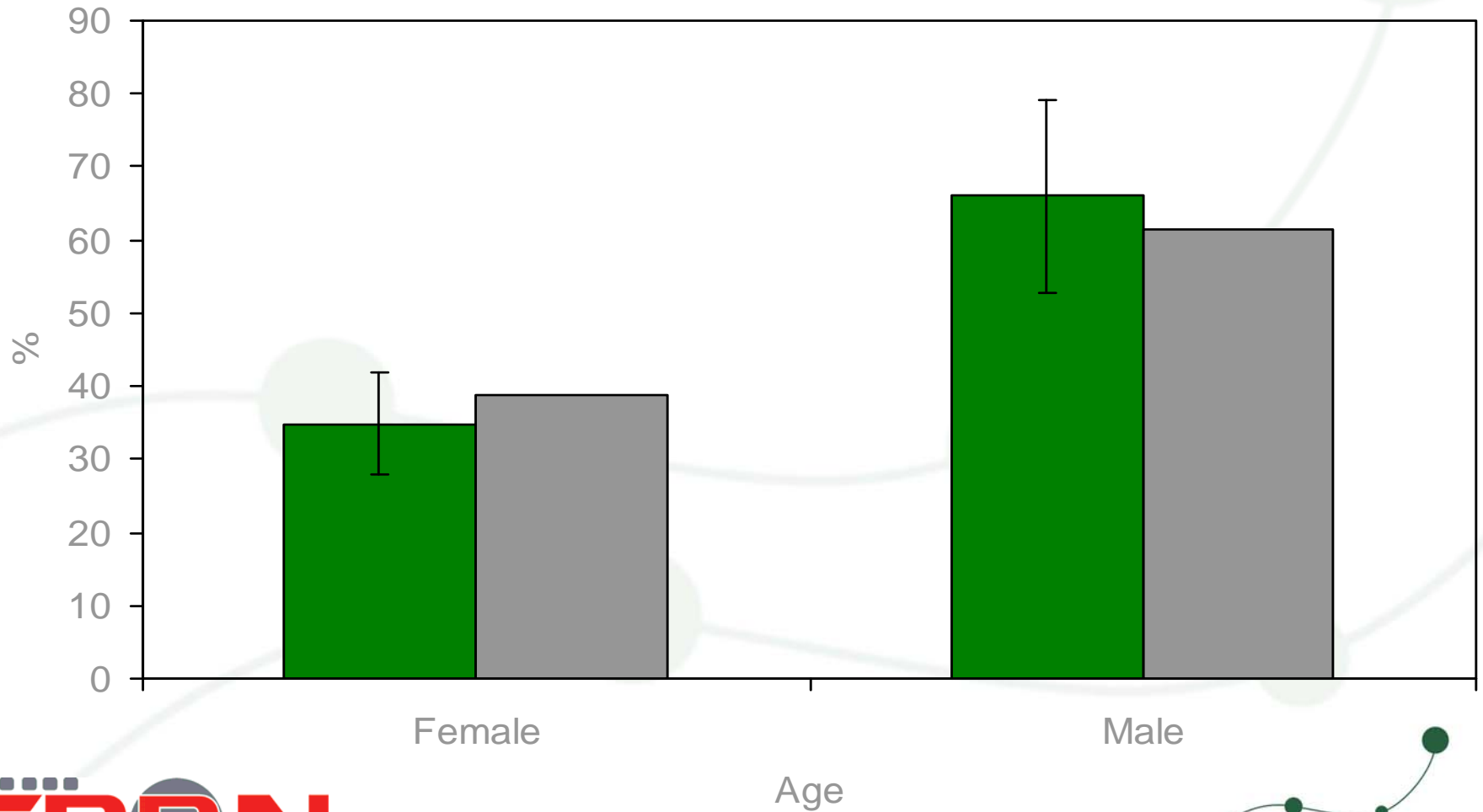
GPs

■ GPRN 2008 ■ Australia 07/08



GPs

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Use of software

	GPs (%)						per 1,000 visits					
Function	Aug-03	Aug-04	Aug-05	Aug-06	Aug-07	Aug-08	Aug-03	Aug-04	Aug-05	Aug-06	Aug-07	Aug-08
Asthma Action Plan	17.2	13.3	17.6	16.8	18.4	17.5	0.8	1.3	1.2	0.8	1.3	1.5
Blood Pressure Monitor	54.8	58.5	59.9	70.8	72.0	74.7	44.6	42.7	65.1	75.0	84.5	108.4
Cardiovascular Risk Calculator	26.1	30.3	25.7	24.4	28.0	34.4	0.7	0.7	0.8	0.8	1.1	1.5
Cytology Request	42.0	38.3	39.6	44.4	45.6	45.3	2.5	2.9	3.5	4.1	4.2	4.1
Diabetes Record	21.7	29.3	24.3	25.2	21.8	21.8	2.0	2.1	4.2	4.7	2.3	3.4
Drug List (Adding New Rx)	100.0	99.5	99.6	99.6	98.9	99.6	156.5	157.2	211.7	292.5	410.2	484.2
Drug-Allergy warning	77.7	71.3	74.8	74.0	78.9	80.4	7.2	6.8	8.1	7.0	11.7	11.7
Drug-Disease warning	96.8	95.7	97.7	96.4	98.5	98.6	11.5	11.9	46.2	48.7	54.4	69.5
Drug-Drug warning	96.8	94.7	92.8	92.4	94.3	96.5	26.4	28.3	37.1	49.8	57.8	67.6
Health Assessment	24.8	27.1	32.4	37.2	30.7	33.7	1.0	1.3	2.6	3.6	3.2	2.9
Immunisation Schedules	92.4	96.8	95.9	95.2	94.3	90.5	16.8	101.2	103.4	128.9	130.6	126.6
INR Record	14.7	18.1	19.8	25.2	24.5	26.3	2.3	3.4	3.6	4.6	6.1	6.4
Letter Written	83.4	88.8	91.9	94.8	97.3	98.6	54.8	67.9	102.8	123.0	152.2	186.0
Pathology Request	89.2	89.9	91.0	96.0	96.9	97.5	57.9	78.0	114.3	134.2	147.0	161.6
Patient Education	77.7	77.7	74.8	82.4	75.5	74.7	6.6	8.0	10.6	13.3	12.5	13.1
Percentile Charts	54.8	55.9	59.5	59.2	49.4	25.3	3.5	4.6	6.2	6.4	6.3	4.0
Radiology Request	79.0	77.7	81.5	86.4	88.9	90.5	19.9	21.4	33.7	38.9	45.3	49.4
Respiratory Function Calculator	41.4	34.0	40.5	32.8	36.0	34.4	2.8	2.6	3.3	2.6	2.9	3.4
Travel Medicine	54.1	56.4	61.7	66.8	69.0	60.4	1.0	1.2	2.0	2.4	2.7	2.7
Weight Calculator	69.4	67.0	70.3	73.6	75.9	81.1	13.3	15.5	25.8	29.6	28.6	37.1

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Medication Change after Rx Warning

Function	n / %	Aug-03	Aug-04	Aug-05	Aug-06	Aug-07	Aug-08
Medication Change After:							
Drug-Allergy warning	n	55	54	77	276	1,136	1,272
	%	4.5	4.3	5.3	21.7	51.2	65.2
Drug-Disease warning	n	251	260	463	1,495	2,760	3,870
	%	12.8	11.7	8.0	22.7	34.8	44.7
Drug-Drug warning	n	511	708	859	2,040	3,580	4,368
	%	11.4	13.1	13.2	24.1	39.5	53.3

Medication Change after Rx Warning

The estimated number of near misses amongst all Medical Director users:

Function		Aug-03	Aug-04	Aug-05	Aug-06	Aug-07	Aug-08
Medication Change After:							
Drug-Allergy warning	NE	2,308	2,266	3,232	11,584	47,680	53,388
Drug-Disease warning	NE	10,535	10,913	19,433	62,747	115,841	162,429
Drug-Drug warning	NE	21,447	29,716	36,053	85,622	150,258	183,331

Ignoring Rx Warnings

- Sweidan et al (2009) expressed a concern that there were significant shortcomings in Rx interaction systems and that users were ignoring warnings and putting patients at risk of harm.
- Sweidan et al (2009) focused on interactions that were considered “major” and “minor”.
- There was no attempt (although probably not possible for the researchers) to quantify the level of overriding.
- So we examined the combinations for the same period (June 2006 - February 2007).

Ignoring Rx Warning

Combination*	N either	n combination	%
Azathioprine + Allopurinol	842	0	0.0%
Colchicine + Clarithromycin	1,490	4	0.3%
Cyclosporin + Diltiazem	579	0	0.0%
Digoxin + Clarithromycin	2,039	18	0.9%
Eplerenone + Ketoconazole	137	0	0.0%
Ethinylestradiol/Levonorgestrel + Doxycycline	2,156	0	0.0%
Fluoxetine + Sibutramine	1,022	5	0.5%
Indinavir + St Johns Wort	1	0	0.0%
Lithium + Diclofenac	2,330	6	0.3%
Methadone + Phenytoin	307	2	0.7%
Methotrexate + Trimethoprim	1,995	6	0.3%
Sertraline + Tramadol	4,625	111	2.4%
Sildenafil + Isosorbide mononitrate	685	2	0.3%
Simvastatin + Gemfibrozil	1,897	12	0.6%
Spironolactone + Perindopril	3,499	73	2.1%
Theophylline + Erythromycin	1,291	4	0.3%
Verapamil + Metoprolol	1,318	8	0.6%
Warfarin + Amiodarone	2,487	86	3.5%
Warfarin + Fluconazole	2,329	1	0.0%
Warfarin + Thyroxine	2,907	65	2.2%
Total	33,936	403	1.2%

* Based on Sweiden et al (2009) combinations investigated.

Conclusions

1. There has been an increase in exposure to drug interaction warnings as a result of:
 - i. Increased number of warnings available
 - ii. Increased recording of drug allergies
 - iii. Increased recording of medications
 - iv. Increased recording of morbidity
2. There has been an increase in the probability of making a medication change.
3. Medication changes are most likely made with Drug-Allergy, followed Drug-Drug then Drug-Disease.
4. However, there is still a high level of warnings that do not promote a change in treatment decision.

The Future

1. Decision support systems need to be designed to further increase the probability of a positive patient outcome.
2. Decision support should be valued and not automatically dismissed by the clinician without consideration.
3. Decision support does not completely replace the experience and training of a critically thinking clinician.
4. Effective decision support requires good medical record keeping.
5. Decision support systems should look to develop approaches that consider severity of warnings and the impact on changing clinician behaviours.

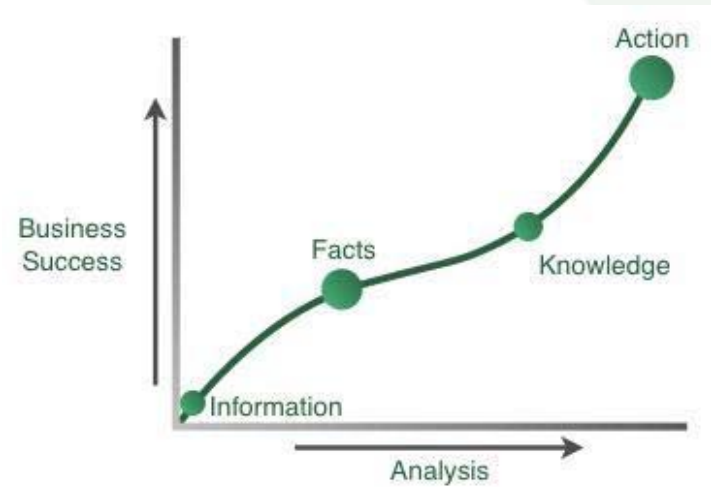
Contact

Geoffrey Sayer

dataworkshop Pty Ltd

Ph: 040 303 4925

E: geoff.sayer@dataworkshop.com.au



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