

To Err is Human

Medication Errors and Adverse Events

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Doctors vs Gun owners

Doctors

(A) The number of physicians in the U.S. is

700,000.

(B) Accidental deaths caused by Physicians

per year are

120,000.

(C) Accidental deaths per physician

is

0.171.

Statistics courtesy of U.S. Dept of Health and Human Services.

Now think about this:

Guns

(A) The number of gun owners in the U.S.

is

80,000,000.

(Yes, that's 80 million)

(B) The number of accidental gun deaths
per year, all age groups,

is 1,500.

(C) The number of accidental deaths per gun owner

is

.000188.

Statistics courtesy of FBI

So, statistically, doctors are approximately

9,000 times more dangerous than gun owners.

Remember, 'Guns don't kill people, doctors do.'

FACT: NOT EVERYONE HAS A GUN,

BUT

ALMOST EVERYONE HAS AT LEAST ONE DOCTOR.

Please alert your friends

to this

alarming threat.

We must ban doctors

before this gets completely out of hand!

Out of concern for the public at large,

I withheld the statistics on

lawyers

for fear the shock would cause

people to panic and seek medical attention!

How dangerous is health care?

- **Less than one death per 100 000 encounters**
 - Nuclear power
 - European railroads
 - Scheduled airlines
- **One death in less than 100 000 but more than 1000 encounters**
 - Driving
 - Chemical manufacturing
- **More than one death per 1000 encounters**
 - Bungee jumping
 - Mountain climbing
 - **Health care**

If you saw this, would you fly ?



Extra Extra

**Airlines expect 1-2
jets to crash daily**

Over 1000 deaths expected weekly

Buy what about being a patient in the health care system

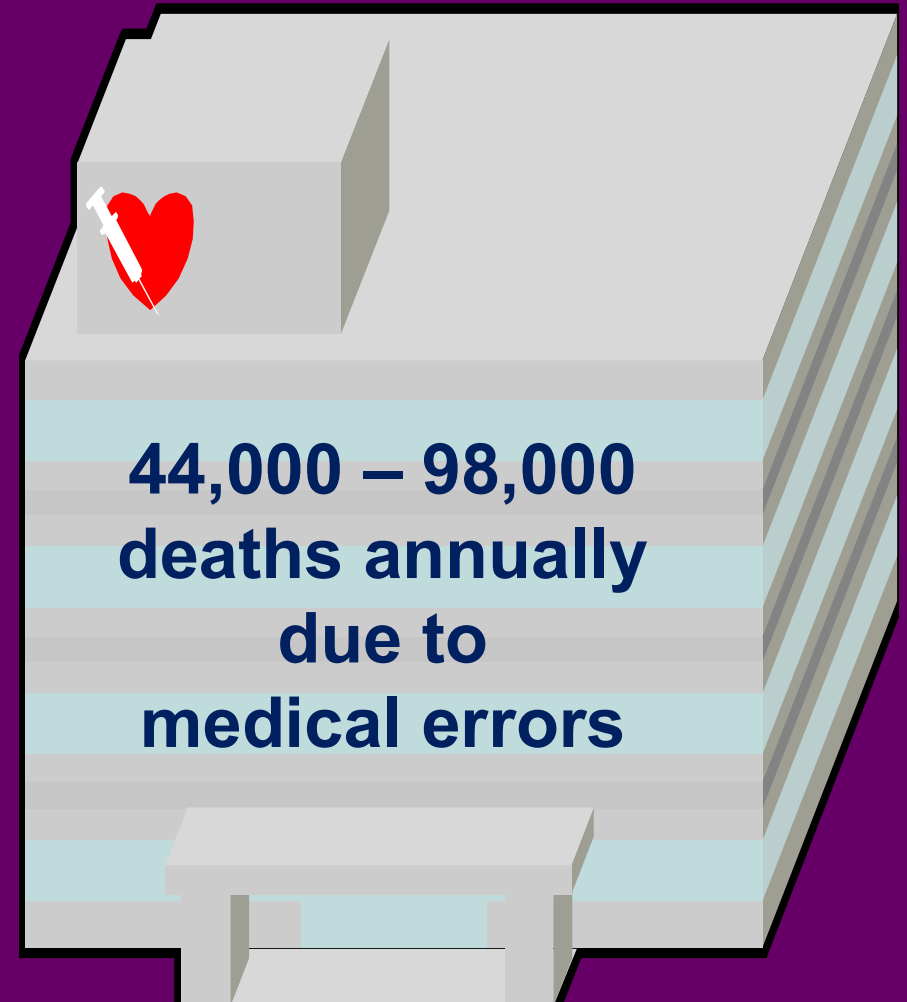


Extra Extra

Airlines expect 1-2 jets to crash daily

Over 1000 deaths expected weekly

=



ADR Effects (Erythema Multiforme)



Used with permission from Michelle Ehrlich, MD and eMedicine.com, Inc.

ADR Effects (Gingival Enlargement due to Ca^{2+} -Channel Blockers)



Used with permission from Carl Allen, DDS and eMedicine.com, Inc

ADR Effects (Warfarin Skin Necrosis)



Used with permission from Michelle Ehrlich, MD and eMedicine.com, Inc

Definition: Medication Error

- any **preventable event** that may **cause or lead to inappropriate medication use or patient harm** while the medication is in the control of the health care professional or patient. Such event may be related to:
 - professional practice,
 - health care products,
 - procedures, and
 - systems, including
 - prescribing;
 - order communication;
 - product labelling,
 - packaging, and
 - nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.

Proportion of adult admissions that are ADR-related: systematic reviews

Review	<i>n</i> studies (LMIC)	<i>n</i> patients	Proportion of adult admissions ADR- related
(1) Einarson, 1993	37 (2)	69 187	Median 4.9%
(2)* Muehlberger, 1997	25 (1)	160 354	Median 4.1%
(3)* Lazarou, 1998	21 (0)	28 017	M-A estimate 4.7%
(4)* Wiffen, 2001	37 (3)	133 741	Weighted mean 3.1%
(5)* Beijer, 2002	51 (4)	116 241	Weighted mean 4.1%
(6)* Kongkaew, 2008	10 (1)	11 477	Median 6.3%
* Subgroup analysis			

1 *Ann Pharmacother* 1993; **27**: 832
 2 *Pharmacoepidemiol Drug Saf* 1997; **6 S3**: S71
 3 *JAMA* 1998; **279**: 1200

4 *Bandolier Extra* 2002: 1-15
 5 *Pharm World Sci* 2002; **24**: 46
 6 *Ann Pharmacother* 2008; **42**: 1017

SA Experience

- **Somerset Hospital: 6.3% admissions as a result of an adverse drug reaction and 41% preventable.**
- **At least 22% possibly preventable by optimal care**
- **6% as probably or definitely preventable**

Four Medical Wards in SA

- ADRs 8.4% of adult medical admissions, which is higher than previous systematic reviews had found
- ADRs contributed to the death of 18% of patients in the medical wards
- Drugs used in HIV and TB management implicated in approximately one-third of ADRs
- 50% serious ADRs were preventable.

Who is at most risk?

The elderly

Who Is At Most Risk?

Beers List identifies two categories of concern:

- Potentially inappropriate **independent** of condition
- Potentially inappropriate **considering** condition

Beers et al. *Arch Intern Med.* 1991; 151:1825-1832

Beers. *Arch Intern Med.* 1997; 157:1531-1536

Fick et al, *Archiv Intern Med.* 2003; 163:2716-2724

Pillans. *Expert Rev Clin Pharmacol.* 2008;1(5):695-705.

Who Is At Most Risk?

Examples of drugs, **independent of condition**

- Indomethacin (GIT, Kidney, CVS)
- Methyldopa (bradycardia, depression)
- Chlorpropamide (long half-life, SIADH)
- Amitriptyline (anticholinergic)
- Long-acting benzodiazepines (long half-life)
- High doses of short-acting benzodiazepines (increased sensitivity)
- Mineral oil (aspiration risk)

Fick et al, *Archiv Intern Med.* 2003; 163:2716-2724

Who Is At Most Risk?

Examples of drugs, **dependent upon condition**

- CHF: disopyramide
- BPH: anticholinergics
- Stress Incontinence: alpha-blockers
- Arrhythmias: tricyclics
- Parkinson Disease: metoclopramide
- Cognitive impairments: anticholinergics
- Depression: long-term benzodiazepine use
- Seizures: bupropion

Who Is At Most Risk?

Use of Beers List drugs documented to correlate with:

- **Total healthcare costs**
- **Provider costs**
- **Facility costs**
- **Inpatient days**
- **Outpatient visits**
- **Casualty visits**

Who Is At Most Risk?

These increases remain even after controlling for:

- Age
- Sex
- Comorbidity
- Total number of prescriptions

The Ambulatory Problem

It's difficult...

“NSAIDs are associated with just 5.5 hospital admissions per 10,000 patients treated with these drugs in primary care.”

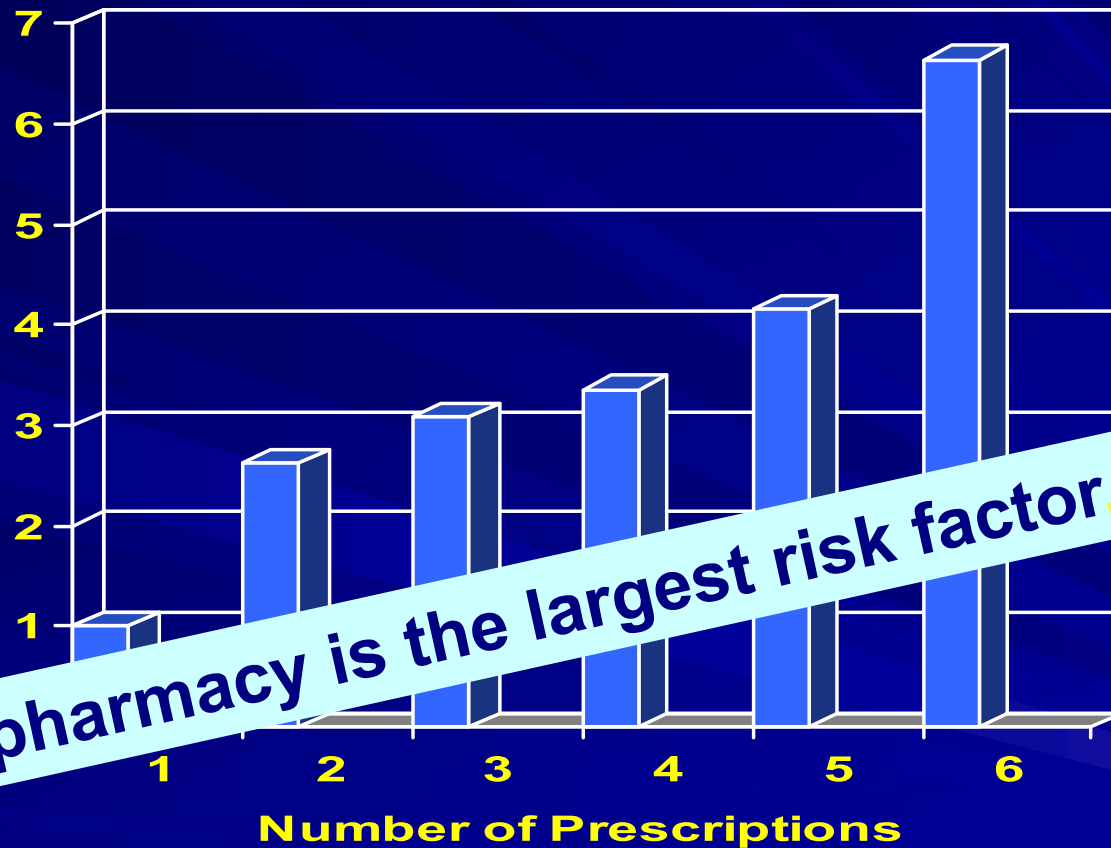
Schneeweiss, S. *British Journal of Clinical Pharmacology* 2001;
52:196-200

The Ambulatory Problem

It's difficult... but important.

“If deaths from gastrointestinal toxic effects of NSAIDs were tabulated separately... *they would constitute the 15th most common cause of death in the United States.*”

Who Is At Most Risk?



Goulding. *Arch Intern Med.* 2004;164:305-312

The Ambulatory Problem

It's difficult... but important.

“Adverse Drug Reactions rank
from the 4th to the 6th
leading cause of death
in the United States.”

Lazarou et al, *JAMA*. 1998; 279:1200-1205

Contribution of Drug Interactions to the Overall Burden of Preventable ADRs

- **Drug interactions represent 3–5% of preventable in-hospital ADRs**
- **Drug interactions are an important contributor to number of ER visits and hospital admissions**

Leape LL et al. *JAMA* 1995;274(1):35–43

Raschetti R et al. *Eur J Clin Pharmacol* 1999;54(12):959–963

Pillans. *Expert Rev Clin Pharmacol*. 2008;1(5):695-705.

- **1980: medical school graduates needed to really know 60 drugs well**
- **2006: this number is estimated at 700 drugs**
- **DDIs increase exponentially with these numbers**

Medications	Potential DDIs
2	1
4	6
8	28
16	120

Karas S. *Ann Emerg Med* 1981; 10:627-630

Safety “Tools”

- Training, memory and best efforts
- “Dear Doctor Letters”
- Package Labeling
- Electronic Medical Records
- Drug Use Review

Training, Memory and Best Efforts As Safety System Tools

**“Asking an individual doctor
to rely on his memory is like
asking travel agents to
memorize airline schedules.”**

Drugs Removed from or Restricted in the U.S. Market Because of Drug Interactions

Torsades de pointes ended 6 drugs so far:

1998: Terfenadine (Seldane)

1998: Mibefradil (Posicar)

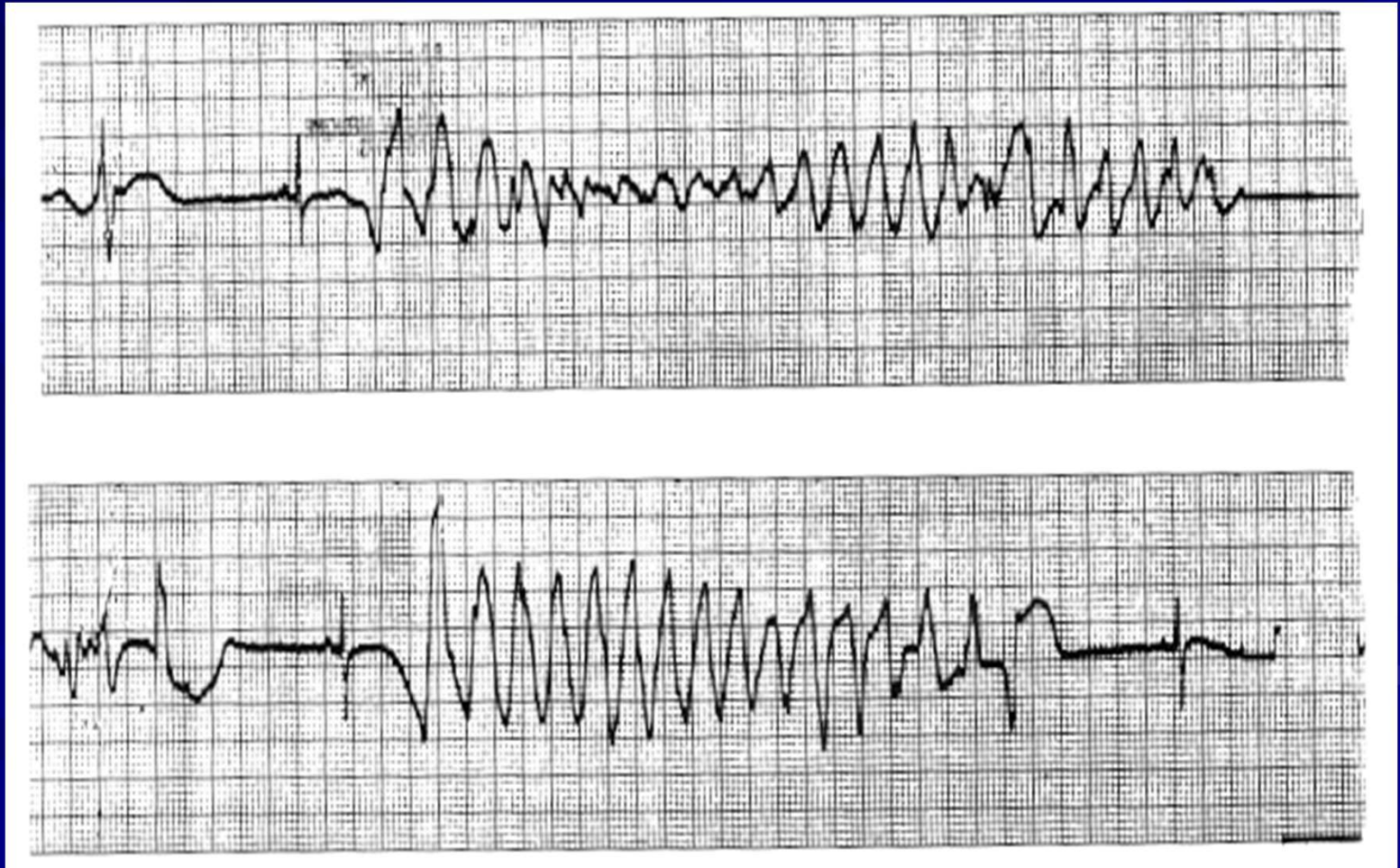
1999: Astemizole (Hismanal)

1999: Grepafloxacin (Raxar)

2000: Cisapride (Propulsid)

2001: Cerivastatin (Baycol)

Torsades de Pointes



Monahan BP et al. *JAMA* 1990;264:2788–279090

Common types of Medication Errors

American Hospital Association

- incomplete patient information
 - (not knowing about patients' allergies, other medicines they are taking, previous diagnoses, and lab results, for example);
- unavailable drug information
 - E.g. lack of up-to-date warnings
- miscommunication of drug orders,
 - E.g. poor handwriting, confusion between **drugs with similar names**, misuse of zeroes and decimal points, confusion of metric and other dosing units, and **inappropriate abbreviations**.

MEDICAL CENTER HOSPITAL
100-190 W. 4TH STREET ODESSA, TEXAS PH. 333-7771

FOR [REDACTED] AGE

ADDRESS 1414 1st St DATE 6/23/95

NO REFILLS ☐ Plendil 20mg # 120 -
20mg P.O. Q6hr

REFILLS ☐ Fenofibrate 300mg # 100
300mg P.O. TID E meals

LABEL ☐ Humulin N
30 units SQ QID

[REDACTED]

PRODUCT SELECTION PERMITTED DISPENSE AS WRITTEN

Actually for Isordil, but patient given Plendil → RIP

HCT 250mg po daily

Hydrochlorothiazide 50mg OR Hydrocortisone
250mg?

60 Regular INSULIN NOW

60 or 6 units of Insulin immediately?

**Medical error is not
fundamentally due to lack of
knowledge but not putting our
knowledge into practice**

**Lucian Leape
BMJ 2000**

Way Forward

A Good Medication History: **AVOID** Mistakes

- **A**llergies?
- **V**itamins and herbs?
- **O**ld drugs and OTC? ..as well as current
- **I**nteractions?
- **D**ependence?
- **M**endel: family Hx of benefits or problems with any drugs?

Some more Tips

- Age, hepatic and kidney disease may impair clearance of drugs so smaller doses may be needed.
- Prescribe as few drugs as possible and give clear instructions
- Where possible use familiar drugs. With new drugs be particularly alert for ADRs and unexpected event.
- Write Neatly and no abbreviations

“Doing the right thing is easy.
Knowing what it is, is more difficult.”

Harry Truman



**"I feel a lot better since I ran out of those pills
you gave me."**

Thank you