Prescribing Errors and Polypharmacy

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Prescribing Errors & Polypharmacy

Trivia Analysis

When a patient comes to a clinician for a visit presenting with symptoms, how many visits out of 3 result in a prescription being written?

a. 1
b. 2
c. 3
d. Every now and then

Prescribing Errors & Polypharmacy

Definition of 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 healthcare professional or patient. Such events may be related to professional practice, healthcare products, procedures, and systems including: prescribing; order communication; product labeling, packaging and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.”

Working definition of medication of medication error, as approved by The National Coordinating Council for Medication Error and Prevention (NCCMERP).

Prescribing Errors & Polypharmacy

Room for Error?

- Prescription drugs are an integral part of personal health
- At least 60% of all Americans take one prescription drug regularly, with 1 in 6 taking 3 or more
- As the population ages, its use of prescription drugs and the number of prescription transactions increases
- Prescriptions account for $221 billion in retail sales and more than 10% of Americans spend on healthcare

Prescribing Errors & Polypharmacy

Risky Business

- 68% Prescribing
- 25% Administering
- 7% Supplying

(As of 2000, Institute of Medicine Report)
Prescribing Errors & Polypharmacy

Major Factors
- Confusion over look-alike drug names
- Confusion over sound-alike names
- Generic drug name complexities with spelling and pronunciation
- Not reading Black Box warnings
- Fatigue & distraction
- And more....

Prescribing Errors & Polypharmacy

The “Sad” Statistics
- At least 1 death/day is due to medication errors
- FDA: Over 700,000 Americans injured each year due to medication errors
- Annual cost of drug-related morbidity & mortality is $177 billion in the U.S.
- At least 7,000 deaths occur each year

Prescribing Errors & Polypharmacy

Trivia Analysis
Where do most prescribing and dispensing errors occur?
- Outpatient/ambulatory setting
- Emergency department/urgent care
- Medical/surgical floors in hospitals
- Critical care/intensive care units

Prescribing Errors & Polypharmacy

Where?
- Vast majority of prescribing and dispensing errors occur in outpatient or ambulatory settings
  - ~ 1 out of 131 outpatient deaths
- Medication errors occur in ~ 1 in every 5 doses given in hospitals
  - ~ 1 out of 854 inpatient deaths
- 10% of all medication errors result from drug name confusion

Prescribing Errors & Polypharmacy

Who is responsible?
- More than 30% of all medication errors reported
- 25% of dispensing errors (pharmacy)
- 10% of administering errors
- There are 1000, sometimes categorically different and potentially harmful, medications to be confused with one another

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More than 9,000 generic drug names

> 33,000 trade marked brand names in the U.S.

The FDA reviews more than 400 brand names a year before a product is to be marketed

Names must be reviewed for potential confusion with other drugs, so that "any" other associations would not harm the patient in the event of an error

1/3 are rejected

What's in the name?

Every drug has 3 names:
- Chemical name
- Generic (non-proprietary) name
- Brand (proprietary) name

Each is subject to different rules and regulations

The common name, loosely referred to as the generic name, must accompany the brand name if there is one

Generic names are coined using an established stem, or group of letters, that represents a specific drug class

United States Adopted Name (USAN) Council stems include:
- suffixes like "-mycin" for bacterial antibiotics (clindamycin)
- prefixes like "dopa-" for dopamine receptor agonists

These names typically look and sound so much alike that they contribute to medication errors, especially if the two drugs share common dosage similarities

Generic drug names are not subject to the scrutiny and rigorous testing that brand drug names undergo

The amount of time and money spent on generic names does not come close to that spent on brand names

There are more reported name-related errors between brand-name drugs than generic names

The Medication Errors Reporting (MER) program suggests that over 4,500 actual and potential medication errors of brand-name drugs occur in a given year
What's in the name?
- Similar pronunciation (e.g., Vinblastine/Vincristine, Celebrex/Cerebyx)
- Complicated drug names (e.g., Clarithromycin, levothyroxine)
- High-tech or exotic sounding names (e.g., Xanax, Lexapro, Zepeda)
- Positive or soothing sounding names (e.g., Viagra, Lunesta, Aleve)

Common Errors Mainly Occur Because Of...
- Unfamiliarity with drug name
- Confusion about correct spelling (especially when giving phone orders)
- Lack of knowledge about generic and brand name pairs

The Joint Commission (TJC)
- Made look-alike/sound-alike drugs part of its National Patient Safety Goals
- Organizations are required, at a minimum, to annually review a list of look-alike and sound-alike drugs used in their facility and take action to prevent mix-ups
- Joint Commission has posted a list of the most problematic drug name pairs for specific health care settings, and facilities must include at least 10 of these drug combinations on their lists

TJC Recommendations for Prescribers
- Prescribers should write both brand and generic names on prescriptions.
- The intended purpose of the medication should be included.
- Verbal or telephone orders should be given only when truly necessary.

Generic Name Mix-Up
- Amrinone (Inocor) and Amiodarone (Cordarone)
- Amrinone = vasodilator
- Amiodarone = anti-arrhythmic
- Serious outcomes from errors involving this similarly named pair, including death were reported

Action
- On the advice of United States Pharmacopeia (USP) and the United States Adopted Names Council (USAN) – the organization in charge of approving generic names –
  Amrinone was changed to Inamrinone
Iodine and Edtodolac (Lodine)

- Iodine = Trace element
- Lodine = NSAID

Amicar vs. Omacor

- If a patient inadvertently took Amicar instead of Omacor, the risk of thrombosis would be increased
- Substituting Omacor for patients that truly need Amicar may be even more significant, possibly leading to serious bleeding

Xanodyne (Amicar) and Omacor

- Amicar = an antifibrinolytic
- Omacor = an omega-3 fatty acids agent

Pilocarpine (Salagen) and Selegiline hydrochloride (Eldepryl)

- Salagen = used to treat the dry mouth symptoms
- Selegiline = MAO-inhibitor used to treat Parkinson's disease
- Both available in 5 mg tablets

Case #1:
A home health nurse received a telephone order for an elderly patient with problems related to a dry mouth. The prescription was for Salagen 5 mg, but the nurse misheard the order and called the pharmacy to request selegiline 5 mg.

Case #2:
About 2 weeks later, another pharmacist was processing a prescription for a fentanyl patch for the same patient when the pharmacy computer system signaled an alert about a drug interaction between fentanyl and selegiline. When the pharmacist contacted the prescriber, he discovered the error.

In the second case, a pharmacist reported that the similar spelling of the two drug names led him to enter "selegiline" into the computer instead of "Salagen". The error was recognized only after the patient complained that the medication was not helping his dry mouth, and this caused the pharmacist to check the patient’s profile.

Salagen vs. Selegiline

- **Case #1:** A home health nurse received a telephone order for an elderly patient with problems related to a dry mouth. The prescription was for Salagen 5 mg, but the nurse misheard the order and called the pharmacy to request selegiline 5 mg.

- **Case #2:** About 2 weeks later, another pharmacist was processing a prescription for a fentanyl patch for the same patient when the pharmacy computer system signaled an alert about a drug interaction between fentanyl and selegiline. When the pharmacist contacted the prescriber, he discovered the error.

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Drug Name Confusion

- **Recommendations:**
  - Maintain awareness of look-alike and sound-alike drugs relevant to your setting, and as published by various safety agencies
  - Use both generic and brand name when writing prescriptions
  - Include the purpose of the medication on prescriptions
  - When possible, list generic and brand names on medication administration records and automated dispensing cabinets

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Abbreviations – A shortcut to potential disaster?

Dangerous abbreviations:

- **μg or mg**
  (use mcg or write out "microgram")

- **QD/q.d. or q.i.d.**
  (use "daily" or "every day")
  QD can also be mistaken for "right eye"

- **IU or IV**
  (use "units")

- **IU/U or 10U**
  (use "units", U can be mistaken for a zero)

- **.5mg or 5mg**
  (always use zero before decimal point)
Abbreviations – A shortcut to potential disaster?

- Dangerous abbreviations:

  1.0mg or 10mg

  (never use trailing zero)

- Dangerous abbreviations:

  AU, AD, AS
  or
  OU, OD, OS

  (JCAHO = spell out; if used - capital letters only and print legibly)

Abbreviation Misunderstanding

A 15-year-old boy with end-stage AIDS was admitted to the pediatric ICU with mental status changes. He was diagnosed with status epilepticus and started on a loading dose of IV phenytoin.

In the step-down unit, the resident wrote an order for a maintenance dose of phenytoin. The order was written as mg/kg/d without specification that ‘d’ meant day vs. dose. As a result, the patient received approximately three times the indicated dose. Later that day, a pharmacist called to alert the resident to his mistake. The subsequent phenytoin level was 98 (therapeutic range 10-20).

Administration of phenytoin was held until the level was therapeutic, and the patient’s mental status gradually improved. He had no further seizure activity and ultimately his mental status returned to baseline. He was discharged back to a chronic care facility.

Abbreviations: Changes that can make a difference

Oregon Health & Sciences University (OHSU) – Case Study

- 454-bed tertiary care center
- Level 1 Trauma Center
- Inpatient pharmacy, processing an average of 2,400 orders daily
- Total of 57 pharmacists (118 full-time pharmacy staff members)
- Servicing both inpatients and outpatients

(Laselle & May, 2006)
Abbreviations: Changes that can make a difference

Sample: OHSU Unacceptable Abbreviations – Do Not Abbreviate List

Avoid

Intended Meaning
Nitro
Nitroglycerin or nitroprusside
AZT
Zidovudine (Retrovir)
CPZ
Prochlorperazine (Compazine)
DTO
Deodorized tincture of opium or diluted tincture of opium
HCL
Hydrochloride
TAC
Tramcinolone or tetracaine, andrenaline, cocaine

Misinterpretation
Misinterpreted as nitroprusside when nitroglycerin is mean and vice versa
Azathioprine
Chlorpromazine
Misinterpreted as diluted when deodorized tincture of opium is meant and vice versa
KCL
Misinterpreted as tetracaine, andrenaline, cocaine when tramcinolone is meant as vice versa

(Alasale & May, 2006)

Abbreviations: Changes that can make a difference
Oregon Health & Sciences University (OHSU) – Case Study

Results

Top 2 most common unacceptable abbreviations:
- Degree sign, instead of hour
- cc, instead of mL

Less common:
- MS, instead of morphine
- QD, instead of daily
- MSO4, instead of morphine

Rarely seen were:
- U, for unit
- Trailing zero

The amount and subsequently, the frequency, of unapproved abbreviations decreased

The rank order for most common unacceptable abbreviations remained unchanged

Process of Implementation & Results:

- Soft Stop: Week long period, when orders containing unacceptable abbreviations or PRN orders without indication, were processed if interpreted without confusion – prescriber notified

- Hard Stop: No order containing unacceptable abbreviations or PRN orders without an indication, was processed – prescriber contacted and required to rewrite order correctly

(Alasale & May, 2006)
Organizations must identify and apply at least 3 “do not use” abbreviations, in addition to the Joint Commission list of unacceptable abbreviations, acronyms, and symbols.

**TJC Official “Do not Use” List**

- **Do Not Use**: Potential Problem and Use Instead
  - U (unit) Misstaken for “0”, the number “4” (four) or “cc” Write “unit”
  - IU (International Unit) Misstaken for IV (intravenous) and the number 10 (ten) Write “International Unit”
  - Q.D., QD, q.d., qd (daily) Misstaken for each other Write “daily”
  - Q.O.D., QOD, q.o.d., qod (every other day) Period after the Q mistaken Write “every other day”
  - Trailing zero (X.0 mg) Decimal point instead Write X mg
  - Lack of leading zero (.Xmg) Write 0.X mg
  - MS Can mean morphine sulfate or magnesium sulfate Write “morphine sulfate”
  - MSO₄ and MGSO₄ Confused for one another Write “magnesium sulfate”

**Exception:**

A “trailing zero” may be used only where required to demonstrate the level of precision of the value being reported, such as for laboratory results, imaging studies that report size of lesions, or catheter/tube sizes.

It may not be used in medication orders and other medication-related documentation.

**Abbreviations**

- Follow both required and recommended JC “Do Not Abbreviate” regulations strictly
- Implement a system to prevent prescriptions of being written using dangerous abbreviations
Prescribing Errors & Polypharmacy

**Can you read this?**

```
Rf    [Prescriber's handwriting]

Rf    [Prescriber's handwriting]
```

Prescribing Errors & Polypharmacy

**Answers:**

- Z-Pak (Zithromax)  >>
- Paregoric 5 cc  >>
  bid prn
  1 month supply

Prescribing Errors & Polypharmacy

**The Pen Is Mightier Than the Sword**

- Hand-writing prescriptions – old age practice?
- New technological advancements – are they the solution?

Prescribing Errors & Polypharmacy

**Rosiglitazone (Avandia) vs. Warfarin (Coumadin)**

A poorly written order (above) for the diabetic medication, Avandia, bears a strong resemblance to the oral anticoagulant, Coumadin. The potential for this potentially disastrous medication substitution is accentuated by the fact that both drugs are available as 4 mg oral tablets.

Prescribing Errors & Polypharmacy

**Felodipine (Plendil) vs. Isosorbide dinitrate (Isordil)**

This poorly written prescription for Isordil® (isosorbide dinitrate) 20 mg q 6 hours was interpreted by the pharmacist and dispensed as Plendil® (felodipine) 20 mg q 6 hours. The patient suffered a myocardial infarction after only one day of taking the erroneous prescription; he died a few days later. The pharmacist and physician were both sued in this case – the physician for the illegible handwriting itself and the pharmacist for not questioning the illegible prescription, especially given that the interpreted order far exceeded the recommended maximum dose of Plendil (10 mg daily).
Handwritten Prescriptions

- Poorly written prescriptions may have potentially fatal results:
  - Wrong medication dispensed
  - Overdose

Prevention Strategies

- Computerize prescribing
- When handwriting: write slowly and legibly
- Use capital letters and/or at least, print
- Refer to the “Do Not Use” Abbreviation List

Dosing Errors

Too much or not enough: What are the dangers?

Result of:

- Poor handwritten prescriptions
- Use of abbreviations
- Unclear administration instructions
- Unfamiliarity with two different administration forms (e.g., IV or oral) of the same drug

Common Dosing Errors

- Dose significantly different from “normal” standards
- Error in dose
- Unavailable dosage form/strength
- Misleading, incomplete or confusing directions
- Take as directed
- PRN directions or refills
- Unclear dose based on concentration
- Sustained release dosage forms

Avoid Dosing Errors

- Follow recommendations for use of abbreviations
- Write complete instructions regarding administering the medicine
- Refer to patient medical records for any information that may affect the dose needed
Legislature

Federal Government Agencies:
- Center for Drug Evaluation and Research, U.S. Food and Drug Administration [http://www.fda.gov/cder/]
- Center for Biologics Evaluation and Research, U.S. Food and Drug Administration [http://www.fda.gov/cber/]
- National Committee on Vital and Health Statistics [http://nchhs.gov]

Federal Patient Safety Reporting Systems:
- MedWatch, FDA Safety Information and Adverse Event Reporting System [http://www.fda.gov/medwatch/]
- National Center for Patient Safety, U.S. Department of Veterans Affairs [http://www.va.gov.ncps/]

Summary: Prescribing Errors

Prescription errors account for many patient injuries and deaths each year.
Most of those errors are preventable with simple measures.
Staying informed and following recommendations on how to avoid such errors is a must for the safety of patients.
Create, implement and adhere to prevention strategies.

Prescriptions errors may be caused by one or more of the following:
- Lack of knowledge/misconceptions about certain drugs
- Confusion about drug names (look-alike, sound-alike)
- Use of dangerous abbreviations
- Illegible handwriting
- Omission of important dosing information

Best prevention strategies:
- Check your handwriting
- Avoid the term "use as directed"
- Recheck dosage calculations
- Include all pertinent information
- Don’t use abbreviations
- Avoid decimals
- Use pre-types prescriptions or drug-name ink stamps for frequently prescribed medications

More prevention strategies:
- Medication reconciliation
- Keep informed of "Black-Box" Warnings and media “high alerts”
- Have medication administration records verified independently by more than one healthcare practitioner
Summary: Prescribing Errors

- Always, always... double and triple check:
  - Patient medical and health histories
  - Drug name spelling
  - Drug dosing and concentrations
  - Indicated use and any Black-Box warnings in effect
  - Use of abbreviations (avoid)
  - Close patient monitoring when adding new medications or changing dosing

Polypharmacy: Who's at fault? What to do?

What is Polypharmacy?
- Polypharmacy = Many Drugs
  - Generally, 3 or more drugs = polypharmacy
  - In hospitalized patients, can be up to 10+ drugs
  - Unwanted duplication of drugs
  - Interactions of drugs
  - Dosages: either too low/high

What illness?
- Iatrogenic is pronounced ("jā-trə-ˈje-nik"
- iatros means physician (Greek)
- -genic means induced by (derived: International Scientific Vocabulary)

  Combined = iatrogenic, meaning "physician-induced"

Iatrogenic illnesses:
- Caused by medical care
  - Includes hospital setting acquired illnesses
  - Illnesses caused by prescription drugs
  - Polypharmacy
Prescribing Errors & Polypharmacy

Types of Polypharmacy

- **Appropriate:** necessary multi-drug treatment
- **Inappropriate:** ingesting more drugs than necessary
- **Pseudopolypharmacy:** medication recording errors in facilities that falsely suggest polypharmacy is occurring

(UMaine Center on Aging, 2003)

Prescribing Errors & Polypharmacy

Widespread: Mentally ill – 5 Subtypes

- **Same-class polypharmacy:** (almost always inappropriate)
  - the use of paroxetine and fluoxetine
- **Multiclass polypharmacy:**
  - the use of full doses of drugs from different medication classes to treat the same symptom cluster
- **Adjunctive polypharmacy:**
  - the use of 1 drug to treat side effects of another
- **Augmentation:**
  - the use of a medication at a low dose to augment another, OR
  - adding a medication that would not be used alone to treat a symptom cluster
- **Total polypharmacy**

(National Association of State Mental Health Program Directors, 2000)

Prescribing Errors & Polypharmacy

Who is at risk?

- Elderly patients (numbers of medications + liver metabolism)
- Patients with multiple conditions (chronic and acute)
- Patients with multiple healthcare providers
- Individuals ingesting 5 or more medications (prescription, OTC, herbs and supplements combined)

Prescribing Errors & Polypharmacy

Who is at risk?

<table>
<thead>
<tr>
<th>Age</th>
<th>% of population taking at least 1 prescription drug</th>
<th>% of population taking 3 or more prescription drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18</td>
<td>20.5</td>
<td>2.4</td>
</tr>
<tr>
<td>18-44</td>
<td>31.3</td>
<td>5.7</td>
</tr>
<tr>
<td>44-64</td>
<td>54.8</td>
<td>20.0</td>
</tr>
<tr>
<td>&gt; 65</td>
<td>73.6</td>
<td>35.3</td>
</tr>
</tbody>
</table>

(CDC, 2006)

Prescribing Errors & Polypharmacy

Why are the elderly at such high risk?

- 21% of the population is age 55+
- As Baby Boomers age: 1 in 5 will be age 55+
- Seniors consume 34% of all prescription drugs
- About 6,500,000 older adults use 1 or more of 33 inappropriate prescription drugs
- All people age 65+
  - 90% – at least one medication/week
  - 40% – five or more
  - 12% – TEN or more

(Rhyne, 2007)
Does age really increase the risk for polypharmacy?
- ~ 30% of older adults are taking 8 or more medications
- 80% of older adults ingest an average of 3 prescription medication daily
- 86% of medications taken by older adults are for long-term health condition
- 45% of older adults are taking at least one non-prescription medication daily

What are the dangers of polypharmacy?
- Clearly linked to heightened risk of occurrence of drug-related problems (DRPs) and a detrimental outcomes:
  - Death
  - Overdose
  - Decline in health
  - Physical injuries – including permanent
  - Inability to effectively control conditions*
  - Iatrogenic illnesses*
  - Higher healthcare costs

Adverse Drug reactions & Polypharmacy
- ADEs are 4th – 6th leading cause of death in the U.S.
- > 100,000 deaths per year due to adverse drug events
- 2.2 million serious ADEs occurrences every year
- 1/3 of prescription medications used are unneeded
- The annual cost of treating medication-related errors exceeds $1.77 billion/year
- The most serious events are usually, the most preventable

Trivia Analysis
Your 68-year-old female patient presents to your office for a check-up. Her history is significant for:
- Type 2 DM
- HTN
- Dyslipidemia
- Hypothyroidism
In reviewing the chart with the patient, she states that she does not use any herbal products. However, she confirms currently taking the following medications:
- Aspirin, 81 mg daily
- Atenolol, 25 mg daily
- Atorvastatin, 20 mg daily
- Calcium carbonate, 600 mg twice daily
- Conjugated estrogens, 1.25 mg daily
- Folic acid, 1 mg daily
- Gemfibrozil, 600 mg twice daily
- Glyburide, 5 mg twice daily
- Metformin, 1,000 mg twice daily
- Hydrochlorothiazide, 25 mg daily
- Levothyroxine, 0.50 mg daily
- Lisinopril, 10 mg daily
- Micronase, 5 mg daily
- Multivitamin daily
- Potassium chloride, 8 mEq daily
- Rosiglitazone, 4 mg twice daily
- Synthroid, 0.025 mg daily
- Vitamin E, 400 IU daily

Trivia Analysis: Answers
- Confusion between generic and trade names of drugs resulted in this patient taking 2 different duplicate medications:
  - glyburide and Micronase, which is the trade name for glyburide
  - levothyroxine and Synthroid, which is the trade name for levothyroxine
- Duplication occurred when the patient was recently discharged from the hospital and received new prescriptions
  - Note: admission to the hospital is a known risk factor for increasing the number of both appropriate and inappropriate medications, as well as for errors in patients’ overall medication regimens
Potential interaction between the levothyroxine and calcium carbonate (Caltrate):

- Thyroid hormones should be administered 1 hour before or 4 hours after calcium supplements (concurrent administration may decrease the absorption and thus, the efficacy of levothyroxine) 

Combined use of lisinopril (Prinivil, Zestril) and KCl can increase risk for hyperkalemia:

- A potassium level should be obtained if one has not been recently ordered

What are the signs/symptoms of polypharmacy?

- Often, patient symptoms get confused with the “normal aging process”:
  - Fatigue, sleepiness and decreased alertness
  - Constipation, diarrhea or incontinence
  - Confusion
  - Falls
  - Depression or lack of interest in usual activities

What are the symptoms of polypharmacy?

- Often symptoms get confused with the “normal aging process”:
  - Weakness
  - Tremors
  - Visual or auditory hallucinations
  - Anxiety or excitability
  - Dizziness
  - Decreased sexual performance

What conditions result from polypharmacy?

- Arrhythmia
- Balance disturbances
- Cognition changes
- Confusion
- Constipation
- Depression
- Gastric ulcers
- Hyper- or hypotension
- Pseudoparkinsonism
- Rash
- Suicidal ideation
- Unexpected treatment failure

Is there too much to choose?

1. Multiple prescription drugs for the same condition
2. Self-medication
3. Wide variety of OTC drugs available for everyday, common ailments
Is there too much to choose?

Medications available and in development for treating
Metabolic Syndrome

<table>
<thead>
<tr>
<th>Lipids</th>
<th>Blood Pressure</th>
<th>Diabetes</th>
<th>Thrombosis</th>
<th>Obesity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently available drugs</td>
<td>Beta-blockers</td>
<td>Sulfonylureas</td>
<td>Aspirin</td>
<td>Clopidogrel</td>
</tr>
<tr>
<td>In development</td>
<td>ACE/ARB</td>
<td>Calcium channel blockers</td>
<td>Beta-blockers</td>
<td>Glucagon-like peptide</td>
</tr>
</tbody>
</table>

Grundy, 2006

Prescription Medications Facts

- Prescription drugs are an integral part of personal health
- > 3.27 billion prescriptions may be written annually
- At least 50% of all Americans take one prescription drug regularly, with one in six taking 3 or more
- As the population ages, the use of prescription drugs increases, as well as the number of prescription transactions
- Prescriptions account for $221 billion in retail sales and more than 10% of what Americans spend on healthcare

Consumer Healthcare Products Association, 2006

OTC Medications Facts

- ~1,000 active ingredients in > 100,000 OTC products available in the marketplace today
- More than 80 ingredients, dosages, or indications have "switched" from prescription to OTC status
- > 700 products available OTC today use ingredients and dosages that were only available by prescription less than 30 years ago
- ~ 77% of Americans take an OTC product to treat common, everyday ailments

Consumer Healthcare Products Association, 2006

Self-medication Facts

- 59% of Americans more likely to treat their own health condition now than a year ago
- 73% would rather treat themselves at home than see a doctor
  - 6 in 10 (62%) would like to do more of this in the future!
- 96% are generally confident about the health care decisions they make for themselves

Consumer Healthcare Products Association, 2006

Self-medication & Polypharmacy

- Increases risk of polypharmacy
- Increases the inability of healthcare providers to monitor patients for potentially dangerous interactions
- Increases the risk of developing additional health problems

Consumer Healthcare Products Association, 2006
Why does polypharmacy occur?
- The “Blame Game” – Who is at fault?
  - Healthcare providers
  - Pharmacists
  - Patients
  - Pharmaceutical Companies
  OR
  YOU?!

“5 Rights” – does it still apply?
- Right drug
- Right patient
- Right dose
- Right route
- Right time

The Nurse’s Role

Roles in medication error prevention:
1. must check to see that other healthcare providers have not made any errors in any part of the medication order chain
2. must ensure that they (themselves) do not make an error

The Nurse’s Impact

48% of medication errors: Contributed to ordering or prescribing the wrong drug, dosage, or route
- Nurses intercept 48% of these errors!
11% of medication errors are transcription errors
- Nurses intercept 23%!

14% medication errors are dispensing errors
- Nurses intercept 37%!

28% of all medication errors: Administration
- Once the medicine has been given, there is no way to intercept it

Overall, nurses intercept 58% of all medication errors!

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How do we achieve minimizing errors as an advanced practice healthcare provider?

Top ways to prevent medication errors when writing prescriptions, especially for older adults:

- "Always lead, never follow" – No trailing zeros
- Include patient in medical decisions and inform what is being ordered and why
- Write the purpose of the medication on the prescription
- Ensure adequate contact information is included for the pharmacist to follow up with the advanced practice healthcare provider

Avoid illegible or poor handwriting
- Avoid dangerous abbreviations, such as those on the Institute For Safe Medication Practices (ISMP) list
- Avoid ordering drugs listed on the Beers Criteria for patients aged ≥ 65 years

Beers Criteria: A Continuing Update

Updates and expands explicit criteria defining potentially inappropriate medication use by the elderly
- Addresses whether adverse outcomes are likely to be clinically severe
- Incorporates clinical information on diagnoses when available
- Criteria are meant to serve:
  - epidemiological studies
  - drug utilization review systems
  - health care providers
  - educational efforts

28 criteria describing the potentially inappropriate use of medication by general populations of the elderly
- 35 criteria defining potentially inappropriate medication use in older persons known to have any of 15 common medical conditions
- Criteria define:
  - medications that should generally be avoided in the ambulatory elderly
  - doses or frequencies of administrations that should generally not be exceeded
  - medications that should be avoided in older persons known to have any of several common conditions

(Chilton, 2006)

(Chilton, 2006)

(Chiles, 1997)

(Chiles, 1997)


**Example of Inappropriate Use**

- Amitriptyline (Evavil) or nortriptyline (Pamelor), both tricyclic antidepressants, can decrease the ability of clonidine (Catapres) to lower blood pressure.

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**Prescribing Errors & Polypharmacy**

**Beers Criteria: The List**

- alprazolam (Xanax)
- amiodarone (Cordarone)
- amitriptyline (Elavil)
- amphetaminesanorexics
- barbiturates
- belladonna alkaloids (Donnatal)
- bisacodyl (Dulcolax)
- carisoprodol (Soma)
- cascara sagrada
- chloral hydrate (Librium, Miltan)
- chloral hydrate-amitriptyline (Limbitro)
- chlorpheniramine (ChlorTrimeton)
- clonidine (Catapres)
- clonidine-hydromorphone (Tramadex)
- clonidine-hydrochlorothiazide (Napha)
- cyclobenzaprine (Flexeril)
- cyclophosphamide (Cytoxan)
- cyproheptadine (Periactin)
- dideoxycytidine (DDC)
- dipyridamole (Persantine)
- digoxin (Lanoxin)
- diphenhydramine (Benadryl)
- dipyrone (Dipyrone)
- disopyramide (Norpace, Norpace CR)
- doxazosin (Cardura)
- doxepin (Sinequan)
- ergot mesylates (Dopastat)
- estrogensethacrynic acid (Edecrin)
- ferrous sulfate (iron)
- fluoxetine (Prozac)
- flurazepam (Dalmane)
- guanadrel (Hylorel)
- guanethidine (Ismelin)
- halazepam (Paxipam)
- hydroxyzine (Vistaril, Atarax)
- hyoscymamine (Levain, Levines)
- indomethacin (Indocin, Indocin SR)
- isosorbine (Vasodilan)
- ketorolac (Toradol)
- lorazepam (Ativan)
- meperidine (Demerol)
- meprobamate (Miltown, Equanil)
- mesoridazine (Serentil)
- mexiletine (Skelaxin)
- methocarbamol (Robaxin)
- methyldopa (Aldomet)
- methylprednisolone (Medrol)
- methylxanthine (Theobromine, Caffeine, Theophylline)
- minoxidil (Loniten)
- mirtazapine (Remeron)
- morphine (MS Contin)
- methadone (Dolophine)
- naloxone (Narcan)
- naproxen (Naprosyn, Avapro, Aleve)
- neodilofidine (Procardia, Adalat)
- nitrofurantoin (Microcostin)
- orphenadrine (Norflex)
- oxazepam (Serox)
- oxybutynin (Ditropan)
- pentazocine (Talwin)
- perphenazine-amitriptyline (Tilavil)
- piroxicam (Feldene)
- piroxicam (Feldene)
- promethazine (Phenergan)
- propoxyphene-Nparacetamol (Darvon and combination products)
- quinapril (Torza)
- rabeprazole (Prevacid)
- ranitidine (Zantac)
- ranolazine (Ranexa)
- reboxetine (Edrens)
- reserpine (Serpasil, Serpasil)
- temazepam (Restoril)
- thioridazine (Mellaril)
- ticlidine (Ticlid)
- trimethobenzamide (Tigan)
- tripeptidylamine

**Prescribing Errors & Polypharmacy**

**Beers Criteria: Managed Care Findings**

**Inappropriate use in nursing home residents:**

- Sedative-hypnotics
- Antidepressants
- Antipsychotics
- Antihypertensives
- NSAIDs
- Oral hypoglycemics
- Analgesics
- Dementia treatments
- Platelet inhibitors
- Histamine2 blockers
- Antibiotics
- Decongestants
- Iron supplements
- Muscle relaxants
- GI antispasmodics
- Antiemetics

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**Prescribing Errors & Polypharmacy**

**Beers Criteria: The List**

- methylprednisolone-hydrochlorothiazide (Aldoril)
- methyltestosterone (Androil)
- mineral oil
- naproxen (Naprosyn, Avapro, Aleve)
- neodilofidine (Procardia, Adalat)
- nitrofurantoin (Microcostin)
- orphenadrine (Norflex)
- oxazepam (Serox)
- oxybutynin (Ditropan)
- pentazocine (Talwin)
- perphenazine-amitriptyline (Tilavil)
- piroxicam (Feldene)
- promethazine (Phenergan)
- propoxyphene (Darvon and combination products)
- quinapril (Torza)
- rabeprazole (Prevacid)
- ranitidine (Zantac)
- ranolazine (Rexa)
- reboxetine (Edrens)
- reserpine (Serpasil, Serpasil)
- temazepam (Restoril)
- thioridazine (Mellaril)
- ticlidine (Ticlid)
- trimethobenzamide (Tigan)
- tripeptidylamine

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**Prescribing Errors & Polypharmacy**

**Polypharmacy Elderly Considerations**

**Absorption:** least affected by age

**Distribution:** highly lipid-soluble medications stay in the body longer

**Metabolism:** 30-40% reduction as a person ages

**Elimination:**

- **Age 20:** creatinine clearance of 100 to 120ml/min
- **Age 40:** creatinine clearance decreases by 10% every 10 years
- **Age 70:** creatinine clearance can be reduced by up to 50% (When creatinine clearance falls below 30ml/min, the excretion of medications through the kidney is greatly reduced)

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Polypharmacy Elderly Considerations

Absorption

- Least affected by age
- Gastric motility has slowed, therefore, absorption will be slower but it will be complete
- May be increased in the elderly (e.g., medication is applied through the skin by topical application, such as a cream or patch)
- The more medications a patient takes, the greater the chance that one medication will interfere with the absorption of another

Absorption Issues Examples

- Synthroid used with a multivitamin/mineral supplement, such as Centrum Silver
  - Causes a decrease in the amount of free Synthroid available for absorption
  - Minerals in the supplement will bind to Synthroid, decreasing bioavailability
  - Prevention: Advise patient to take Synthroid either 2 hours before or 4 hours after Centrum Silver

Absorption Issues Examples

- Antacids containing either calcium, magnesium or aluminum taken with: quinolones (Cipro, Levaquin, Avelox), tetracycline, doxycycline and/or iron
  - Medications will bind to the metals in the antacids and be made insoluble
  - Decreased absorption of active medication
  - Prevention: Advise patient to take prescribed medication either 2 hours before or 4 hours after antacid

Distribution

- Occurs once medication has been absorbed and enters circulation
- Medications, depending on their chemical characteristics, get distributed into either fat or water
- Medications: usually 90% protein bound and 10% free or active medication (free or unbound medication exerts the physiological effect in the body)

Distribution Issues

- As a person ages:
  - Decrease in lean body mass and total body water
  - Increase in the percentage of body fat
  - Decrease in albumin produced by liver

Distribution Issues

- Decreased albumin:
  - Usually not significant
  - If there is less albumin in the body, the amount of medication bound to protein will be decreased
  - Thus, the amount of active or free medication will be increased
Polypharmacy Elderly Considerations

Distribution Issues

Example disease states and conditions that decrease albumin:
- Surgery
- Malnutrition
- Cancer
- Diabetes
- Burns
- Uremia
- Liver disease

(Rhyne, 2007)

Distribution issues examples

Patients receiving a narrow therapeutic index medication (small change in the medication level results in a large physiological effect), such as digoxin, may experience potentially significant clinical impacts:
- Malnourished elderly will experience decreased protein binding
  - Increased free or active medication = overdose
  - Increased risk for toxicity
  - (Monitor dig levels and for signs/symptoms of dig toxicity: nausea, vomiting, visual changes, weakness and ST)

(Rhyne, 2007)

Polypharmacy Elderly Considerations

Metabolism issues examples

Cimetidine (Tagamet) + a long-acting benzodiazepine:
- Cimetidine (Tagamet): inhibits liver enzymes from breaking down the long-acting benzodiazepine
  - Prolongs the benzodiazepine’s duration of action
  - May cause: oversedation, confusion and ataxia
- Consider:
  - Famotidine (Pepto) or nizatidine (Axid) which do not affect the liver enzymes
  - OR
  - A short-acting benzodiazepine like lorazepam (Ativan), temazepam (Restoril), alprazolam (Xanax), oxazepam (Seroquel)

(Rhyne, 2007)

Long-acting benzodiazepines: implicated in increased falls and hip fractures in the elderly
- Long plasma half-lives and rely on the liver for metabolism:
  - Diazepam (Valium)
  - Chloridiazepoxide (Librium)
  - Flurazepam (Dalmane)
- With repeated administration, can build up and cause daytime sedation, dizziness, and lethargy in the morning (mostly in the elderly)
- Signs:
  - Unsteady gait
  - Decreased muscle coordination
  - Increase their risk of falls

(Rhyne, 2007)

Metabolism: “breakdown of the medication”

Majority occurs in the liver
- As people age:
  - Decrease in the mass or size of the liver
  - Decrease in the flow of blood through the liver
  - Reduction of the metabolism of medications by as much as 30%-40%
  - Resulting in higher levels of the medications

(Rhyne, 2007)
Polypharmacy Elderly Considerations

**Metabolism:**

- **Always monitor the elderly for signs of high medication levels**
  - **Decreased metabolism:**
    - Can increase the development of ADRs
  - **Interactions:**
    - May occur days or weeks after the medication is begun
  - **Most cases:**
    - Hold medication
    - Then restart at either a lower dosage or with a longer dosing frequency

(Rhyne, 2007)

**Elimination:**

- removal of medication from the body
  - Occurs primarily in the kidneys
  - As people age, they experience decreases in:
    - Renal blood flow
    - Glomelular filtration rate
    - Tubular secretion
    - Renal mass
    - Lean body mass = decreased creatinine production
    - Serum creatinine levels appear normal (even when significant renal impairment exists)

(Rhyne, 2007)

**Elimination issues examples**

- Aminoglycosides (amikacin, gentamicin, tobramycin) depend on the kidneys for excretion
  - Dosages/levels need to be adjusted/monitored very closely
  - Monitor for nephrotoxicity
  - Monitor for ototoxicity: 8th cranial nerve damage

(Rhyne, 2007)

- Meperidine (Demerol):
  - With kidney impairment, normeperidine (active metabolite) builds in the kidneys
  - Monitor for neurotoxicity (seizures and convulsions)
  - Safer alternative = oxycodone/acetaminophen (Percocet)

(Rhyne, 2007)

Utilizing the Beers Criteria

- Although an excellent guide, it is not inclusive of ALL possible dangerous drugs
- Best, if combined with additional research
- Individualized patient therapy

So...Why does polypharmacy occur?

- The "Blame Game" – Who is at fault?
  - Nurses – more often than not, they are the frontline of prevention

Then is it:

- Healthcare providers
- Pharmacists
- Patients
- Pharmaceutical Companies
  - ?
Study: “Reduction of High-Risk Polypharmacy Drug Combinations in Patients in Managed Care Settings”

- Patients: 195,971 patients
- Setting: Outpatient, managed care, integrated delivery system
- Design: Longitudinal, time series cohort
- Objectives: Enhance physician and patient awareness of polypharmacy, decrease risks, drug costs, and waste resulting from polypharmacy; make the business case for reducing misuse, overuse, and underuse of drugs by reducing polypharmacy

Criteria to identify patients at risk:
- 5 or more different drugs prescribed concurrently for long-term use
- Receiving any of the following 4 combinations of high-risk drugs:
  - 2 or more narcotics
  - 2 or more benzodiazepines
  - Combination of nitrate and sildenafil (Viagra)
  - 3 or more oral anti-diabetics (for patients with Hgb A1c > 8.5%)

Intervention program:
1. Identifying at-risk patients
2. Physician reports
3. Pharmacist review & recommendations
4. Patient education
Two identical interventions separated by 1 year

Use of inappropriate medications before and after interventions (shown in %):

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Before 1st intervention</th>
<th>After 2nd intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall polypharmacy</td>
<td>30.00</td>
<td>25.00</td>
</tr>
<tr>
<td>&gt; 5 concurrent drugs</td>
<td>25.00</td>
<td>20.00</td>
</tr>
<tr>
<td>&gt; 3 benzodiazepines</td>
<td>5.00</td>
<td>3.12</td>
</tr>
<tr>
<td>&gt; 2 narcotics</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>&gt; 3 oral anti-diabetics*</td>
<td>2.15</td>
<td>0.31</td>
</tr>
</tbody>
</table>

% Decrease after both interventions:
- Sildenafil + nitrate: 91%
- > 3 oral anti-diabetics*: 71%
- > 2 narcotics: 71%
- > 3 benzodiazepines: 57%
- > 5 concurrent drugs: 57%
- Overall polypharmacy: 57%

Conclusions:
1. Systematic multidisciplinary team review of drug therapy is fundamental to improving drug safety and reducing unnecessary polypharmacy
2. Highlighted the importance of providing appropriate:
   - Clinical information
   - Decision support
   - Patient self-management support
   - Care delivery re-design
3. Significant reductions in overall polypharmacy after interventions, resulting in reduced drug costs with very little investment
So...Why does polypharmacy occur?

Who is at fault?

Healthcare Providers & Polypharmacy

In the outpatient setting, are we...

Encouraging patients and their caregivers to:
1. Closely monitor for any physiological/psychological changes after a new dosage or medication is added?
2. Keep a list of all medications along with dosages, schedules and dates of first use?
3. Compile a separate list of the most common OTC medications and/or ingredients that may interact with their prescription meds?

In the inpatient setting, are we...

1. Collecting as much information about current prescription meds, OTCs, herbs, supplements and dosages?
2. Always contacting the primary healthcare provider to verify such medications and dosages?
3. Actually minimizing risk of interactions by making information available to all consulting/treating staff?

Generally are we...

1. Discontinuing unnecessary drugs?
2. Dismissing "age-related" issues as part of "growing old"?
3. Treating adverse reactions of one drug with another?

(Laird, 2000)
Prescribing Errors & Polypharmacy

Healthcare Providers & Polypharmacy

- **Don’t forget to:**
  1. Use single-dose regimens
  2. Avoid/limit use of PRNs
  3. Consider all new meds as a therapeutic trial
  4. Attempt prescribing one drug to treat more than one problem
     - CCBs or BBs for both HTN & angina
     - ACEIs for both HTN, HF and/or renal protection (diabetics)
     - Alpha-blockers for HTN & BPH

Pharmacists & Polypharmacy

1. Must always verify drug interaction databases for potential ADEs
2. Provide patients/caregivers with:
   - Clear instructions on medication use, administration and dosages
   - Consultation each time a new medication is added
   - A complete list of possible side-effects and reported ADEs

Patients & Polypharmacy

Patients’ Responsibilities:

1. Use only one pharmacy
2. Keep a complete medication list
3. Know why each med is needed
4. Always read labels
5. Bring all meds to every visit

- **Patients’ Responsibilities:**
  6. Avoid combining OTCs, herbs, vitamins and other supplements with prescription meds
  7. Never use meds prescribed for others
  8. Always report any new symptoms
Types of Advertising

Product-claim ads:
- Mention drug name
- Condition intended to treat
- Describe risks and benefits

Reminder ads:
- Give drug name, but not its intended use, effectiveness or safety

Help-seeking ads:
- Contain information about a disease/condition
- Do not mention a specific drug

Advertising Requirements

**Product-claim ads:**
- Print ads: **required** to disclose risks in a “brief summary”
- Broadcast ads: **required** to give a “major statement” of risks and an “adequate provision” for finding out more information (toll-free number or website)

**Reminder ads:**
- **Not required** to provide risk information

**Help-seeking ads:**
- **Not required** to provide risk information

Terbinafine (Lamisil):
FDA sent a formal letter to the makers for overstating the drug’s effectiveness, minimizing risk information and making an unsubstantiated superiority claim.

Pravastatin (Pravachol) – drug approved to:
- Lower cholesterol
- Prevent heart attacks
- Prevent strokes

FDA sent a warning regarding one of the company’s ads misleadingly suggesting that the drug had been proven to help prevent stroke in all people worried about having a stroke, regardless of whether or not they had heart disease.

Direct-to-consumer advertising

**Advertising often:**
- Lists vague symptoms which may apply to a large number of people
- Presents risk information as an afterthought
- Prints risks in small type or rapidly lists
- Prompts patients to request advertised drugs
Prescribing Errors & Polypharmacy

Direct-to-consumer advertising

Is it really so bad?

FDA Survey: Physician Report

What Were the Beneficial Effects?

- Better communication with patients: 47%
- More patient awareness of treatments: 38%
- More likely to take prescribed drug: 16%
- More likely to consider prescription changes: 5%
- New condition discovered: 2%
- Other reasons: 2%

So... Why does polypharmacy occur?
The “Blame Game” – Who is really at fault?

- Nurses: more often than not – the frontline of prevention
- Advanced Practice Healthcare Providers: doing “the best they can”
- Pharmacists: only able to identify some potentially dangerous interactions
- Patients: growing confident in their ability to manage own healthcare
- Pharmaceutical companies: using direct-to-consumer advertising to increase demand of their products

Direct-to-consumer advertising

Pros:
- Helps start a dialog between patient and prescriber
- May aid in earlier detection of disease

Cons:
- Cultivates the belief that there is a “pill for every ill”
- May prompt patients to withhold information from providers and try to treat self
- May be misleading about risks and proper drug use

So... Why does polypharmacy occur?
The “Blame Game” – Who is really at fault?

Blame for polypharmacy falls on ALL:
- Nurses, advanced practice healthcare providers, pharmacists, patients/caregivers must work together
- Patient education/inclusion in care management decisions is a must
- Pharmaceutical companies must be more careful in the representation of their drugs
So...Why does polypharmacy occur?

Is there more we can do?

Main Goals of the Program:
1. Increase awareness of medical product (drug) induced disease and the importance of reporting
2. Clarify what should and should not be reported
3. Facilitate the ease of reporting
4. Provide feedback to health professionals about new safety issues

Avoid Drug/Drug Interactions

Most common agents to avoid combining with other medications:

- Aspirin
- Antibiotics
- Bronchodilators
- Antifungals
- Anti-diabetic meds
- Bronchodilators
- Antifungals

Drug/Drug Interactions – Stepwise Approach

- Take a medication history (AVOID Mistakes)
- Remember who the high-risk patients are:
  - Any patient on 2+ medications
  - Any patient taking anticonvulsants, antibiotics, digoxin, warfarin, etc.
- Check pocket reference
- Consult pharmacists/drug specialists
- Check up-to-date computer programs:
  - Medical Letter Drug Interaction Program
  - Clinical Pharmacology (gsm.com)
  - www.epocrates.com

Drug/Drug Interactions – AVOID Mistakes

- Allergies?
- Vitamins and herbs?
- Old Drugs and OTC? as well as current Interactions?
- Dependence?
- Medications: family history of benefits/problems
Prescribing Errors & Polypharmacy

Avoid Drug/Food Interactions

- Foods decrease effectiveness of:
  - Antihistamines
  - Analgesics/antipyretics
  - Some ACEIs (captopril, moexipril)
  - Cephalosporins
  - Osteoporosis meds

- Foods increase absorption of:
  - Lovastatin (Mevacor)
  - K+ present in “green leafy vegetables” interacting with Coumadin
  - Grapefruit or grapefruit juice may interact with most statins
  - MAOIs Inhibitors + wine/cheese = hypertensive crisis

Prescribing Errors & Polypharmacy

Avoid Drug/Herb Interactions

- Feverfew:
  - Relieves the pain and nausea of migraine headaches
  - Interferes with the action of platelets
  - If combined with warfarin, could potentially lead to severe bleeding

- Ginkgo biloba:
  - Memory booster, can thin the blood; should not be mixed with Coumadin or NSAIDs
  - Possible decreased effectiveness of anti- seizure medications
  - May increase blood pressure if used in combination with thiazides
  - Risk of hypertensive crisis if combined with MAOIs

- Saint John’s Wort:
  - Causes mild to moderate depression
  - Limits the effectiveness of some AIDS and cancer drugs, and cyclosporine
  - May increase sun damage if taken with tretinoin (Retin-A)

- Pure Licorice (not to be confused with the common red or black candy sticks):
  - Large quantities of pure licorice may ease stomach ulcers, inflammation of the URI tract, others
  - May offset the actions of immunosuppressive drugs, including corticosteroids
  - May worsen the adverse side effects of digoxin

Prescribing Errors & Polypharmacy

Polypharmacy: The Bad

- Potential for severe side effects and iatrogenic illnesses
- Increased risk of ADEs, toxicity and numerous interactions
- Possible ineffectiveness of treatment
- Sometimes, it’s just “more harm than good”

Prescribing Errors & Polypharmacy

Polypharmacy: The Good

- Combining drugs: often a way to treat multiple symptoms arising from one condition
- Terminally ill patients are dependent on polypharmacy
- The elderly and patients with multiple comorbidities may experience improved quality of life

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Polypharmacy: Final Thoughts

- Overall, polypharmacy is widespread and not only limited to elderly patients.

- The risks of polypharmacy can be substantially diminished by close monitoring and collective responsibility of all involved (nurses, advanced practice healthcare providers, patients/caregivers, pharmacists and pharmaceutical companies).

~ THANK YOU ~