Medication System Safety

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ISMP Canada

Outline

- The environment
- Medication systems
  - Why errors occur
  - High-alert medications
  - Experience in Ontario acute care projects
- Error prevention strategies

Observations

- Issues are similar across the spectrum of care and from country to country
- We are beginning to learn what and how to improve systems
- We are starting to change –
  - It is difficult
  - It is worth it!

The OPRAH Magazine - May 2005

- Special Report “When Bad Medicine Happens to Good People”
- Prescription for disaster – “You say Celexa I say Celebrex”
- “Don’t let it happen to you”

One specialist says: 'The pen and prescription pad are killing people'

THE TORONTO STAR

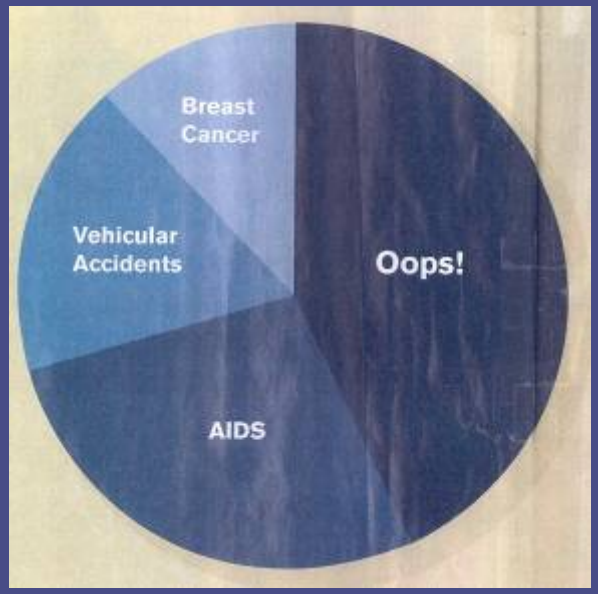
Canada's Weekly Newsmagazine
Maclean's
www.macleans.ca $4.50

JULY 2, 2001
People weekly

THE BOTTOM LINE

Besides their harmful effects on patient health, medical errors are expensive. While Canadian data are hard to come by, U.S. studies from the late 1990s calculate costs (in Canadian dollars) to that health system:

- Patients suffering adverse reactions to drugs stayed an additional 2.2 days in hospital with an increased cost of $4,866 per patient
- Total annual health-care costs for preventable adverse effects: $31 billion



NATIONAL POST

This package of lethal potassium chloride is almost identical to vials of harmless saline and water

STORING MEDICINE THAT KILLS

Mistakes with potassium chloride like the kind that killed Jeffrey Brown have happened elsewhere and could happen again, unless steps are taken to reduce the risk. In six of eight cases reviewed from 1996 to 1998 by the U.S. Joint Commission on Accreditation of Healthcare Organizations, concentrated potassium chloride was mistaken for some other medication, primarily due to similarities in packaging and labelling. The most effective way to prevent errors, the commission found, is simply to remove concentrated potassium chloride from patient-care areas.

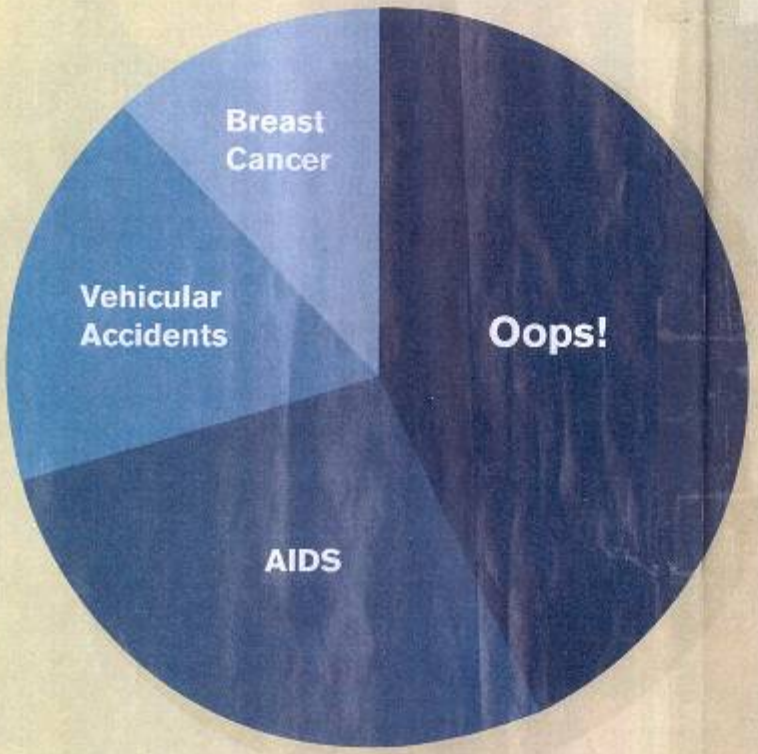
Like many other institutions, Toronto Western Hospital has done just that. Nursing units now stock only diluted solutions, which are used to treat potassium deficiency. Physicians wanting to have potassium chloride administered to a patient have to write their orders on standardized forms specifying the pre-mixed solutions. Meanwhile, the hospital's frontline medical, nursing and pharmacy staff have been re-educated about the causes of medication mistakes. The hospital made the changes not only to protect patients from risk of error, but to help staff avoid circumstances in which they could commit an error. "Good people can make mistakes," says Sylvia Hyland, the hospital's manager of pharmacy operations. "Words cannot express the devastation they can feel."

JULY 2, 2001
People weekly

HOW TO PREVENT MEDICAL ERRORS

MAJOR CAUSES OF DEATH IN THE UNITED STATES:

No one wants to hear that their appendix operation was a success when it was their gallbladder that needed to be removed. The fact is, errors in the health care system are a growing concern. Fortunately, most errors are preventable, especially when people become active and informed participants in their own health. This is why UnitedHealth Foundation is providing information from medical and patient safety experts* that can help keep you and your family safe. By following the tips below, you can limit the chance of getting a medicine that will clear up your acne when you need one to relax your muscles.



1. Make sure you and every member of your health care team knows about every prescription, over-the-counter medication, herbal product or supplement you may be taking. Be sure your doctor knows about any allergies or adverse reactions you have to any medicine.

2. When your doctor writes a prescription, make sure you can read it and that you fully understand what it's for. Be sure you know exactly when and how to take it and that you are aware of any potential side effects your medication may cause.

3. When you pick up your medicine from the pharmacy, ask the pharmacist to confirm that it is the medicine and the dosage that your doctor prescribed.

4. If you have a test, be sure to call and get the results. No news is not necessarily good news.

5. If you need to stay at a hospital and you have a choice, choose one where many patients have had the procedure or surgery you need.

6. If you're having surgery, be sure that your health care team agrees on exactly what will be done to exactly which part of your body. Having the surgeon mark the site to be operated on is a good idea.

7. When being discharged from a hospital, ask your doctor or health professional to thoroughly explain the treatment plan you will use at home, review your medications and coordinate your follow-up visit.

8. Speak up if you have questions or concerns and don't be shy about asking your doctor or nurse for more information from reliable sources. Good health professionals value the relationships they have with their patients.

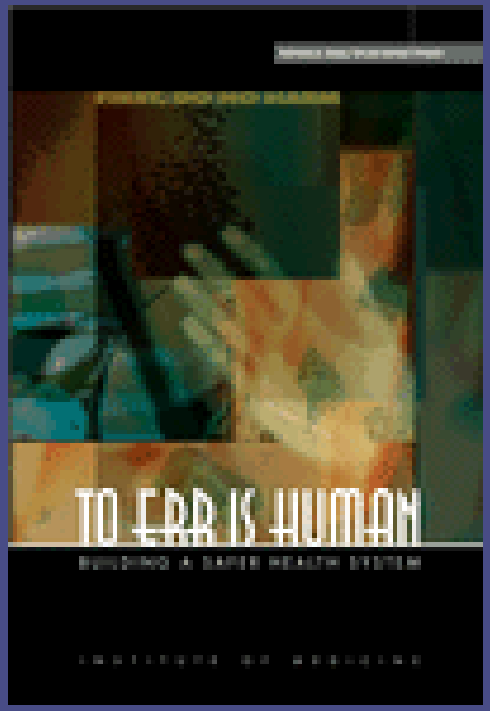
We believe that the more you know about your health, the healthier you'll be. Keep this information and share it with your family and your health care team. For more information on preventing medical errors and other health care-related topics, visit us at www.unitedhealthfoundation.org.

UnitedHealth

United States
IOM (1999): To Err Is Human

Hospital medical errors kill 44,000-98,000 people per year:

"More people die from medical errors each year than from suicides, highway accidents, breast cancer, or AIDS."



"These stunningly high rates of medical errors - resulting in deaths, permanent disability, and unnecessary suffering - are simply unacceptable in a system that promises to first 'do no harm'."

William Richardson

Canadian Adverse Events Study

Baker GR, Norton PG, Flintoft V, et al.
CMAJ. 2004;170(1):1678-1686.
Available online at www.cmaj.ca

Adverse Event

"an unintended injury or complication that results in disability at the time of discharge, death or prolonged hospital stay and that is caused by health care management rather than by the patient's underlying disease process." (p.1679).

Canadian Results

- 7.5% (or 187,500) patients in Canadian hospitals were seriously harmed by their care.
- As many as 9,250 to 23,750 people died in a Canadian hospital as a result of medical errors.
- 37% of adverse events were determined to be preventable.

Related Adverse Events

#1
Surgical = 34.2%

#2
Medication and fluid-related = 23.6%

Table 5: Procedures or events to which AEs were related, by service most responsible for delivery of care at time of AE

	Most responsible service; no. of AEs			
Type of procedure or event*	Medicine	Surgery	Other†	Total
Surgical	6	115	2	123
Drug- or fluid-related event	69	15	1	85
Other clinical management	30	11	2	43
Diagnostic	26	11	1	38
Medical	16	9	1	26
Other‡	9	8	1	18
System event§	3	4	4	11
Fracture	2	5	1	8
Anesthesia-related event	1	6	0	7
Obstetric	0	1	0	1
Total	162	185	13	360

*Physician reviewers could attribute events to more than 1 type of procedure.
†Includes dentistry and oral surgery, nursing, osteopathy, pharmacy, physiotherapy and podiatry.
‡AEs not covered in previous categories (e.g., burns, falls).
§System events include AEs that cannot be attributed to an individual or specific source (e.g., communication, reporting, lack of equipment).

Other Canadian Studies

- Forster AJ et al. Ottawa Hospital Patient Safety Study: incidence and timing of adverse events in patients admitted to a Canadian teaching hospital CMAJ 2004; 170(8): 1235
- Forster AJ et al. Adverse events among medical patients after discharge from hospital. CMAJ 2004; 170(3): 345
- Gurwitz JH et al. The incidence of adverse drug events in two large academic long-term care facilities. AMJ 2005; 118: 251-258

Globe & Mail – June 12, 2002

Wrong injection causes death

BY GRAEME SMITH

A drug used to execute death-row prisoners was mistakenly injected into an elderly woman, whose death in a Peterborough, Ont., hospital will be examined in a coroner's inquest.

Bonita Porter, Ontario's deputy chief coroner of inquests, announced yesterday that a jury will look at why Frances Marie Tanner, 84, died at the Peterborough Regional Health Centre on Jan. 21.

The cause of Ms. Tanner's death is already known: Somebody injected a dose of potassium chloride into her vein. Small quantities of the drug can cure potassium deficiencies, but larger amounts are poisonous.

At least three other Canadians have died after receiving the same drug, sometimes from nurses who thought it was a different medicine.

Some doctors blame these accidents on manufacturers who sell potassium chloride in plastic ampoules and vials that closely resemble containers of sterile water, saline solution, and other harmless solutions.

Others say hospitals need stricter controls over potentially deadly substances. Ontario's chief coroner sent a memo to hospitals last year specifically warning them that potassium chloride has been wrongly administered in the past.

After the latest death, however, the coroner's office decided it was time to emphasize the danger.

"It was felt that an inquest might be the best way to get the information out," Dr. Porter said.

The medical community knows surprisingly little about its own errors. A newsletter published last month by the Institute for Safe Medication Practices Canada recorded five cases in which patients were accidentally given potassium chloride; three died, and two were considered "near misses."

More cases could exist, said the institute's president, physician David U. While many hospitals have removed potassium chloride from nursing stations, he said, some doctors still demand to have it on hand, particularly in intensive-care units. And the drug manufacturers have a financial interest in maintaining their products' uniform packaging.

"The companies have just one assembly line, so they all look the same," he said. "It's an accident waiting to happen."

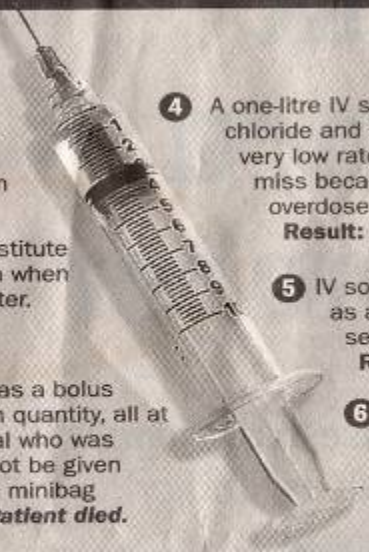
Researchers have suggested that perhaps 5,000 to 10,000 Canadians die because of medical error in hospitals every year.

The estimate is extrapolated from just one American study, however. A Canadian study was launched last month.

Litany of errors

Incidents involving potassium chloride in Canada:

1. Potassium chloride (KCl) was administered via direct IV when the intended action was to flush an intravenous line with diluted sodium chloride. **Result:** ***Patient died.***
2. KCl concentrate was used to reconstitute a drug for parenteral administration when the intended diluent was sterile water. **Result:** ***Error was noted before administration.***
3. KCl concentrate was administered as a bolus injection – an injection given in high quantity, all at once – by a health-care professional who was unaware that KCl concentrate cannot be given as a bolus but must be diluted in a minibag and given as an infusion. **Result:** ***Patient died.***
4. A one-litre IV solution was prepared with potassium chloride and although it was administered at a very low rate, the incident was felt to be a near miss because of the potential for accidental overdose. **Result:** ***Error was noted during administration.***
5. IV solutions containing KCl were administered as a fluid replacement in a patient requiring several litres of fluid in a short time frame. **Result:** ***Hyperkalemia, patient died.***
6. Frances Marie Tanner, 84, received an intravenous injection of potassium chloride at the Peterborough Regional Health Centre on Jan. 21, 2002. **Result:** ***Patient died.***



SOURCE: INSTITUTE FOR SAFE MEDICATION PRACTICES REPORT, MAY, 2002 IMAGE: PHOTODISC

THE GLOBE AND MAIL

Globe & Mail – June 17, 2002

Injection death second in 3 years

Ontario hospital's treatment with drug used for executions killed patient in 1999

BY GRAEME SMITH, BRIGHTON, ONT.

Relatives of a hospital patient injected with a drug commonly used to execute death-row prisoners are demanding to know why nothing changed at the Ontario hospital before another woman suffered the same fatal mistake.

They didn't want to publicize the tragic story of why Ruby McConnell's heart stopped.

It has been a family secret since the evening of June 29, 1999, when the 94-year-old woman felt weak, fell hard onto her sofa and was taken to the Peterborough Regional Health Centre with a fractured hip.

But they broke their silence, in an exclusive interview with The Globe and Mail, after hearing a news report last week that sounded tragically familiar to them.

An elderly woman, Frances Marie Tanner, had died at the Peterborough hospital after someone shot potassium chloride into a vein.

A coroner's inquest will investigate.

Few people knew the rest of the story: Ms. Tanner was the second person to die of potassium chloride poisoning at Peterborough's hospital in less than three years.

Only four such cases have been recorded in Canadian hospitals.

"I was just horrified," said Mary Gardner, who had been watching the newscast at home in Brighton,

J. P. MOCZULSKI/THE GLOBE AND MAIL

Earl Gardner, left, listens to his wife, Mary, as she reads from a coroner's report on the death in June, 1999, of Mr. Gardner's aunt, Ruby McConnell.

am I, chopped liver? I'm her nephew.' "

Still, the relatives didn't make a

'You have a busy nurse

alone, Dr. U said. Anecdotal evidence suggests that only 10 to 20

Patient dies after

Man, 69, went to ER following accident

Injected drug normally used in palliative care

BOB WEBER
CANADIAN PRESS

RED DEER, ALTA.—Health officials in central Alberta have launched an investigation after a 69-year-old patient received the wrong pain-killing medication and died.

"All of the staff feels it," said Denise McBain, a vice-president with the David Thompson Health Region.

"There isn't a professional out there who doesn't think of her own practice when something like this happens."

It is the third Alberta fatality linked to hospital drug mix-ups this year.

Two Calgary patients died in March after being given the wrong medication during dialysis treatments.

The Red Deer case involved a man who came to the hospital emergency room about 3:30 p.m. Sunday with a chest injury received while horseback riding, said Dr. Dave Dawson, vice-president of medicine for the region.

"It was determined that his chest injury, while it was very painful, was not felt to be terribly serious," Dawson said.

The man's condition remained stable. Three hours later, he was discharged, but not before receiving a 10-milligram injection of what was thought to be morphine for the pain.

"Inadvertently, a more potent narcotic was prepared and administered," Dawson said.

The drug, hydromorphone, is more potent than morphine and is normally used in palliative care. Outside of palliative care, it is usually given in doses one-quarter to one-fifth the size the man received.

The mistake was discovered during a medication check at shift change.

Hospital staff immediately called the man's home. They also called the hospital in Innisfail, Alta., a town just south of Red Deer on the patient's way home, warning them he might be brought in.

However, the man's condition deteriorated rapidly. Although his family took him to Innisfail hospital, where he was given an anti-narcotic, he died shortly after, said Dawson.

"He was very ill," said Dawson. "(Hydromorphone) is capable of depressing that part of the brain that drives the breathing apparatus."

The health region has removed all hydromorphone from the emergency ward. Only low-dose stocks will be kept outside the palliative care unit, said McBain.

Dawson noted both drugs had been stored near each other in similar 10-milligram ampoules.

There will also be an external review,

Another baby is given morphine by mistake

Boy survives after same hospital that gave infant fatal overdose makes second drug error

BY TRACY HUFFMAN AND CAL MILLAR
STAFF REPORTERS

A second baby has been mistakenly injected with morphine at Brampton's Peel Memorial Hospital.

A doctor at the hospital gave 9-month-old Juliano Pariselli the drug instead of codeine in an operating room, just before the baby underwent surgery to repair a hernia Feb. 15. Juliano survived, but his parents are worried about future health problems the error may cause.

It's the second time in eight months a child has received morphine by mistake at the hospital. Two morphine injections given mistakenly by a pediatric nurse killed 11-month old Trevor Landry last June 24.

An inquest followed and the hospital said it had implemented procedures to prevent such medication errors from happening again.

'The nurse wouldn't get a pediatrician, so I got really upset with her and said I knew about the Landry story and didn't want the same thing to happen to my son.'
— SABINA PARISELLI

"I was horrified," said Sabina Pariselli, who was by her son's crib last week when a nurse noticed the baby in distress and needing oxygen. "I knew something wasn't right. . . . I immediately thought of the Landrys."

The 26-year-old mother said she didn't know what had occurred, but was later told her son had been given the wrong drug.

Toronto lawyer Harry McMurtry, who represents Sabina Pariselli and her husband Bruno, said documents obtained from the hospital indicate Juliano was given three milligrams of morphine.

A document prepared by Dr. Gail Hirano said Juliano was supposed to receive 12 milligrams of codeine before surgery.

The mistake was noted at noon by Hirano on the doctor's orders and progress report.

"Patient received morphine . . . instead of codeine at 08.30," Hirano's handwritten note reads. "Explained to mother that medication error occurred and that Juliano would be observed in PACU (pediatric acute care unit) until . . . effects of morphine have passed."

Sabina said she was not immediately told how much morphine Juliano had been given and there was no indication on the baby's medical chart.

She said she repeatedly checked the chart, but there was never any indication of the dose administered. It wasn't until she and her husband were able to obtain copies of their son's records from the hospital a couple of days later that they saw a notation that Juliano had been given three milligrams of morphine.

According to the Canadian doctors' pharmaceutical bible, the *Compendium of Pharmaceuticals and Specialties*, three milligrams of morphine is equivalent to 36 milligrams of codeine. An appropriate dose of morphine for a baby of Juliano's weight would be between 0.9 milligrams and 1.8 milligrams, the compendium says.

Dr. Tom Dickson, the hospital's chief of medical staff, said he couldn't legally discuss Juliano's case because his parents hadn't given him permission to disclose any confidential patient information. He suggested drug and medication errors are a fact of life in hospitals around the world.

"It's a universal problem and the rate of drug error will never be reduced to zero.

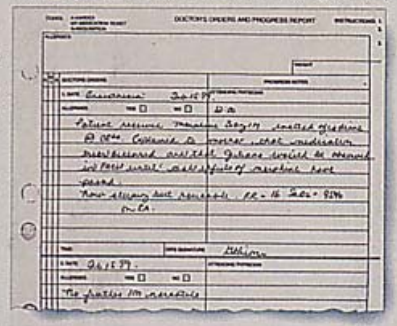
"It's not a practical possibility, but we all aim to try to reduce the potential for error."

Using the media is not the way to deal with errors involving drugs and drawing parallels between recom-

Please see Medication, A17

PETER POWER/TORONTO STAR

SHAKEN PARENTS: Bruno and Sabina Pariselli say they got "a little bit of a dose" of what Trevor Landry's parents felt when their son Juliano was given morphine by mistake.



DOCUMENTATION: Doctor's progress report shows drug error.

Media Reporting Affects Public Trust!

Comparisons to Other Industries:

What if we had 99.9% Accuracy?

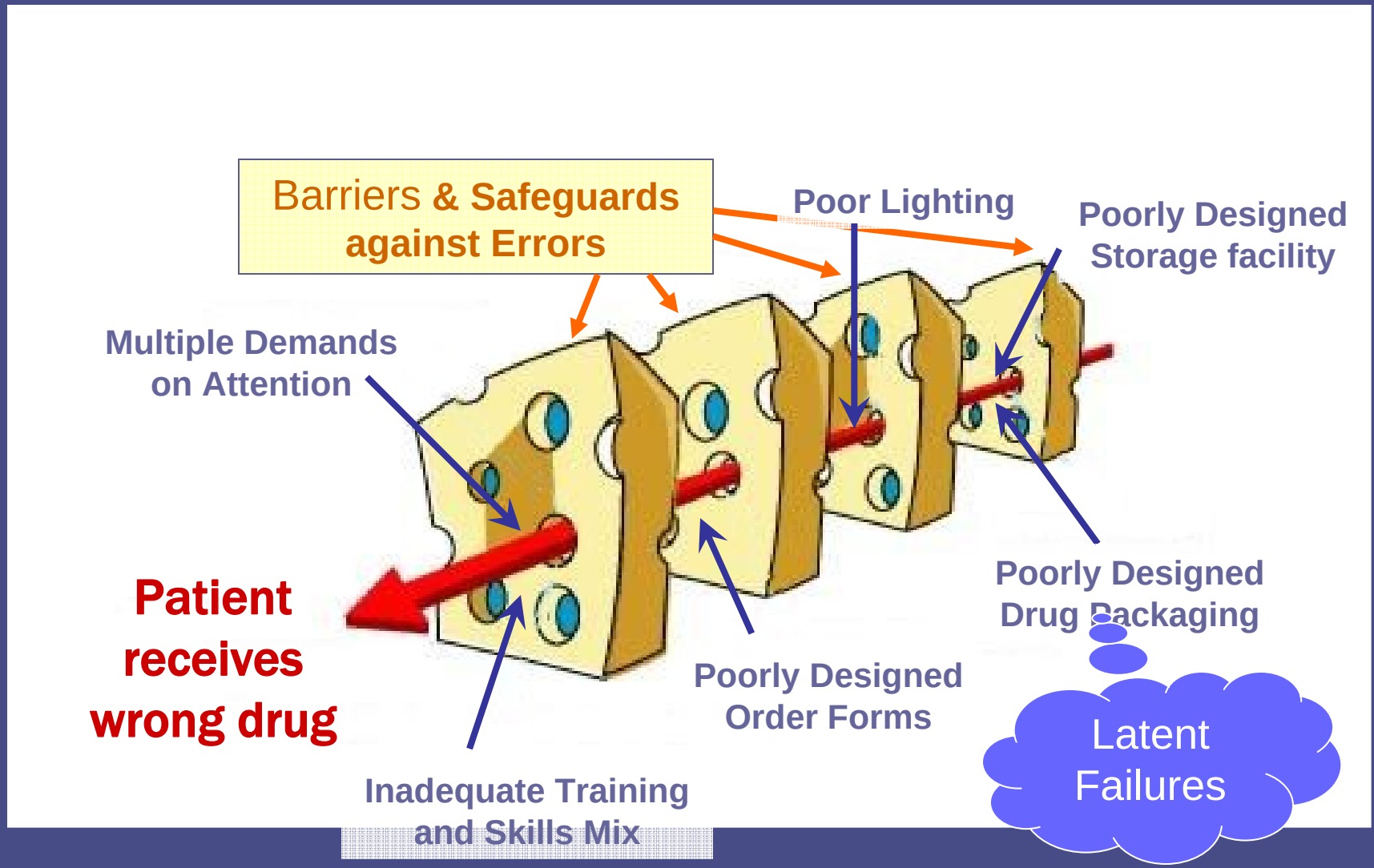
- **2 unsafe landings at O'Hare Airport/ day**
- **16,000 pieces of mail lost/ day**
- **32,000 bank cheques deducted from the wrong account each HOUR!**
- **50 babies dropped at birth everyday in the U.S.**

(Deming, 1987)

Sharp End vs. *Blunt End*

- Error investigations have always concentrated on ***sharp end*** (front line staff) where patient/caregiver interaction occurs
- Contributing factors and latent errors often originate at the ***blunt end*** where organizational policies, procedures and resource allocation decisions are made

Swiss Cheese Model



(modified from James Reason, 1991)

Beyond Acute Care

- National-
  - CCHSA patient safety goals –support change across system
  - Safer Healthcare Now! – medication reconciliation
- Ontario MOHLTC – several projects
  - Patients (OHA)
  - ISMP Canada: EMS / LTC / Community Pharmacy

Making Health Care Safer

Key steps:

A. **Recognize** that improving safety is a **priority**
B. Improve the **reporting** of errors and near misses
C. Increase focus on **system changes**
D. Gain greater **knowledge** about safer systems – much already exists
E. **Leadership** is needed on all levels

G R Baker & P G Norton

A. Recognize that Improving Safety is a Priority

- **Ontario Medication Safety Support Service (MSSS)**
  - Funded by Ontario MOHLTC
  - To provide assistance with implementation of preferred/ better practices for patient safety
- **To provide general support for safe medication practices – high-alert medications**
  - Concentrated potassium chloride
  - Narcotics

B. Improve Reporting of Errors and Near Misses

Lack of Reporting due to:

Many reasons including:

- Failure to recognize error
- Lack of certainty if it “really is an error”
  - definition (? Related to harm)
- Punitive culture
  - Fear of reporting: self and others

Increased Reporting

ISMP Canada research project:

- 14 hospitals increased error reporting
- Over 5,000 errors received in 12 months

ISMP Canada is an independent Canadian nonprofit agency established for the collection and analysis of medication error reports and the development of recommendations for the enhancement of patient safety.

The Healthcare Insurance Reciprocal of Canada (HIROC) is a member-owned expert provider of professional and general liability coverage and risk management support.

ISMP Canada Safety Bulletin

Volume 2, Issue 4 April, 2002

SENTINEL EVENT WITH STERILE WATER – LESSONS SHARED

Hospitals are urged to review their storage conditions and supply processes for selected sterile water preparations.

ISMP Canada has recently received an error report describing accidental intravenous infusion of sterile water, instead of the intended normal saline solution. Unfortunately, close to 600 mL

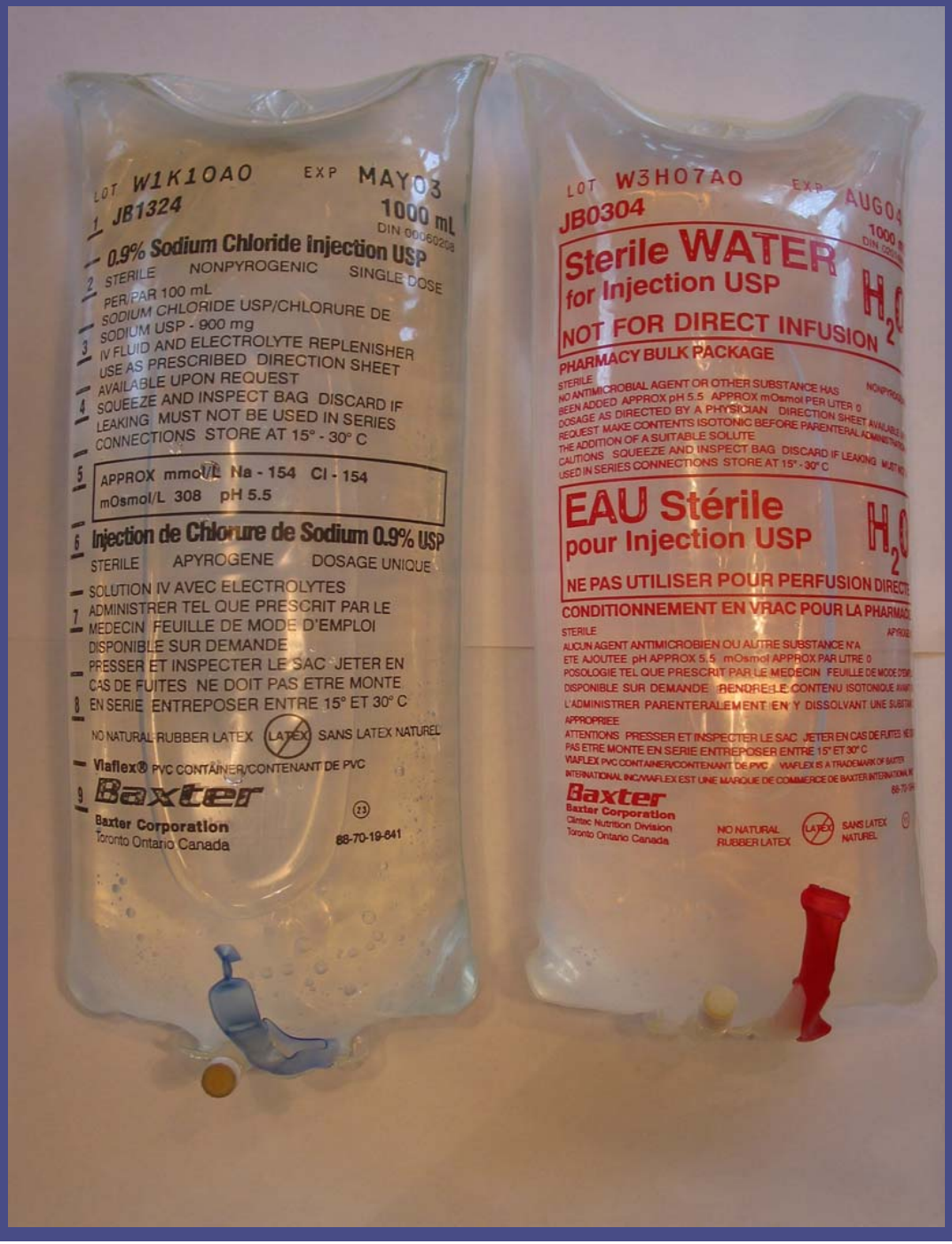
3. The one-litre Sterile Water for Injection product had been used as an alternate to other sterile water products (inhalation and irrigation solutions) as a result of previous back-orders with the sterile water products. This resulted in increased availability of the product in the hospital.

Bulletin excerpt

Canada: 3 reports

2 hospital
1 ambulance

US: several reports
1 death


LOT W1K10AO EXP MAY03
JB1324
1000 mL
DIN 00060208
0.9% Sodium Chloride Injection USP
STERILE NONPYROGENIC SINGLE DOSE
PER/PAR 100 mL
SODIUM CHLORIDE USP/CHLORURE DE SODIUM USP - 900 mg
IV FLUID AND ELECTROLYTE REPLENISHER
USE AS PRESCRIBED DIRECTION SHEET AVAILABLE UPON REQUEST
SQUEEZE AND INSPECT BAG DISCARD IF LEAKING MUST NOT BE USED IN SERIES CONNECTIONS STORE AT 15° - 30° C
APPROX mmol/L Na - 154 Cl - 154
mOsmol/L 308 pH 5.5
Injection de Chlorure de Sodium 0.9% USP
STERILE APYROGENE DOSAGE UNIQUE
SOLUTION IV AVEC ELECTROLYTES
ADMINISTRER TEL QUE PRESCRIT PAR LE MEDECIN FEUILLE DE MODE D'EMPLOI DISPONIBLE SUR DEMANDE
PRESSER ET INSPECTER LE SAC JETER EN CAS DE FUITES NE DOIT PAS ETRE MONTE EN SERIE ENTREPOSER ENTRE 15° ET 30° C
NO NATURAL RUBBER LATEX LATEX SANS LATEX NATUREL
Viaflex® PVC CONTAINER/CONTENANT DE PVC
Baxter
Baxter Corporation
Toronto Ontario Canada
88-70-19-841
LOT W3H07AO EXP AUG04
JB0304
Sterile WATER for Injection USP
H_2O
NOT FOR DIRECT INFUSION
PHARMACY BULK PACKAGE
STERILE NONPYROGENIC
NO ANTIMICROBIAL AGENT OR OTHER SUBSTANCE HAS BEEN ADDED APPROX pH 5.5 APPROX mOsmol PER LITER 0
DOSAGE AS DIRECTED BY A PHYSICIAN DIRECTION SHEET AVAILABLE ON REQUEST MAKE CONTENTS ISOTONIC BEFORE PARENTERAL ADMINISTRATION BY THE ADDITION OF A SUITABLE SOLUTE
CAUTIONS SQUEEZE AND INSPECT BAG DISCARD IF LEAKING MUST NOT BE USED IN SERIES CONNECTIONS STORE AT 15° - 30° C
EAU Stérile pour Injection USP
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ATTENTIONS PRESSER ET INSPECTER LE SAC JETER EN CAS DE FUITES NE PAS ETRE MONTE EN SERIE ENTREPOSER ENTRE 15° ET 30° C
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88-70-19-
Baxter
Baxter Corporation
Clintec Nutrition Division
Toronto Ontario Canada
NO NATURAL RUBBER LATEX
LATEX
SANS LATEX NATUREL

How Error Reports Are Received

i) website: www.ismp-canada.org
ii) e-mail: info@ismp-canada.org
iii) phone: 1-866-54-ISMPC [47672]
or 416-480-4099

- ISMP Canada guarantees confidentiality and security of information received. ISMP Canada respects the wishes of the reporter as to the level of detail to be included in publications.

C. Increase the Focus on System Changes

CCHSA Patient Safety Goals

Culture

Goal 1: Create a culture of safety within the organization

Communication

Goal 2: Improve the effectiveness and coordination among care/service providers and with the recipients of care/service across the continuum

Medication Use

Goal 3: Ensure the safe use of high risk medications

Goal 4: Ensure the safe administration of parenteral medications

High Alert Medications

"High-alert medications are drugs that bear a heightened risk of causing significant harm when they are used in error."

From the ISMP Medication Safety Alert!, October 16, 2003 , **Survey on high-alert medications - Differences between nursing and pharmacy perspectives revealed**

Examples of High-Alert (Risk) Medications

- all chemotherapeutic agents
- all **narcotic** medications
- heparin & oral warfarin
- insulin & oral hypoglycemics
- inotropic medication (e.g. digoxin)

www.ismp.org/msaarticles/highalert

Why Focus on the Medication System

- Almost every patient receives medications
- Sophistication and complexity of medication therapy has increased
- Patient complexity has increased

Reality of Health Care Environments

- Cognitive overload
- Workloads
- Multitasking
- Interruptions
- Miscommunication
- Difficult technology

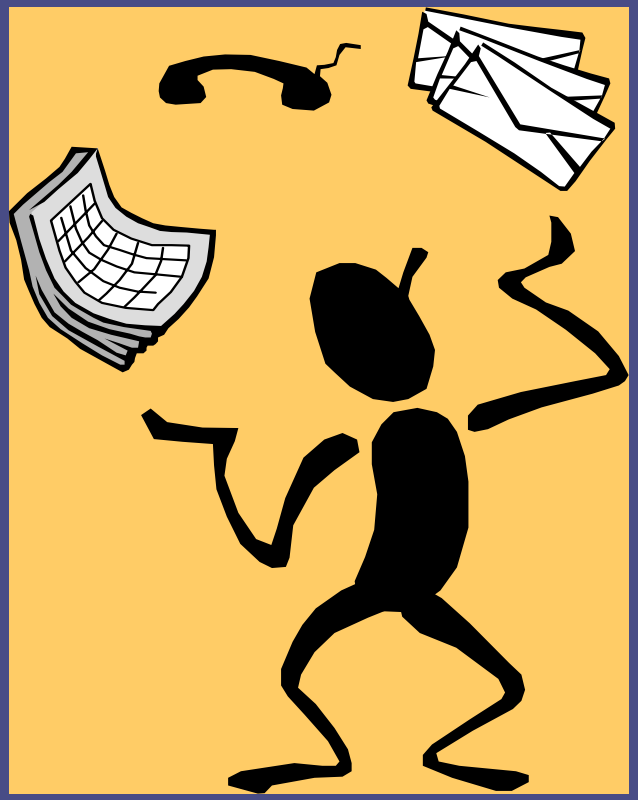


Figure 2. Cognitive pathway for RN #1

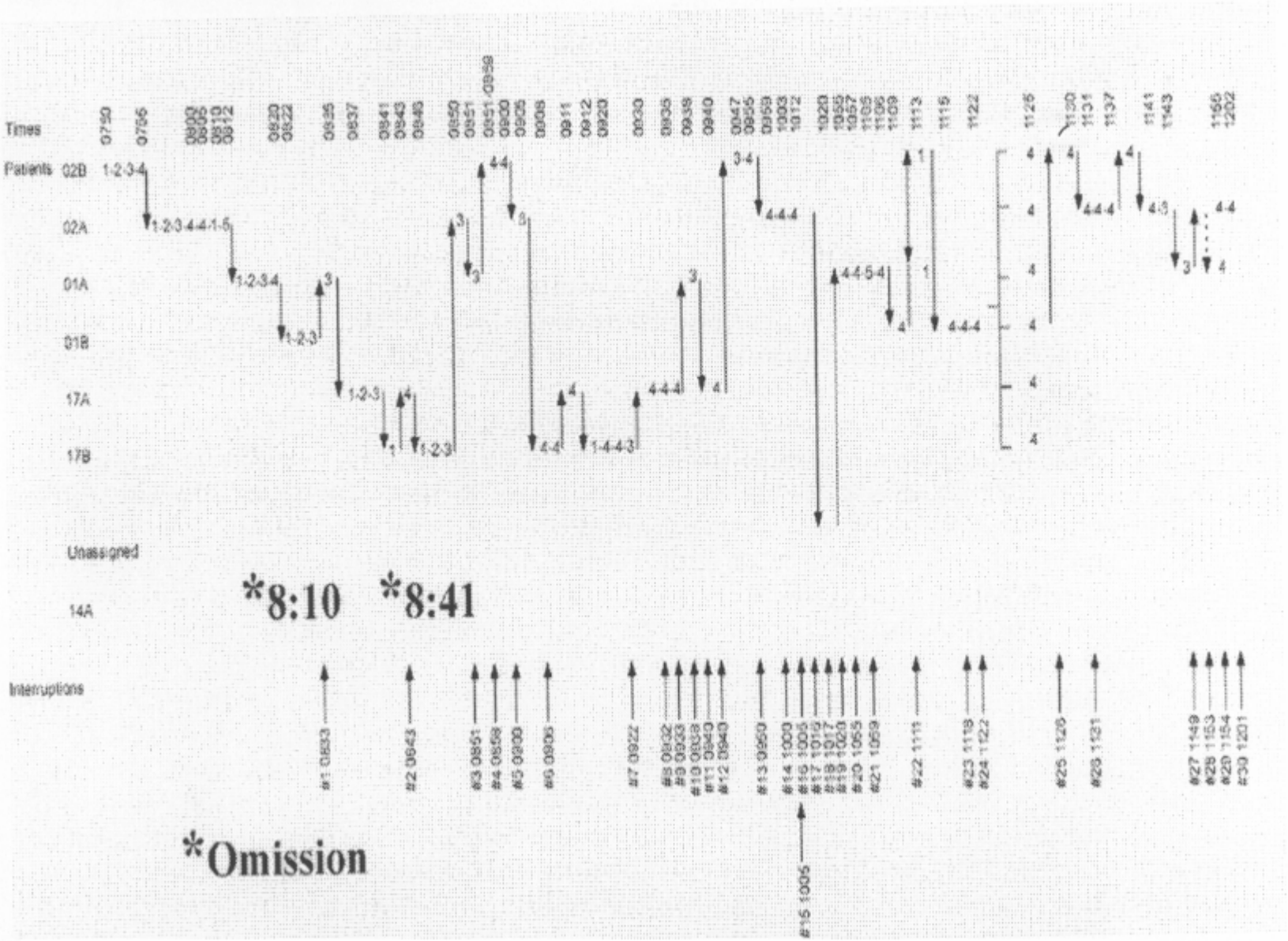


Figure 1. Link analysis for RN #1

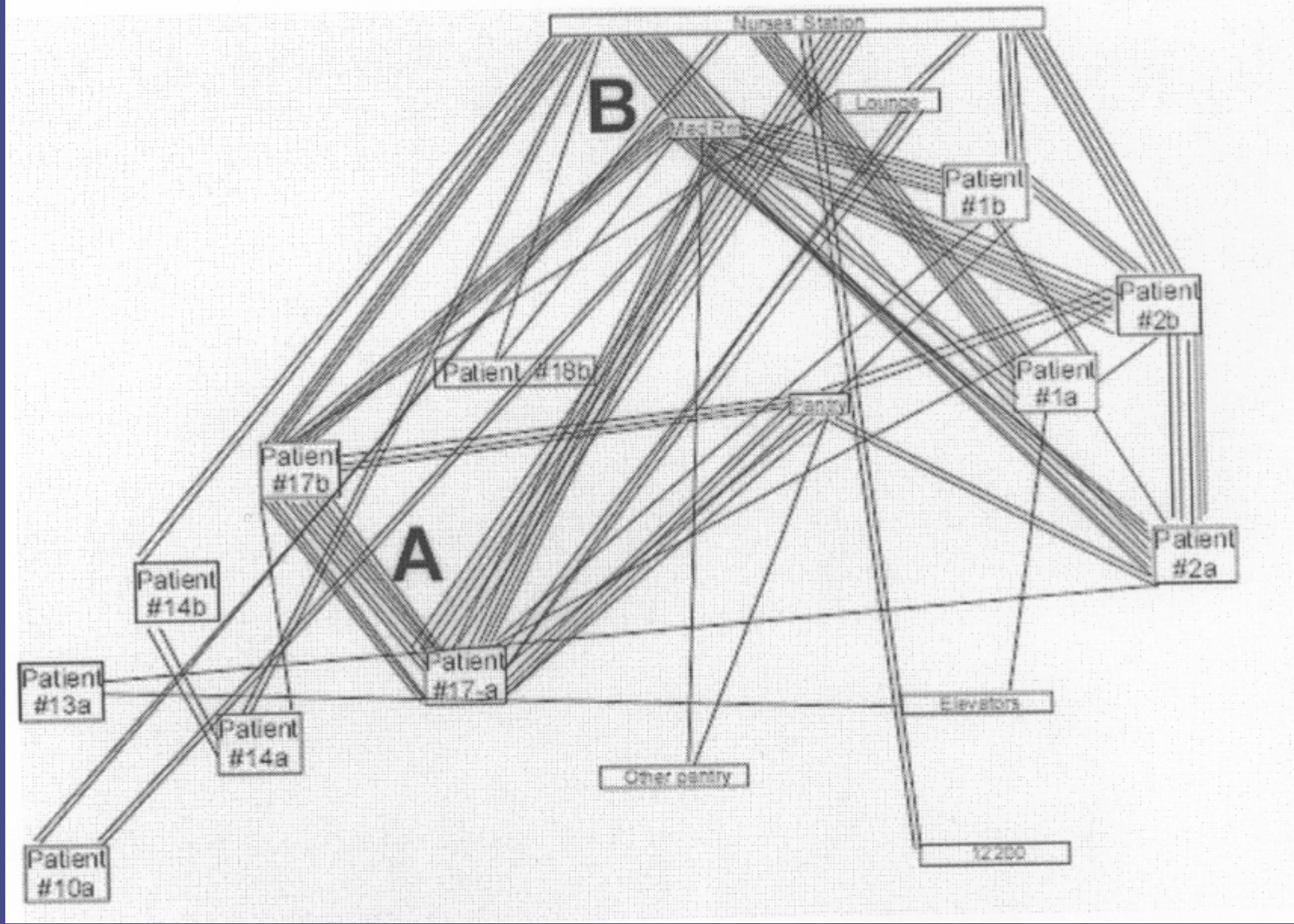


Table 1. Interruptions for single RN observation (RN#3)

Interruption	Time	Description of interruption	Location	Type	Nursing process	Cognitive stacking measure: # activities
1	0734	Unit Clerk inquiry	Nurses desk	Delay	N/A	5
2	0808	Paged	Patient room	Disrupt direct	Intervention	10
3	0852	RN inquiry	Nurses desk	Disrupt indirect	Intervention	18
4	0853	Patient inquiry	Nurses desk	Disrupt indirect	Intervention	19
5	0935	MD rounds	Patient room	Disrupt direct	Intervention	18
6	0941	Paged	Patient room	Disrupt Indirect	Intervention	18
7	0957	Answers phone	Patient room	Delay	N/A	17
8	1010	Responds to patient call out	Hallway	Delay	N/A	17
9	1014	Computer malfunction	Patient room	Delay	N/A	17
10	1021	Unit Clerk report	Nurses desk	Disrupt direct	Planning	17
11	1104	MD inquiry	Nurses desk	Disrupt direct	Planning	19
12	1105	Unit Clerk inquiry	Nurses desk	Delay	N/A	18
13	1239	Computer malfunction	Patient room	Delay	N/A	14
14	1248	Paged	Patient room	Delay	N/A	14
15	1359	Patient inquiry	Hallway	Delay	N/A	15
16	1451	Unit Clerk report	Nurses station	Delay	N/A	11

Confirmation Bias

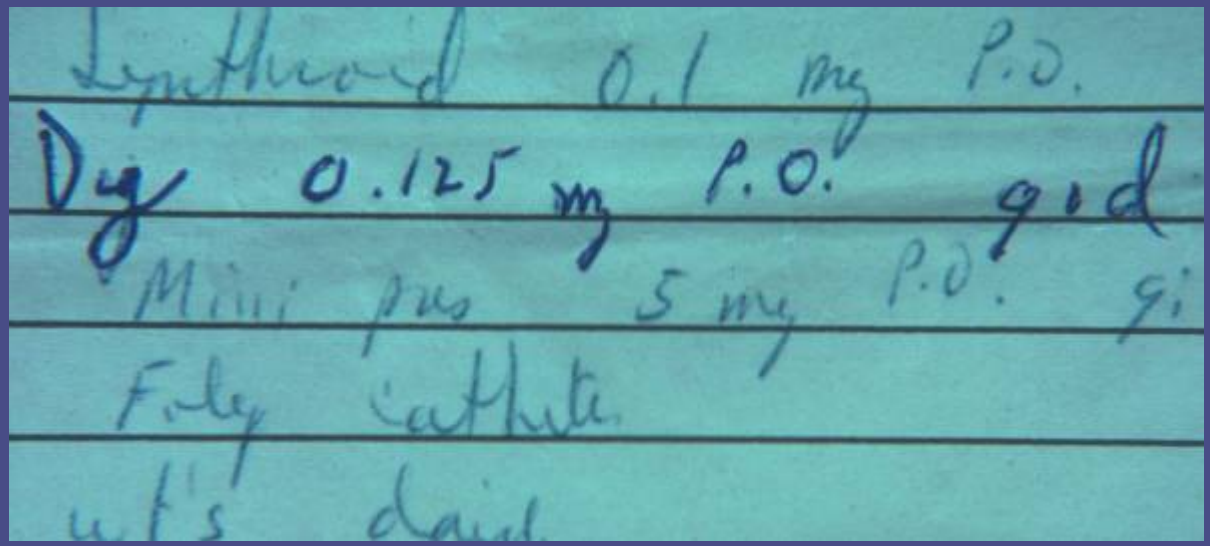
It leads one to “see” information that confirms our expectation rather than to see information that contradict our expectation.

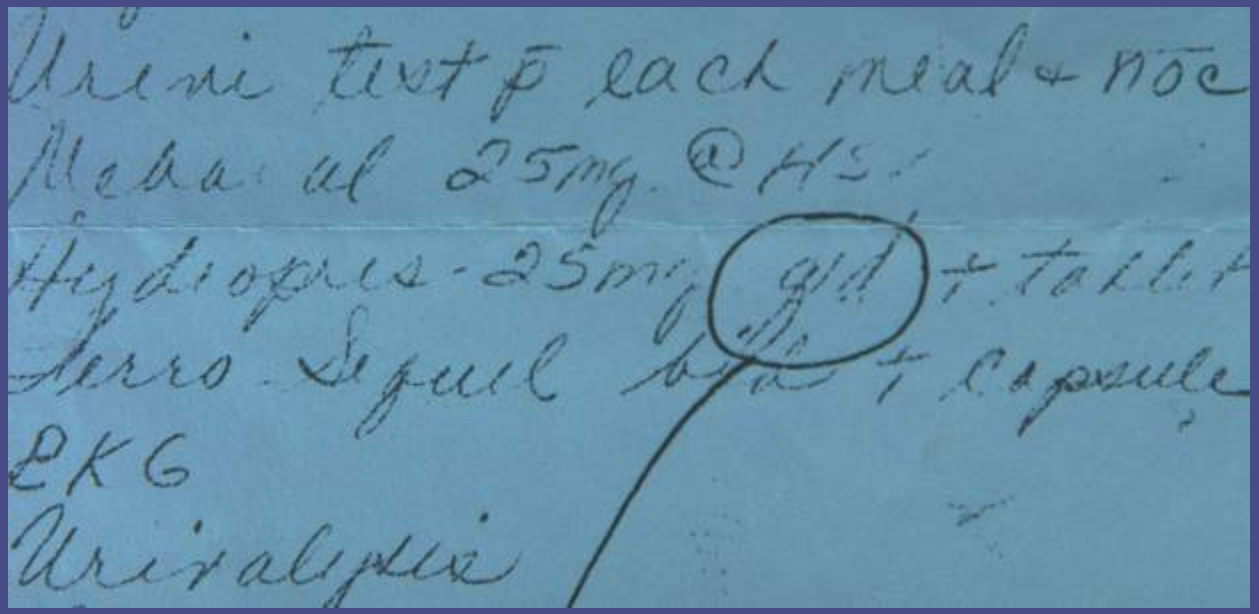
The pweor of the hmuan mnid

Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in what oredr the ltteers in a wrod are. The olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a total mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

Amzanig huh?

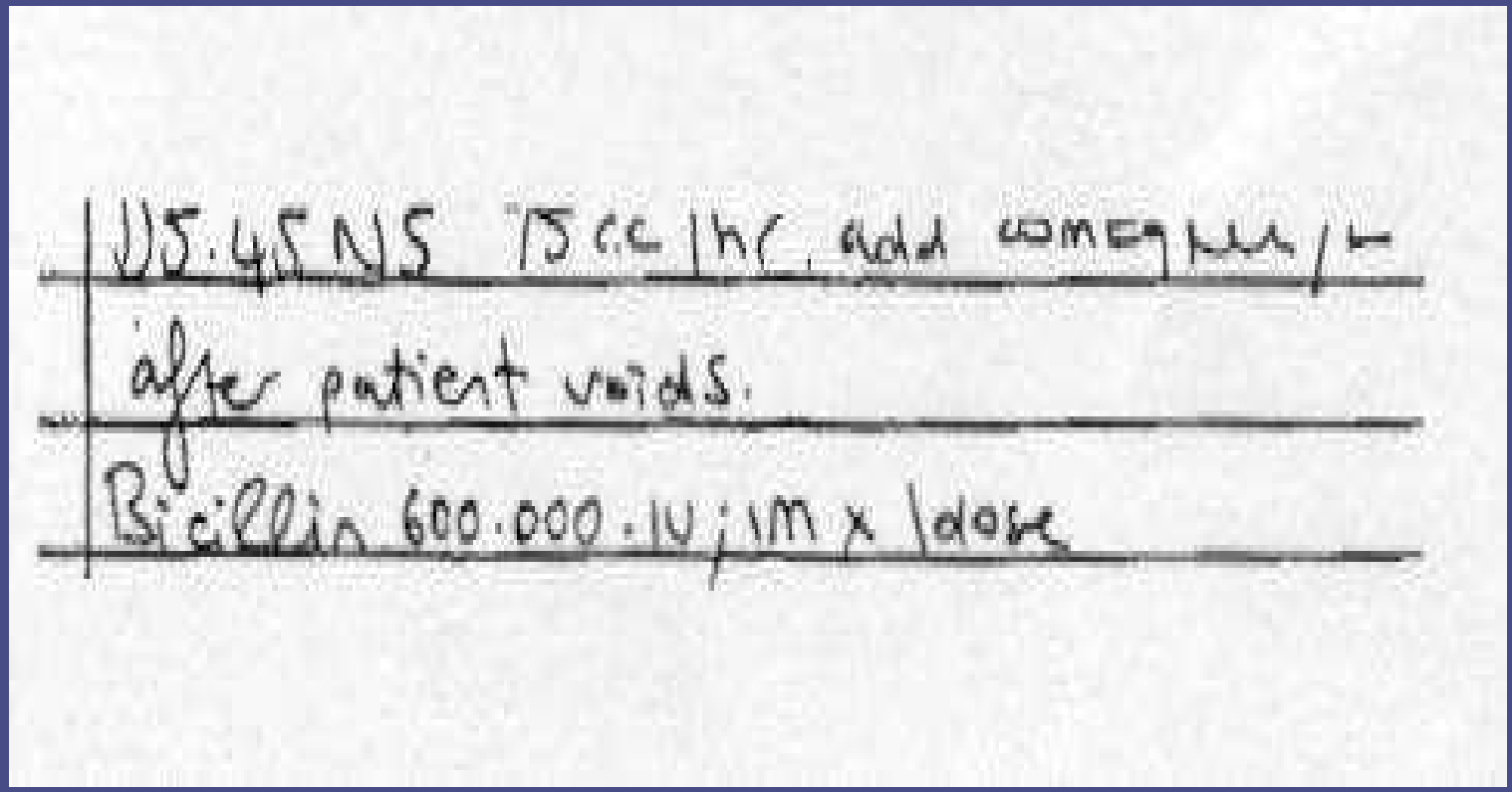
60 Regular Insulin Now



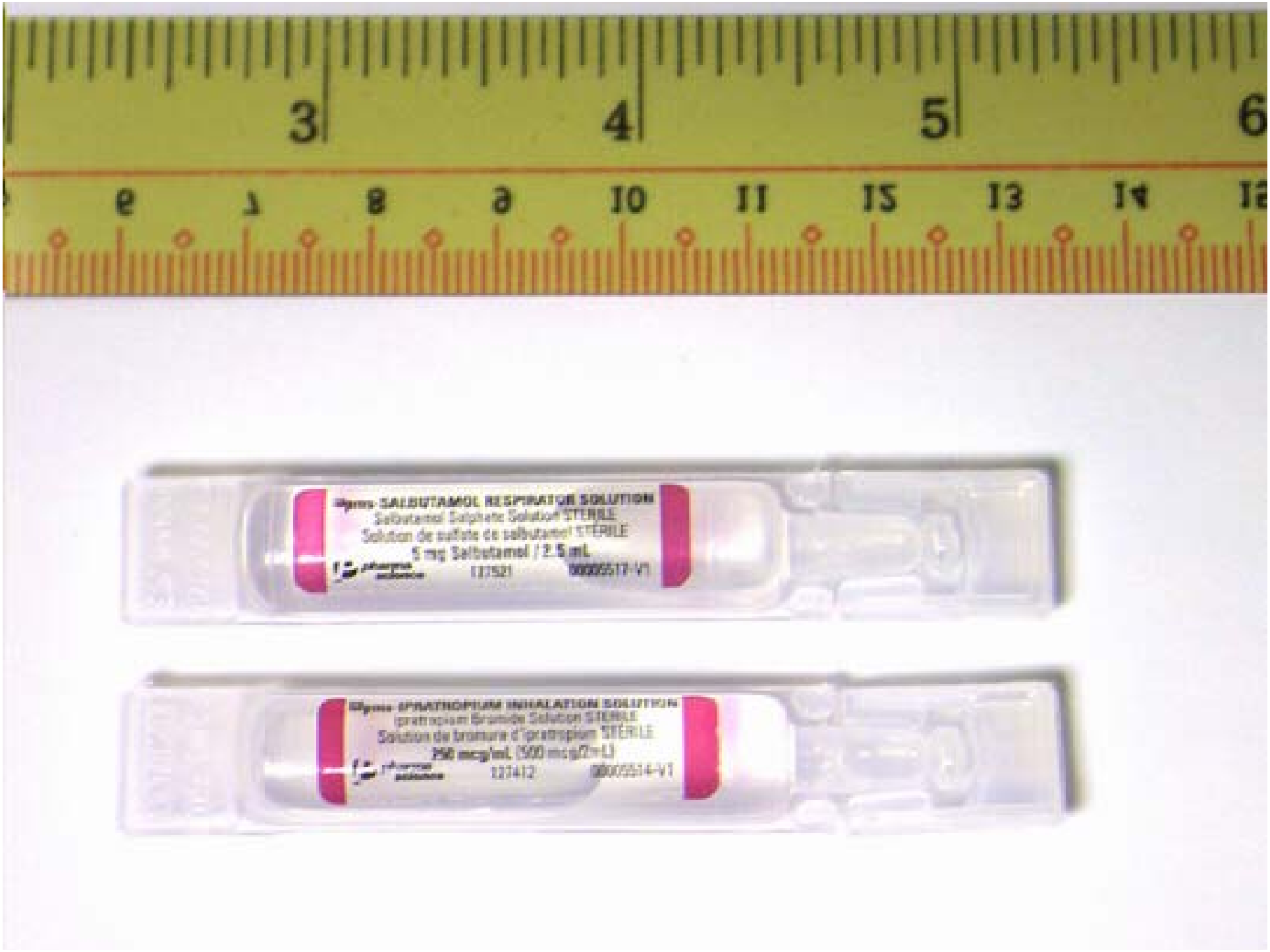


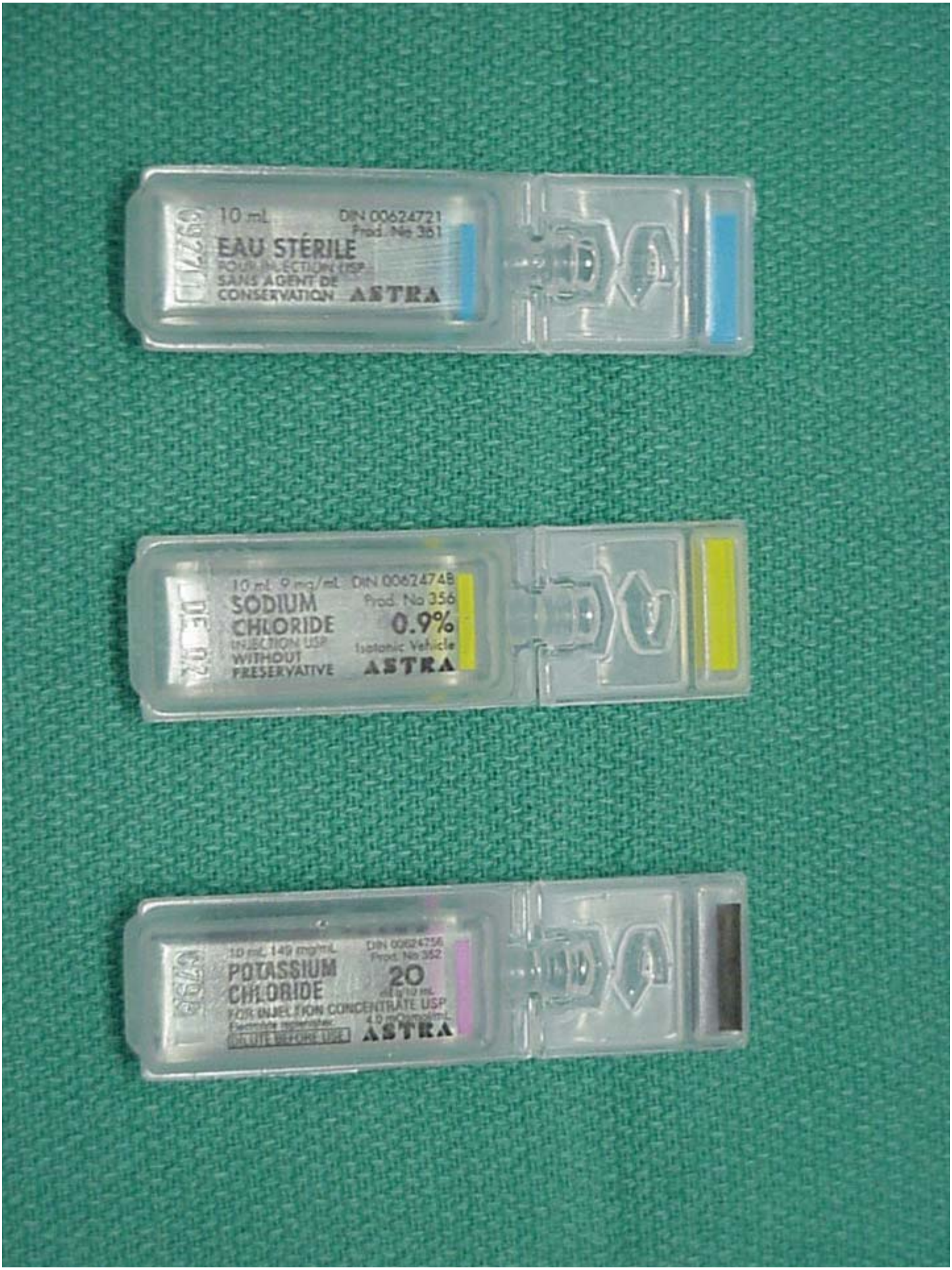
Synthroid 1mg


RUN 35AL/H


D5.45NS 75 cc/hr, add
after patient voids.
Bicillin 600,000 IU/1M x 1 dose

Enalaprilat
Injection
1.25 mg/mL
Anhydrous Equivalent
FOR INTRAVENOUS
NDC 10019-281-02
Pancuronium
Bromide Injection
2 mg/mL
Rx only
For IV Use
2 mL Vial Preserved


3
4
5
6
SALBUTAMOL RESPIRATOR SOLUTION
Salbutamol Sulphate Solution STERILE
Solution de sulfate de salbutamol STÉRILE
5 mg Salbutamol / 2.5 mL
121521
IPRATROPIUM INHALATION SOLUTION
Ipratropium Bromide Solution STERILE
Solution de bromure d'ipratropium STÉRILE
250 mcg/mL (500 mcg/2 mL)
121412


10 mL
DIN 00624721
Prod. No 351
EAU STÉRILE
POUR INJECTION USP
SANS AGENT DE
CONSERVATION
ASTRA
10 mL 9 mg/mL
DIN 00624748
Prod. No 356
SODIUM
CHLORIDE
INJECTION USP
WITHOUT
PRESERVATIVE
0.9%
Isotonic Vehicle
ASTRA
10 mL 149 mg/mL
DIN 00624756
Prod. No 352
POTASSIUM
CHLORIDE
FOR INJECTION CONCENTRATE USP
20
4.0 mEq/mL
DILUTE BEFORE USE
ASTRA

D. Gain Greater Knowledge About Safer Systems

Principles

- Reduce or eliminate the possibility of errors
  - E.g. Remove from clinical area (concentrated KCl)
- Make errors visible
  - E.g. Automation, Independent double check selected drugs
- Minimize the consequences of errors
  - E.g., Make less potent product available,

What We Have Been Learning in Acute Care

- High-Alert Drug Focus
- Human Factors Engineering Principles
- Collaboration and support

Human Factors Engineering

- Research and practical applications designed to improve the interface of humans with systems
- Develops practical design principles that account for the psychological and physical characteristics of people

Rank Order of Error Reduction Strategies

1. **Forcing functions and constraints**
2. **Automation and computerization**
3. Simplify, standardize and differentiate
4. Reminders, check lists and double check systems

5. Rules and policies
6. Education
7. Information
8. Punishment (no value)

PRIORITY Recommendations*
for Ontario Hospital Narcotic (Opioid) Project

CULTURE AND COMMUNICATION

1. Educate staff regarding the system-based causes of medication error.
2. Educate staff about the hierarchy of effectiveness of error reduction strategies.
3. Include the patient/family in the narcotic medication-use process.

STORAGE AND STANDARDIZATION

Immediate

1. **Remove the following stock items from patient care areas:**
   - **Hydromorphone ampoules or vials with concentration greater than 2 mg/mL (exceptions may include palliative care).**
   - **Morphine ampoules or vials with concentration greater than 15 mg/mL**
   - **Morphine ampoules or vials greater than 2 mg/mL in paediatric patien care areas.**
   - **Sufentanil (exceptions may include Operating Room and Labour and Delivery).**
2. Assess risk associated with narcotic stock in patient care areas.
3. Restrict as much as possible the admixing of narcotic solutions outside of pharma
4. Standardize infusion concentrations of parenteral narcotic medications and select of medications for pain management.

INDEPENDENT DOUBLE CHECK

Immediate

1. **Implement a policy of Independent Double Checks for PCA infusions.**

   The policy should include a clear process for an independent double check a documentation when the following occur:
   - Initial pump programming
   - Changes in pump programming
   - Solution changes
   - Patient transfers
2. Consider a policy of Independent Double Checks for:
   a. All opioid infusions (continuous or intermittent)
   b. Epidural infusions

PCA AND EPIDURAL

1. For PCA, develop and follow patient selection criteria (inclusion and exclusion).
2. For epidural, identify and implement multiple error prevention strategies to enhance differentiation of epidural infusions from other infusions.

ISMP Canada Narcotic (Opioid) Project supported by the Ontario Ministry of Health and Long-Term Care
January 2005, Version 1.

Applying Error Reduction Strategies

1. Forcing functions and constraints

Constraint:

Hydromorphone 10 mg was removed

Man's death after drug error to be probed

ve wrong narcotic
horse-riding accident

into a "serious medication error" that may have caused a patient's death.

The 69-year-old man, who was not identified, died after being treated at the Red Deer Regional Hospital Centre for a chest injury from a horseback riding accident on Sunday.

"This is a tragedy. Our first concern and attention indeed is to this family who . . . are grieving and very distressed at what has happened," said David Dawson, vice-president of medicine for the David Thompson Health Region.

"We also, of course, are very much concerned to make sure we take the immediate actions that are needed to reduce to an absolute minimum the likelihood that anything like this may subsequently occur."

The case is the third known death from a drug mix-up in Alberta this year.

The man, who was brought in by ambulance but was in stable condition, was X-rayed and observed in the hospital's emergency room for a few hours. Before being discharged, he was prescribed 10 milligrams of morphine for pain.

However, a nurse instead injected him with 10 milligrams of hydromorphone — an amount considered an overdose. The medication is a highly concentrated narcotic that can slow breathing and is normally used in palliative care.

"The two drugs have a similar name, they look very similar. There are a number of factors that could have led to the error," said Denise McBain, the health region's senior vice-president and chief operating officer.

The mistake was discovered about an hour after the injection, and about 30 minutes after the man left with his family, when the ER shift changed and staff did a routine narcotic count.

A phone message was quickly left instructing the patient to go to hospital immediately.

However, as the man and his family drove home, his condition "deteriorated very quickly," Dr. Dawson said.

He died after arriving at a hospital in Innisfail, south of the central city of Red Deer, despite the use of a drug to combat the effects of hydromorphone.

The "very experienced" nurse who made the mistake was put on indefinite paid leave and feels terrible, Ms. McBain said.

Officials stressed that they will not know whether the mistake resulted in the man's death until the medical examiner's final report is available in about 10 days.

"The evidence is not all in and therefore I think it would be unfair to conclude what the cause of death is," Dr. Dawson said.

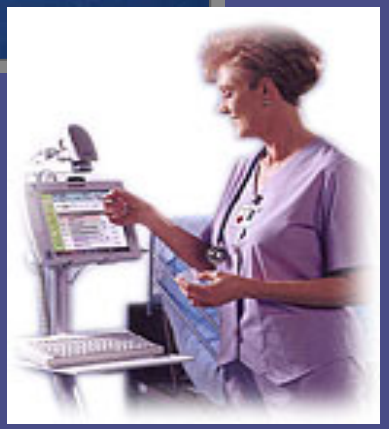
Alberta Health Minister Gary Mar told reporters he will work with the health region to ensure such an error does not happen again.

Ms. McBain said an independent team of experts from outside Alberta will be asked to conduct an investigation and issue public recommendations.

Applying Error Reduction Strategies

2. Automation and Computerization:

- CPOE
- Bar Code technology
- Automated bedside verification



Applying Error Reduction Strategies

3. Simplify, standardize and differentiate

- Bedrock Human Factors Principles
  - reduce steps and interfaces
  - Call 911
- Standardize processes and procedures
  - Airline industry

Standardization

Standardization and Simplification

- Identical drug drawers
- Drug protocols/ standard concentrations
- Standard order forms

Standardize Order Communication

- Use leading zero (0.1 mg not .1 mg)
- No trailing zeros (1 mg not 1.0 mg)
- Avoid nonstandard abbreviations (“U” for unit, q.d., drug name abbreviations such as “MS”)

Differentiate – Use Tall Man Lettering:

vincristine

vinblastine

vin**CRIS**tine

vin**BLAST**ine

Applying Error Reduction Strategies

4. **Independent double checks & other redundancies**

Human Error Rates With Selected Activities

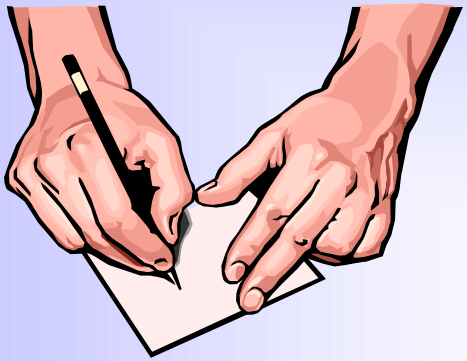
Activity*	Rate of Human Error**
General error of commission for example, misreading a label	3/1000
General error of omission in the absence of reminders	1/100
General error of omission when items are embedded in a procedure for example, cash card is returned from cash machine before money is dispensed	3/1000
Simple arithmetic errors with self checking but without repeating the calculation on another sheet of paper	3/100
Monitor or inspector fails to recognize an error	1/10
Staff on different shifts fail to check hardware condition unless required by checklist or written directive	1/10
General error rate given very high stress levels where dangerous activities are occurring rapidly	1/4

* Unless otherwise indicated, assumes the activities are performed under no undue time pressures or stress.

** (# of errors / # of opportunities for the error)

Adapted from Nolan TW. System changes to improve patient safety. BMJ 2000;320(7237):771-773 Nolan

Where Medication Errors Occur…



PRESCRIBING
39% of errors

TRANSCRIPTION
12% of errors

DISPENSING
11% of errors

ADMINISTERING
38% of errors

Independent Double Checks: Working Definition

An Independent Double Check is a process in which a second practitioner conducts an individual verification.

Independent Double Checks

Research show that people find 95% of mistakes when double checking the work of others

Grasha et al. Process and Delayed Verification Errors in Community Pharmacy. Tech Report Number 112101. (2001) Cognitive Systems Performance Lab

Independent Double Checks

- Common in other industries

- Acknowledges complex and high risk systems and that practitioners are human, and therefore fallible

It Reduces the Probability of Error

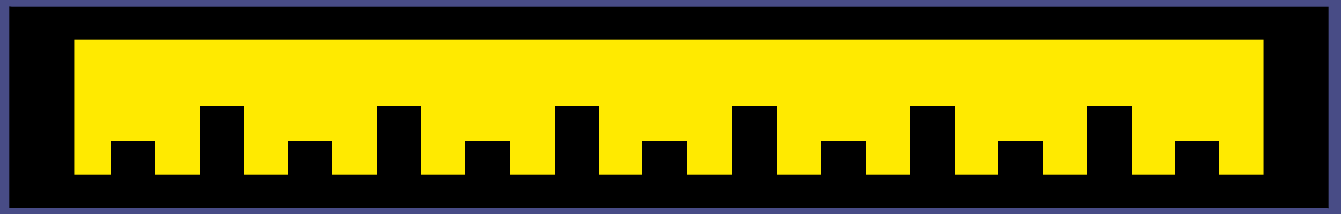
$$\frac{1}{100} \times \frac{1}{100} = \frac{1}{10{,}000}$$

Expectations of the Five Rights

- Does not take into account human factors – E.g. human bias, interruptions, stress, noise, light
- ISMP Newsletter

Patient Safety

MEASURING PATIENT SAFETY



Interventions to PREVENT errors

- Medical Product Design

(IV tubing, pumps, monitors, drug packaging & labels, medical records)

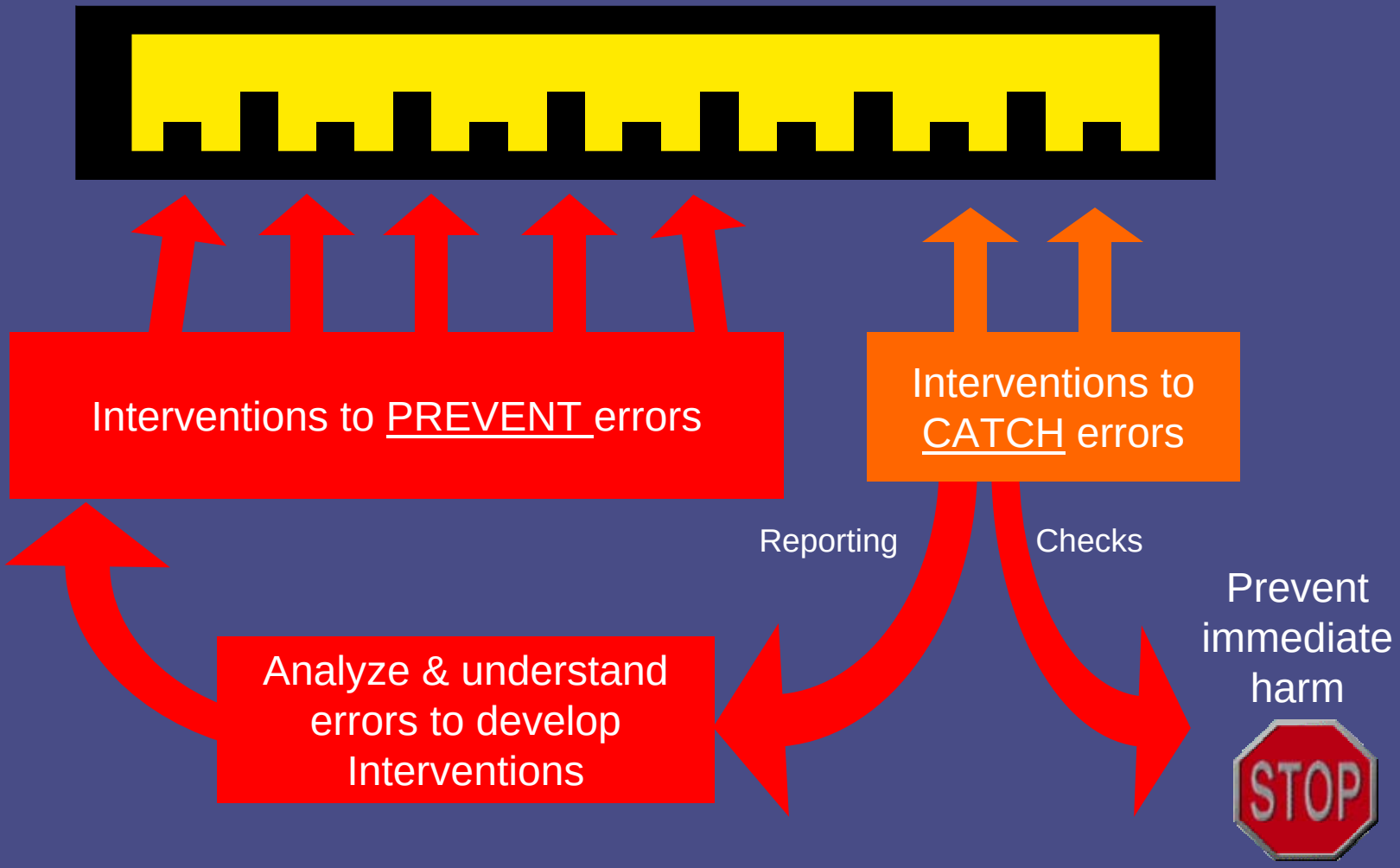
- Work Environment Design (Architecture, Work Station Design)
- Task or Process Design

Interventions to CATCH errors

- Close Call Reporting
- Checks (auto or manual)

Patient Safety

MEASURING PATIENT SAFETY



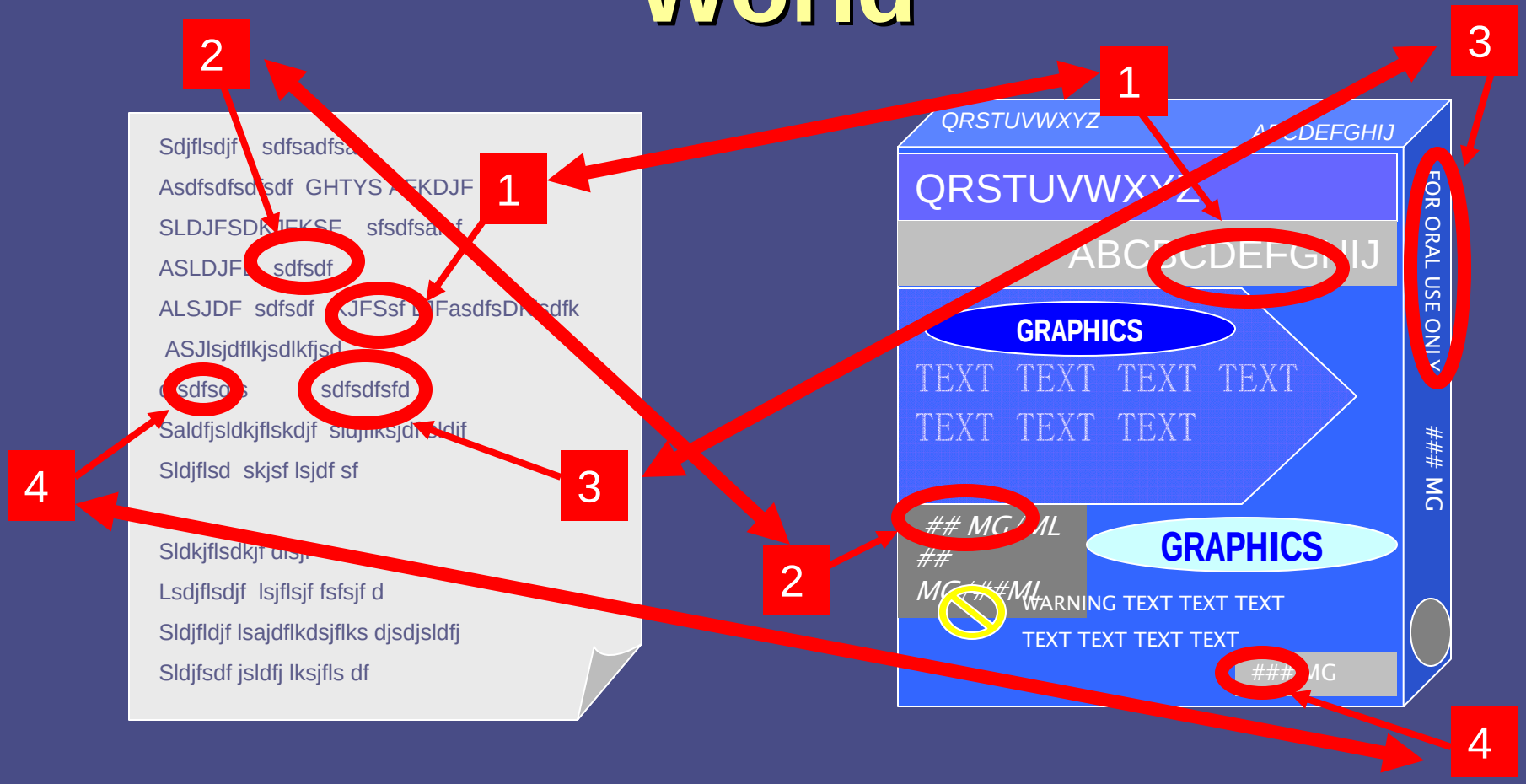
Why do we need independent double checks?

Front line staff work with:

- ☑ High Stress Environment
- ☑ High Risk Drugs
- ☑ Poorly designed Order Forms
- ☑ Poorly designed Packages & Labels!
- ☑ Poorly designed Pumps

Human Factors

The Physical & Cognitive World



ORDER FORM

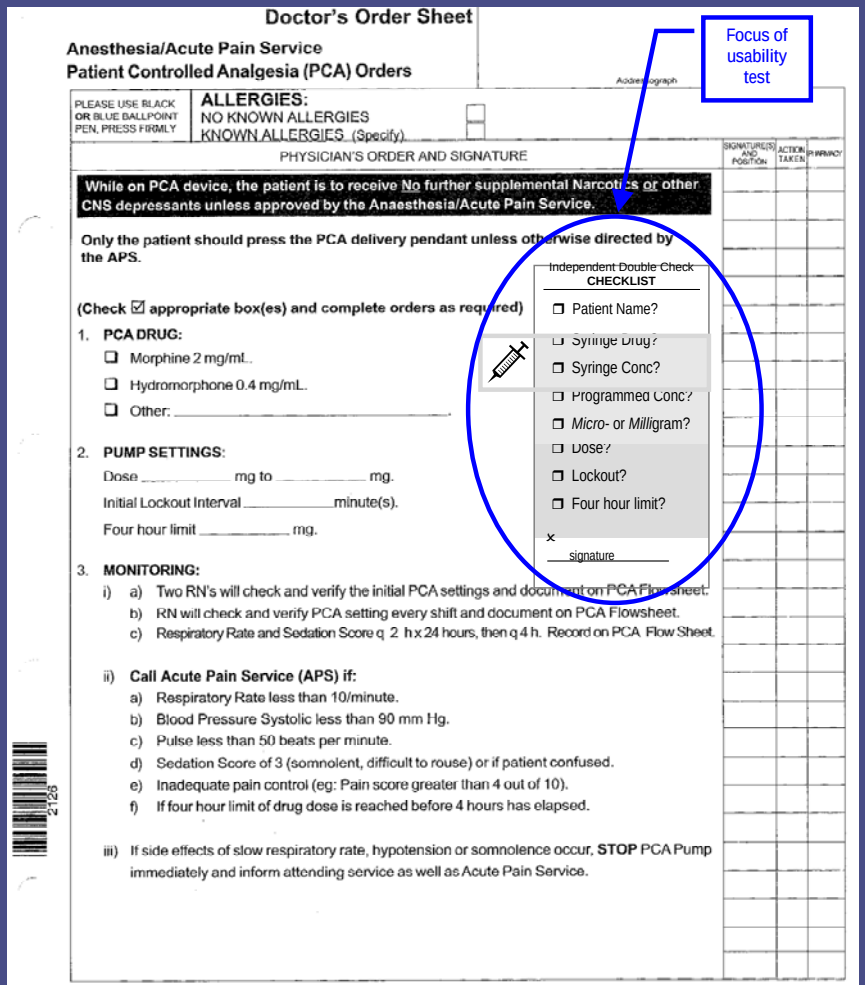
DRUG PACKAGE & LABELS

Narcotics Project: PCA Checklist Tool

5. Rules and Policies

- bring to point of care

This is an example of an existing PCA order form. This order form was NOT evaluated. Only the *Independent Double Check CHECKLIST* was evaluated in the usability test.



Doctor's Order Sheet

Anesthesia/Acute Pain Service
Patient Controlled Analgesia (PCA) Orders

Focus of usability test

PLEASE USE BLACK OR BLUE BALLPOINT PEN, PRESS FIRMLY

ALLERGIES:
NO KNOWN ALLERGIES
KNOWN ALLERGIES (Specify)

PHYSICIAN'S ORDER AND SIGNATURE

SIGNATURE(S) AND POSITION | ACTION TAKEN | PHARMACY

While on PCA device, the patient is to receive No further supplemental Narcotics or other CNS depressants unless approved by the Anaesthesia/Acute Pain Service.

Only the patient should press the PCA delivery pendant unless otherwise directed by the APS.

Independent Double Check CHECKLIST
- ❒ Patient Name?
- ❒ Syringe Drug?
- ❒ Syringe Conc?
- ❒ Programmed Conc?
- ❒ *Micro-* or *Milli*gram?
- ❒ Dose?
- ❒ Lockout?
- ❒ Four hour limit?

x ____ signature

(Check ☑ appropriate box(es) and complete orders as required)

1. **PCA DRUG:**
   - ❑ Morphine 2 mg/mL.
   - ❑ Hydromorphone 0.4 mg/mL.
   - ❑ Other: _____
2. **PUMP SETTINGS:**
   Dose _____ mg to _____ mg.
   Initial Lockout Interval _____ minute(s).
   Four hour limit _____ mg.
3. **MONITORING:**
   i) a) Two RN's will check and verify the initial PCA settings and document on PCA Flowsheet.
   b) RN will check and verify PCA setting every shift and document on PCA Flowsheet.
   c) Respiratory Rate and Sedation Score q 2 h x 24 hours, then q 4 h. Record on PCA Flow Sheet.

   ii) **Call Acute Pain Service (APS) if:**
   a) Respiratory Rate less than 10/minute.
   b) Blood Pressure Systolic less than 90 mm Hg.
   c) Pulse less than 50 beats per minute.
   d) Sedation Score of 3 (somnolent, difficult to rouse) or if patient confused.
   e) Inadequate pain control (eg: Pain score greater than 4 out of 10).
   f) If four hour limit of drug dose is reached before 4 hours has elapsed.

   iii) If side effects of slow respiratory rate, hypotension or somnolence occur, **STOP** PCA Pump immediately and inform attending service as well as Acute Pain Service.

2123

Independent Double Check

CHECKLIST

- ❒ Patient Name?
- ❒ Syringe Drug?
- ❒ Syringe Conc?
- ❒ Programmed Conc?
- ❒ *Micro* or *Milligram?*
- ❒ Dose?
- ❒ Lockout?
- ❒ Four hour limit?

x _____

signature

Independent Double Check Tool

Independent Double Checks

“Thank you for a wonderful and thought provoking seminar. It is nice to look at things from a different perspective. When I spoke to the nurses on my units about this they were interested and I think that they felt that the “blame” for not always being “perfect” was being taken away”

Applying Error Reduction Strategies

Culture and Communication

6. Education and Information

- Educating staff:
  - System-based causes of medication errors
  - Hierarchy of effectiveness of error prevention strategies
  - Bring patients and family into the medication-use process (pamphlets)

E. Leadership Needed

- Making safety a priority
- Promoting a Culture shift
- Eliminate use of “error rates” as a measurement tool
- Proactive approach
  - Failure Mode and Effects Analysis (FMEA)
  - High reliability organizations
  - Learning from each other (internal, external, outside healthcare)

“Technically the biggest ‘safety system’ in healthcare is the minds and hearts of the workers who keep intercepting the flaws in the system and prevent patients from being hurt. They are the safety net, not the cause of injury”.

Don Berwick

www.ismp-canada.org