

Applying Engineering Principles to Medication Safety

*Making Sense of HFE,
FMEA and RCA*

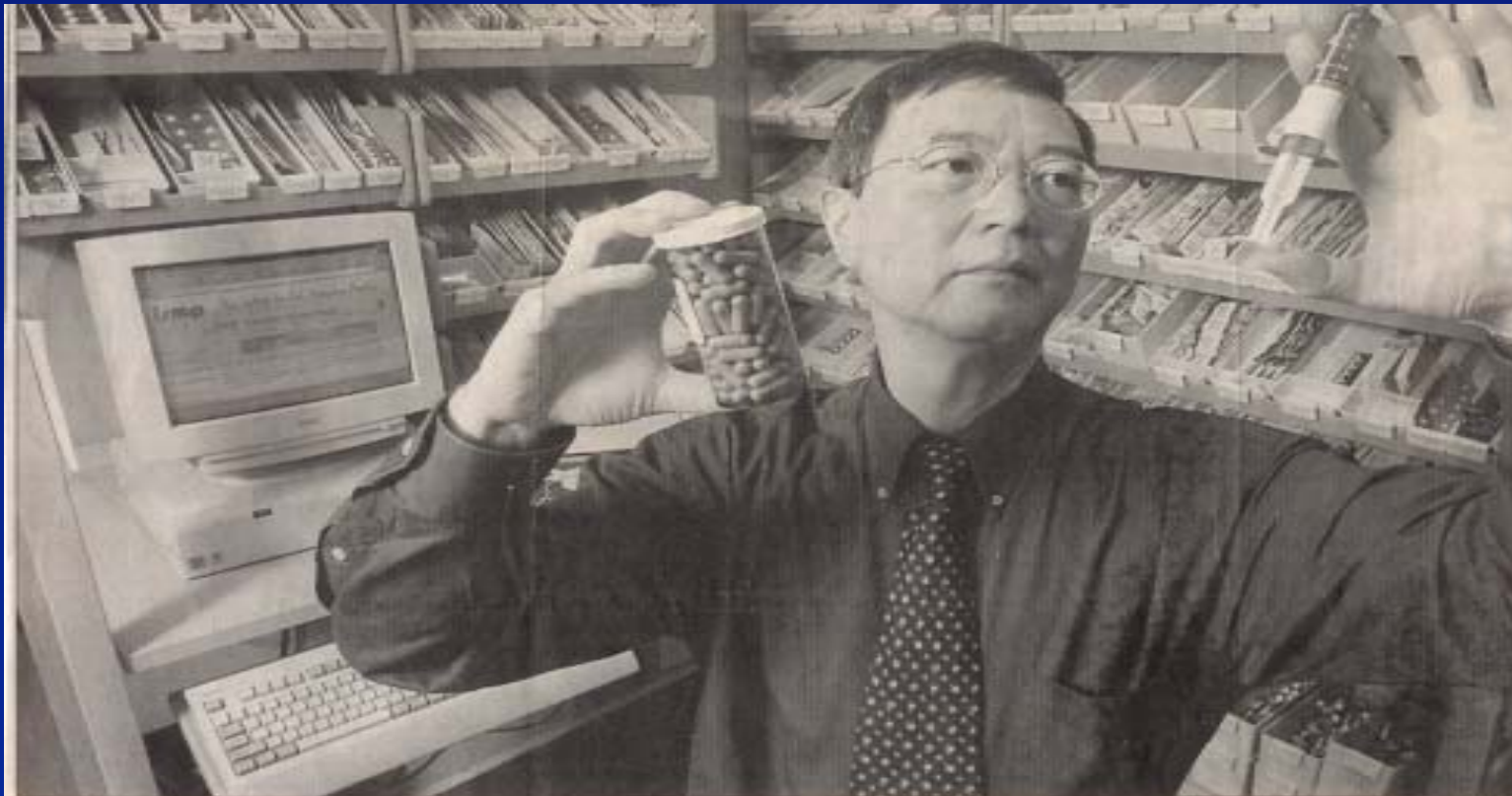
Agenda

- 15:00 Introduction
- 15:10 Human Factors Engineering (HFE)
- 15:30 Failure Mode and Effects Analysis (FMEA)
- 15:55 Root Cause Analysis (RCA)
- 16:20 Case Study
- 16:45 Debrief



Media
Reporting
Affects Public
Trust!

It's in the News.... National Post, April 29, 2001



David U, president of the Institute for Safe Medication Practices, Canada, says most mistakes in medication stem from "system error."

Hospital errors hidden for too long, critics say

was still three times higher than among adults. Most involved incorrect doses. Others involved not specifying how a drug should be administered, or a patient with an allergy to a drug, for example, penicillin, being prescribed a penicillin-based medication.

The researcher said 93% of the errors could have been prevented with computerized order entry

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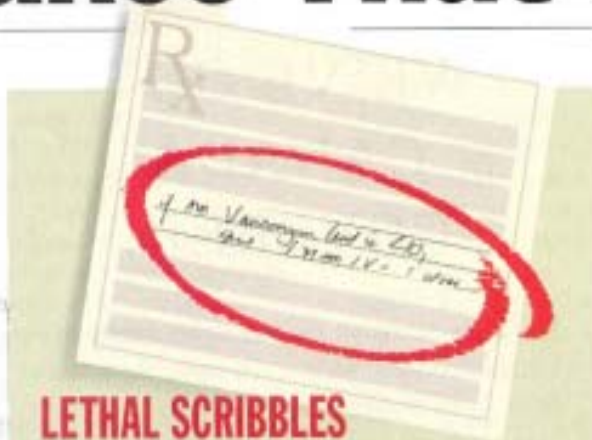
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Uncounted thousands of Canadians die each year because of avoidable medical errors. A program is just beginning to monitor the errors and eliminate the causes.

Mistakes That Kill

BY DIANA WILEY

ON JULY 30, 1996, Nancy Brown witnessed her son's death by the same lethal injection that is used for executions in the United States—potassium chloride. The setting, however, was no death row but the supposedly curative premises of Leamington District Memorial Hospital in southwestern Ontario. Jeffrey Brown, 33, undergoing treatment for a kidney infection, was chatting with his mother and a friend when a nurse arrived with a medication cart. Brown was supposed to receive an injection of lasix, a drug used to reduce swelling caused by excess bodily fluids. Instead the nurse somehow took a vial of concentrated potassium chloride from a drawer in the cart, filled a 20-cc syringe and in-



LETHAL SCRIBBLES

The Institute for Safe Medication Practices posted this prescription on its Web site as an example of how doctors' unclear writing can lead to errors in medication. It calls for a patient with renal failure to be given a dose of the antibiotic vancomycin, along with orders to administer another one-gram dose intravenously if his vancomycin level the next morning is "<10," meaning less than 10 milligrams per litre. But the "less-than" symbol is written in a way that makes the number 10 look like 40. The posting does not say whether the patient actually received the wrong dosage. A single dose that size is unlikely to cause harm, but prolonged excessive dosing could lead to kidney damage, ear damage or blood problems.

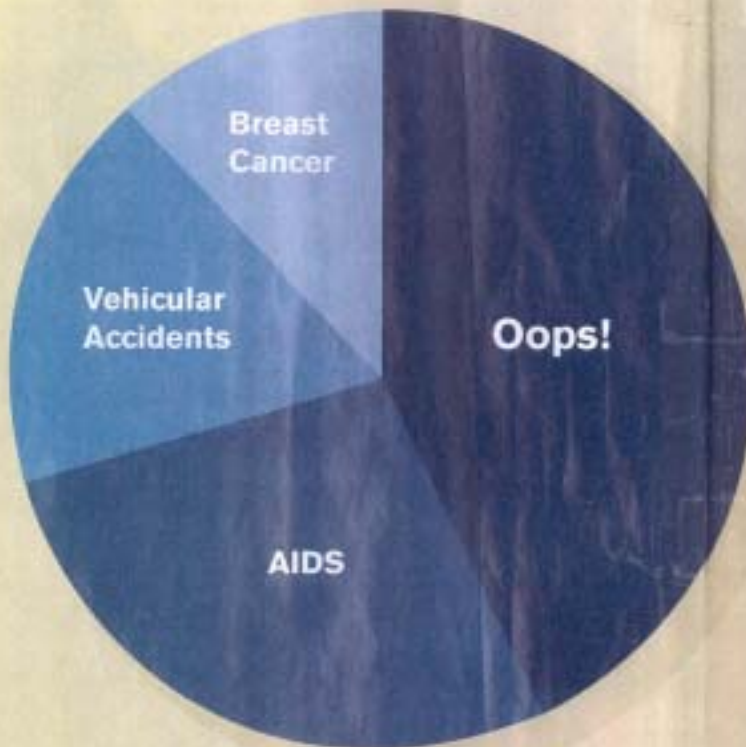
experience, was charged with criminal negligence. Two and a half years later, she was cleared of all charges. Nancy Brown is still trying to make sense of this "unfinished business," as she calls it. "My son died in a public institution and no one's been held accountable," she says. "I cannot heal until I am certain there are practices and procedures in place to prevent this ever happening again."

CLEARLY, THERE AREN'T. In hospital settings, where the guiding principle is the Hippocratic injunction "First, do no harm," thousands of Canadians—credible estimates range as high as 10,000 per year—are dying as a result of medical error. A further 10,000 deaths may result from infections acquired in hospitals and unanticipated complications from medications. Add to this an estimated 20,000 medication-related

HOW TO PREVENT MEDICAL ERRORS

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.

MAJOR CAUSES OF DEATH IN THE UNITED STATES:



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.

Everyone knows we are talking about...

- Systems
- No blame



After World War II engineers started to develop mechanisms to introduce safety.




Engineers taught to perform
accurately to be perfect.

Healthcare workers socialized to
be perfect!



Engineering Principles are
now being used in
healthcare.



General knowledge in proactive design of healthcare processes are very limited.

“The rate of failure in healthcare is unknown and may be unknowable.”

Reference: Root Cause Analysis in Healthcare: Tools and Techniques

As healthcare assessments become more complex, surgeries and processes increasingly inter-dependent, there is an...

↑ Opportunity for failure

↑ Difficulty of recovering from failure

Today's Topics

- **Human Factors Engineering (HFE)**
 - The study of how people interact with equipment and their environment.
- **Failure Mode Effects Analysis (FMEA)**
 - Process performed to prevent process and product problems 'before' they occur.
- **Root Cause Analysis (RCA)**
 - Process used after 'something bad' has occurred to identify underlying causes.