Examples of Importance and Impact

- A classic: Therac-25 disasters
- It still happens: Lifecare infusion pump
- Palm Beach ballot
- Business examples
- Cost Justification

Medical Human Factors

- Therac-25
  - Machine has low-power focused bean and high-power x-ray modes
  - User error correction never anticipated or tested
  - Poor error messages and feedback worsen accident: "Malfunction 54" did not communicate nature of error or success/failure of treatment
  - Context of use made things worse: no intercom or close-circuit TV

Medical Human Factors (2)

- Lifecare 4100 infusion pump
  - (Tallahassee Democrat newspaper, 2000)
  - Pump automatically administers drug infusions, can be set at different dosage levels
  - Fatalities and near fatalities caught FDA attention
  - "Human error" blamed
  - U of Toronto studies revealed difficult UI
  - Default setting could cause fatal concentrations
  - Manufacturer says users should read manual, users often blame machine for changing concentrations on its own
  - Liability problems complicate case, no FDA action

Subsequent Developments
(Vicente, 2002)

- Reporters, lawyers, manufacturer interested in Toronto (Vicente) studies
  - Improved UI reduced errors in laboratory
  - Done prior to events
- Manufacturer does not act, additions deaths
- Letter to clinicians warning lack of training
- Vicente, manufacturer, consultant trade published rebuttals
  - Vicente claims ethics violations
- Call to FDA to regulate human factors / safety in medical devices just as in nuclear power plants

Subsequent Developments
(Andre, 2000)

- Explicitly states connection with Abbott Labs
- Disputes explanation of error as acceptance of default
  - Gives example of transposing numbers
  - Claims errors can happen even if setting is required (no default)
- Vicente took a specific scenario and fixed that
  - Fixing one problem can have unintended consequences in other area
- In most cases device is not mis-programmed
- Changing device might cause negative transfer
  - Vicente suggested high concentration presented as default rather than low – practiced responses might cause huge errors

Subsequent Developments
Thought Questions

- How do you assess what is a human error and a design induced human-system error?

- How do you assess impact of a fix?

- How could it be done in this case?

Class Exercise

- Molich & Nielsen, 1990, Computerworld contest
- Task: Point out as many different usability problems in the human-computer dialog as possible
  - Criticize the dialog not the functionality
  - Suggestions for new features not part of the exercise
  - Numbered list of usability problems, suggestions for improvement are optional
  - Number of problems already listed by Molich & Nielsen
  - Hint: First problem:

    "The screen design uses upper case letters only, although we know frorm human factors studies that mixed-case text is much more readable…"

Exercise (con't.)

- "Manhatten Telephone" (MANTEL) service to home computer users

- Typical users have little knowledge of data processing

- System provides name and address of telephone subscriber in US given telephone number of subscriber

- For purposes of the exercise: assume one subscriber per telephone number

- List your problems in number list for scoring after exercise

- 30 min. time limit

Nielsen's Principles

- Simple and natural dialog
- Speak the user's language
- Minimize the user's memory load
- Be consistent
- Provide feedback
- Provide clearly marked exits
- Provide shortcuts
- Provide good error messages
- Prevent errors

Example: From Mauro (1994)

- Printer manufacturer – serious usability problem
  - printer driver installation & operation
- 50% of first 100,000 customers called customer care
  - $ .5 million per month
- Poor reputation
  - Overloaded customer care phone system
- Delivered fix on new diskettes to 200,000 customers
  - $ 900,000
- Problem could have been fixed in usability testing
  - Tested internally by engineering group – found no problems