Automated Screening for
Look-Alike and Sound-Alike Medication Errors

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Acknowledgments

Overview

- Basic facts about look-alike/sound-alike (LASA) errors

- Why do they occur?

- What can be done to predict or prevent them?

Basic Facts About LASA Errors

- What are they?

- When do they occur?

- How often do they occur?

- What are the consequences?

Why do LASA Errors Occur?

- Cognitive psychological factors

- Environmental/workplace factors

- Interaction between psychological and workplace factors

Basic Prevention Strategy

- Identify which psychological processes are involved in each type of error

- Use theories from cognitive psychology to guide our efforts at error minimization

LASA Error Types Broken Down by Psychological Faculty

- Memory Errors (e.g., forgetting, misremembering)

- Perceptual Errors (e.g., misperceiving)

- Action errors (e.g., typographical errors, order entry errors)

Example: Memory Errors

Known Psychological Phenomena

- Phonological similarity effect
- Word length effect
- Unattended speech effect
- Articulatory suppression effect
- Word frequency effect

Baddeley's Working Memory Model

- Consists of central executive, visuo-spatial sketchpad, and phonolgical loop.

- Phonological similarity effects are explained by the phonological loop.

- Phonological representations of words are subject to partial loss due to decay and interference (Gathercole and Baddeley, 1993).

- Loss and decay are most consequential when an item is phonologically similar to another item already in the phonological store.

Using the Theory to Guide Prevention

- Develop automated measures of similarity

- Use automated measures to study relationship between similarity and probability of error

Automated Measures of String Similarity

- Bigram

Atarax	Marax	Common bigrams
(at, ta, ar, ra, ax)	(ma, ar, ra, ax)	(ar, ra, ax)

- Trigram

Atarax	Marax	Common trigrams
(ata, tar, ara, rax)	(mar, ara, rax)	(ara, rax)

- Edit distance

Atarax   Marax

How many insertions or deletions would it take to transform one word into the other? In this case, 2: (1) Change A to M, (2) delete t.

Results

- Case-control studies

- Recall and recognition memory experiments

How Can We Prevent LASA Errors?

- Engineer the drug lexicon to make it 'error resistant'

- Engineer the work environment to make it 'error resistant'

Engineer the Drug Lexicon

- Each drug is a point in a multi-dimensional space
- Dimensions of this space are orthographic and phonological similarity as well as dose, schedule, route of administration, color, shape. etc.
- Errors occur when drug products are 'too close' to one another in this space

Engineering the Lexicon

- Use automated measures of similarity to screen new drug products

- Only approve new products that are a 'safe distance' from existing products

- Something like this is routinely done as part of the legal screening of new trademark names

Engineering the Drug Lexicon

- We need a reference standard database of drug information against which new drug products would be screened

- More research is needed to determine how close is 'too close'

- Must decide what to do when new name is 'too close' to an old name

Engineering the Drug Lexicon

- Automated searches should be part of failure mode and effects analysis (FMEA)

- FMEA should be a routine part of the FDA approval process

Engineering the Work Environment

- No talking while prescribing, dispensing, or administering drugs
- No alphabetical storage of drugs
- No handwritten prescriptions
- No faxed prescriptions
- Use of bar codes where feasible
- Use of additional retrieval cues where feasible (e.g., dose, indication, scheduling, etc.)

Summary

- Basic facts about look-alike/sound-alike (LASA) errors

- Why do they occur?

- What can be done to predict or prevent them?

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