How a Voice-enabled, Virtual Assistant Improved Care Delivery, Physician Workflow Across a Network of Long-term Acute Care Facilities

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CMIO, Evidence Based Medicine
Nuance
Taking CPOE from GUI to LUI (AKA CUI)

What we did
How we did it
What’s driving further development
Video went here
What You Didn’t See

CHIEF COMPLAINT
No data to display

HISTORY OF PRESENT ILLNESS
No data to display

LABS
- Glucose 137
- Blood urea nitrogen 14
- Creatinine 1.1
- Sodium 137
- Potassium 4.4
- Chloride 101
- Carbon dioxide 28

PROBLEMS
- Shoulder pain ICD-9 123

What is the route
What You Didn’t Hear

– Doctors at Landmark requested TTS be turned off
– Using a Desktop, eyes on the screen
– Doctors using the iPad app asked for TTS
  – Most wanted terse
  – Some wanted verbose
– All are options
Side by Side Comparison of Adding 20 Orders

<table>
<thead>
<tr>
<th>Traditional CPOE</th>
<th>CPOE + Nuance Florence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>08:43</strong></td>
<td><strong>05:35</strong></td>
</tr>
<tr>
<td><strong>26 sec</strong></td>
<td><strong>18 sec</strong></td>
</tr>
<tr>
<td><strong>87 clicks</strong></td>
<td><strong>0 click</strong></td>
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</tbody>
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Total time (20 orders)
Results – Landmark LTAC Hospitals

- Greatest use for lab and medication orders
- Number of orders entered via voice increased November – February as much as four-fold
- Time for entering orders decreased by 35%
Florence – A Virtual Physicians’ Assistant

- Uses voice to navigate chart
- Uses voice to create notes
- Creates orders from notes
- Uses voice to create orders
Actions of a Personal Assistant

Listen
- Be prepared to carry out pre-defined tasks
- These are taught (programmed) functions

Clarify
- Ask for needed additional information
- Discourse/dialogue is essential

Act
- Perform all the necessary steps to complete the task
- Few tasks are a single step

Anticipate
- Some actions are routinely followed by another action
- Initiate these actions

Remind
- Schedules
- To-do lists
Physician Orders – Frequent, Repetitive Act

Orders are:
• Terse
• Content rich

A place for conversation
• Ask for clarification
• Ask for completion
• Ask for verification
The Technical Choices

Listen & Understand
- Mrec
- Nuance speech Anywhere – NSA
- Nuance Recognizer 10 – NR10
- Grammar based recognition

Clarify
- Order type parameters
- Accept in any order
- Prompt for missing parameters
- Present order and ask if correct

Act
- Pass orders and parameters coded in
  - LOINC
  - Snomed
  - RxNorm
  - RadLex
The Grammars

~10,000 Drugs from the USP Formulary
~600 Common labs from the NLM/LOINC repository
~400 Imaging orders from RadLex
~50 Routes of admin from the FDA
~70 Frequencies from ISMP
Parameters

- **Only built order types with standard parameters**
  - Vaso-active drips not included
  - Chemo therapy not included
- **Ask for missing parameter(s)**
  - All at once
  - Accept in any order
- **Ambiguity**
  - Context is not adequate
    - Can’t be 100% certain
    - Avoid frustration
  - Dealt with via grammars
    - “Dilantin level” is a lab
    - “Dilantin” is a drug
Advent of intelligent systems

Will virtual assistants propel the future of medicine?

8 in 10 Doctors believe that by 2018, virtual assistants, powered by clinical language understanding, will drastically change how physicians interact and use EHRs.
75% of people today feel that they are forced to adapt to technology, as opposed to the technology adapting to them.

SOURCE: Speak Easy: Majority of Consumers Want Mobile Personal Assistants and Apps That Can Adapt and Converse; August 2013
We need to reinvent the relationship between clinicians and technology