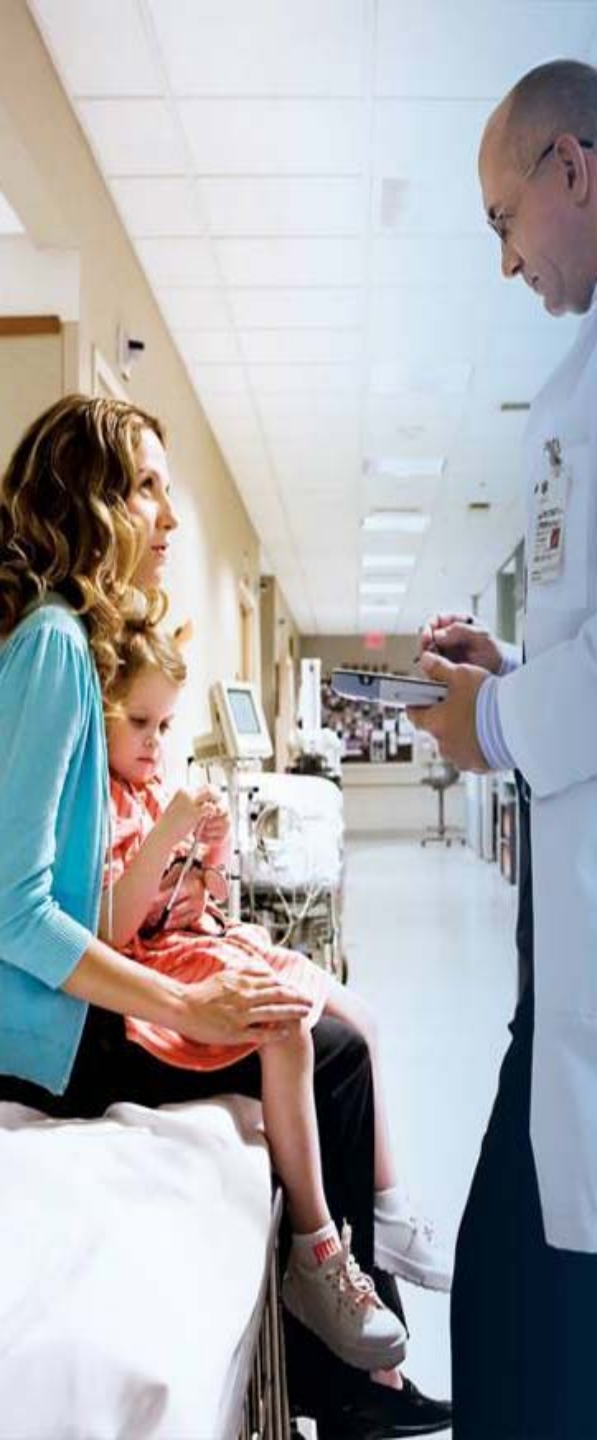

Point of Care Usability in Mobile Healthcare Client Devices: A Study

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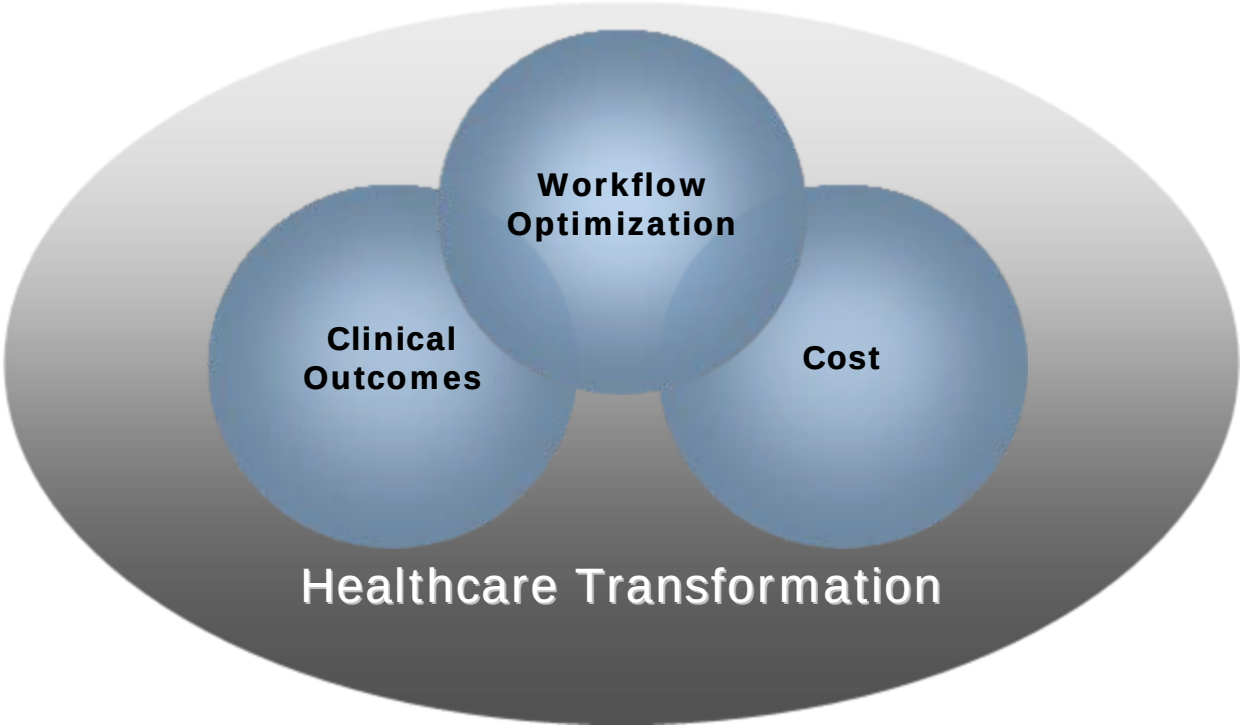
Digital Health Group
Intel

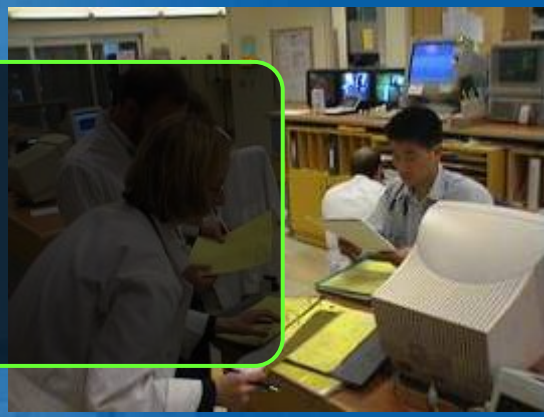
The Value Proposition - What We Have Heard:

Chapter I: EMR Adoption

Chapter II: Going Mobile at the Point of Care



The Value Proposition - Why Mobility Matters...

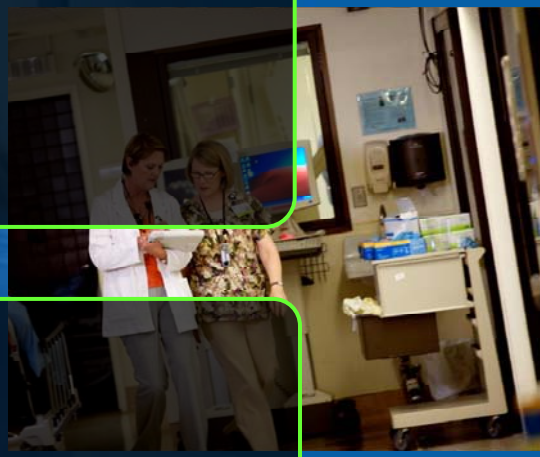


Everyone and everything moves

- Patients
- Staff
- Equipment

Resource location is Mission Critical

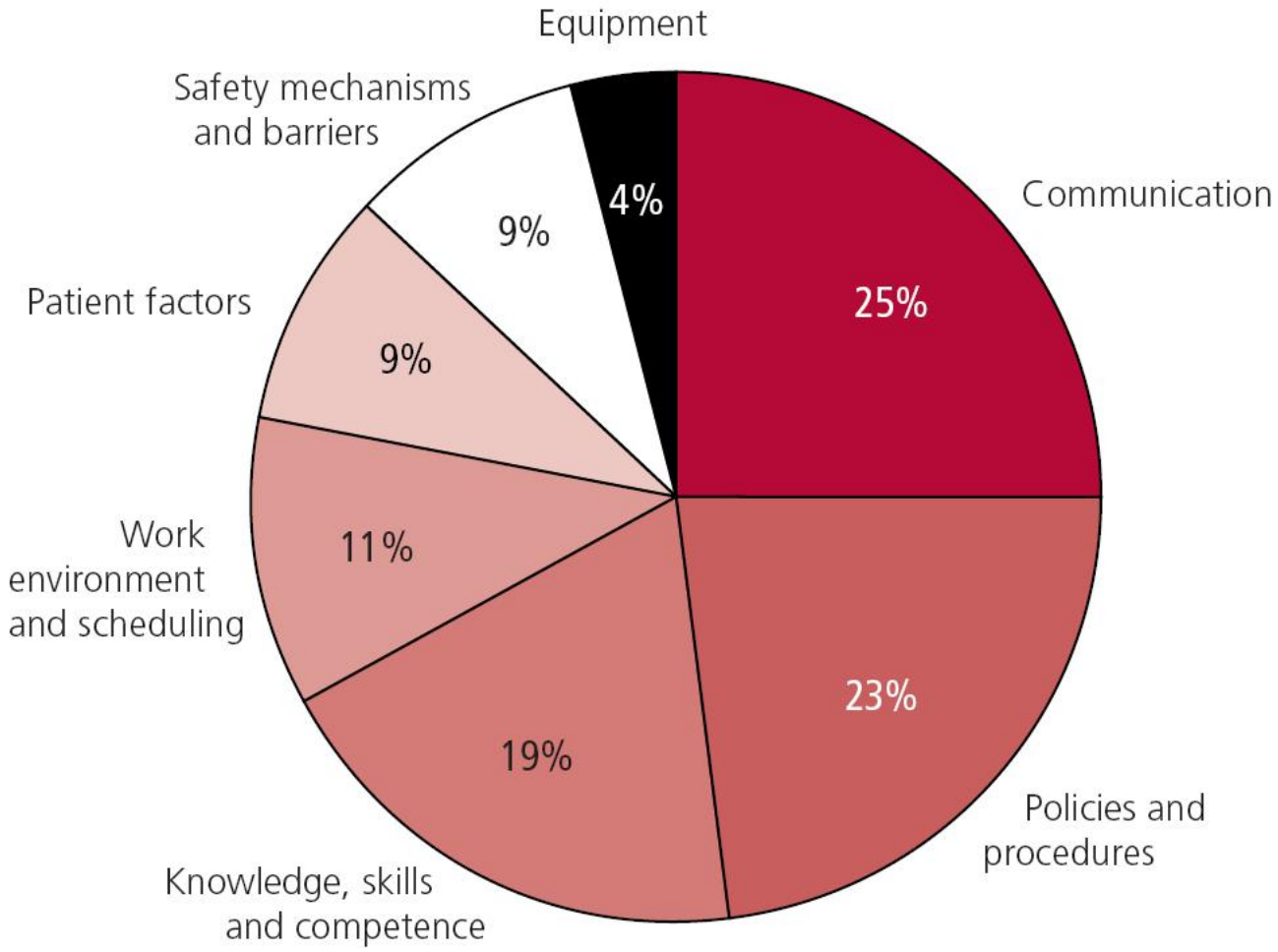
- Cost
- Quality
- Access



Workflow increasingly dependent on I.T.

- Practice Guidelines
- Clinical Decision Support
- Task/Charge-based systems

The Value Proposition - What goes wrong in hospitals today



The Value Proposition - Improved Quality of Care, Improved Access

- Reduce errors and delays
- Support fact-based decision making
- Enhance collaboration

"I think wireless mobility is very important. It's the next step that we should be doing. I can access it on my computer, my laptop from home, or wherever I am. It makes time from the onset of a rhythm problem to delivering care to the patient so much shorter."

— Tracy Stevens, MD, Cardiologist,
St. Luke's Medical American Heart Institute

The Value Proposition - Workflow Optimization Goes Mobile – *What If….?*

Clinical Outcomes

- **30% reduction in medication errors** (2)
- Faster, more-informed decision-making (4)
- **50% reduction in wait time (ER, Admission, Transport) (5)**
- Treat 7% more patients per clinical FTE staff (7)
- Improved patient care (4)

Effective

Efficient

- Increase utilization of movable assets (from average 35–50% utilization) (5)
- 90% decreased in query times (4)
- **85% faster to transact Admission, Discharge and Transfer changes** (3)
- 10% higher patient throughput, bed utilization (3)
- 6x faster Bed turnaround (5)

Cost

- 18 minutes/day savings per clinician in faster decisions, access to resources (1)
- Reduced paper handling and administrative overhead (4)
- Treat 73% more patients per admin FTE (7)
- **25% reduction of bed cleaning staff per shift(5)**

- **$5M increase revenue** in year 1 (5)
- 6 months break-even point-to-point wireless (1)
- **12 months break-even** point-to-multi-point wireless (1)
- Happy staff (1,2,3)
- Happy CEO (1)

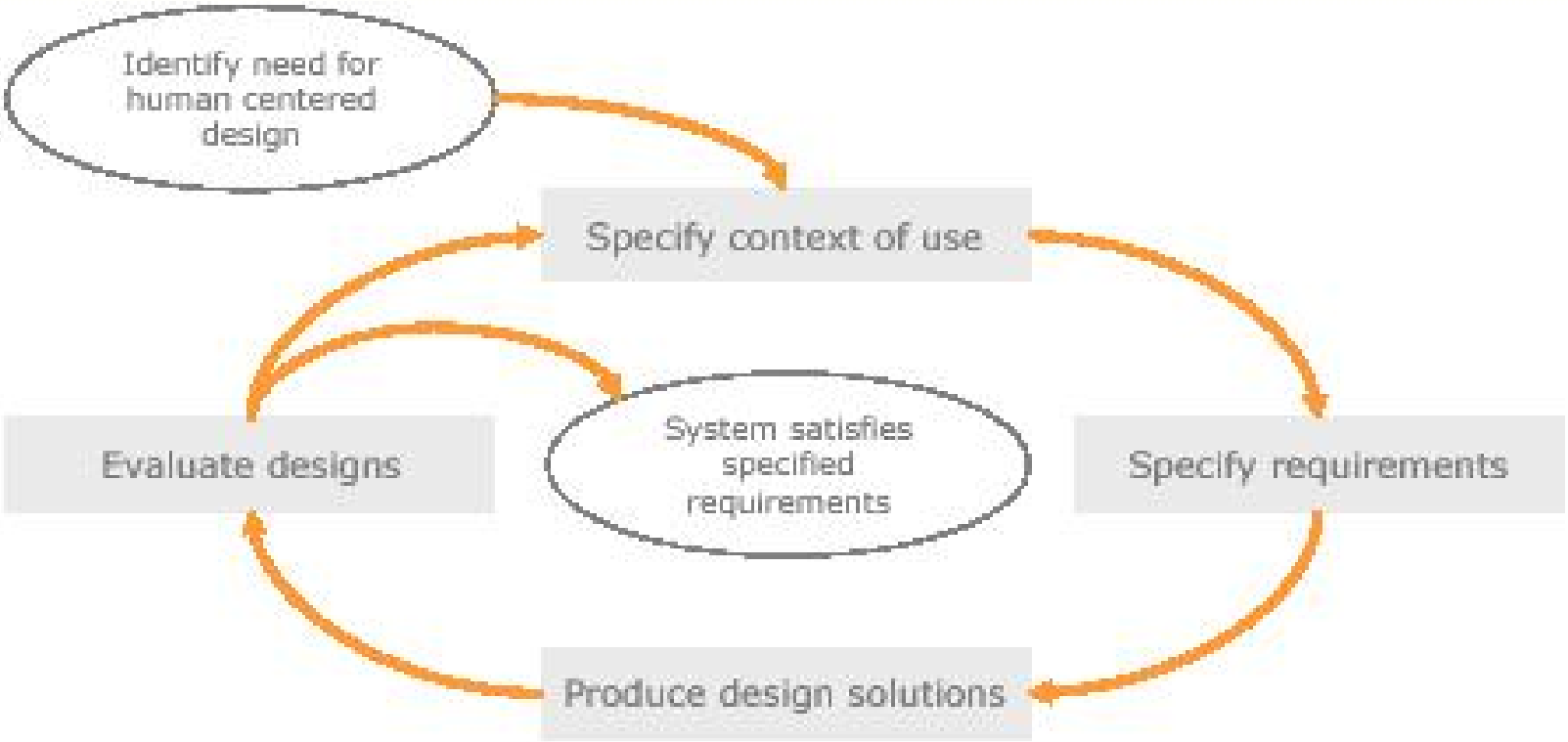
Value

(1) Wireless at Alfred Hospital, Australia
(2) Wireless at El-Camino Hospital, California
(3) RFID at St. Vincent's Hospital, Alabama
(4) EMR, wireless at Clalit Health Services, Israel
(5) St. Luke's Episcopal Hospital Houston, Texas
(6) Veterans Administration, U.S.
(7) Stephen P. Pollak, PhD Creative Intelligence International Limited

Converting the Value Proposition to Reality

"If you do not understand it, then don't fix it"

User-Centered Design



ISO 13407: Human-centered design process

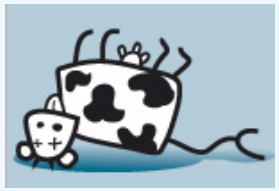
"grounds the process in information about the people who will use the product"

User-Centered Design

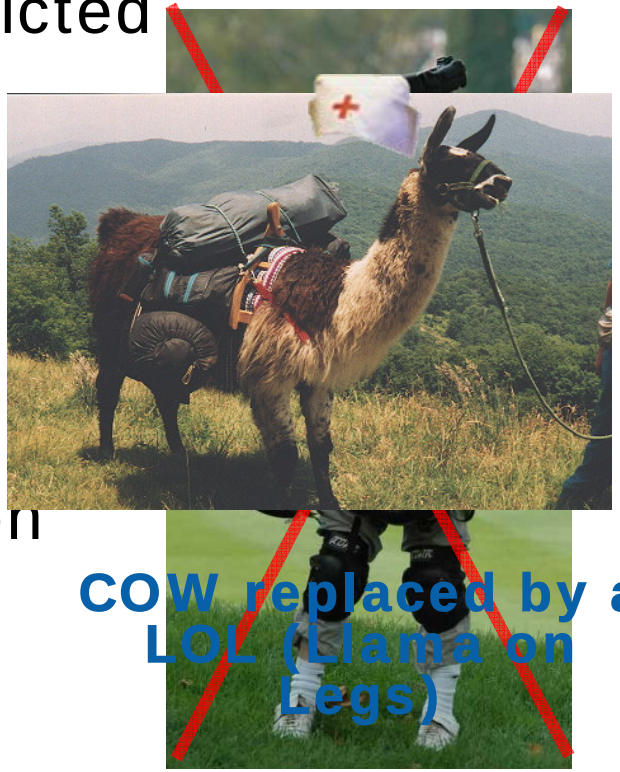
Study	Observe people in their own environments to assess unmet needs--on top of market research
Understand	Explore how people deal with specific healthcare problems
Develop	Design prototypes of new technology solutions
Pilot	Field-test prototypes, listen to the results, iteratively re-design
Deliver	Turn prototypes into new platforms that meet people's needs
Evaluate	Evaluate impact; **restart cycle**

Understanding the User Base

- Physicians and nurses are highly mobile workers
  - Complex, stressful and safety critical environments
  - Cognitive overload common
  - Portability important
- Physical space and movement restricted



The COW (computer on wheels), **a dying breed**



COW replaced by a LOL (Llama on Legs)

- Collections of solutions is no solution
- "Information appliance"
  - All in one portable multi-utility device

Rationale for *REALLY* Understanding the User Base

- "one of the most critical threats to the safe and effective use of any complex technology is an event that is unfamiliar to the user and that has not been anticipated by the designers"

Vincente, K. (2002). Cognitive Work Analysis: toward safe, productive, and healthy computer-based work.

Motion C5: Benefits & Features Built into Mobile Platform

Key Features:

- ~1 KG slate with handle
- 10.4” XGA screen (1024 x 768)
- Semi-sealed, disinfectable design
- Intuitive user interface
- ~3 hrs. battery life
- WiFi (802.11a/b/g)
- Bluetooth
- RFID reader
- Optional barcode scanner
- 2.0 MP Camera
- Fingerprint Reader
- Speak Anywhere® audio technology
- Optional View Anywhere® display

Key Options:

- Docking Station
  - Easily mountable on tabletops, walls or carts
  - Battery charging slot
- Spare batteries
- Spare pens

True Mobility Requires an Ecosystem

Studying the Human in the C5 Ecosystem

- C5 Usability Study - Goal
  - evaluate the usability, manageability, and satisfaction of C5
  - experienced nurses using C5 in a simulated environment
  - performing three normal clinical work processes

Simulation Tasks

- intake assessment of a newborn
- documentation of a wound assessment using the C5 built-in digital camera
- medication administration exercise using the C5 bar-code scanner.

Methodology Overview

- Observational ethnography of qualitative impressions
- Quantitative measurement of user reactions.
- Semi-structured interviews, surveys, and quantitative analysis of observations
- Think-aloud protocols

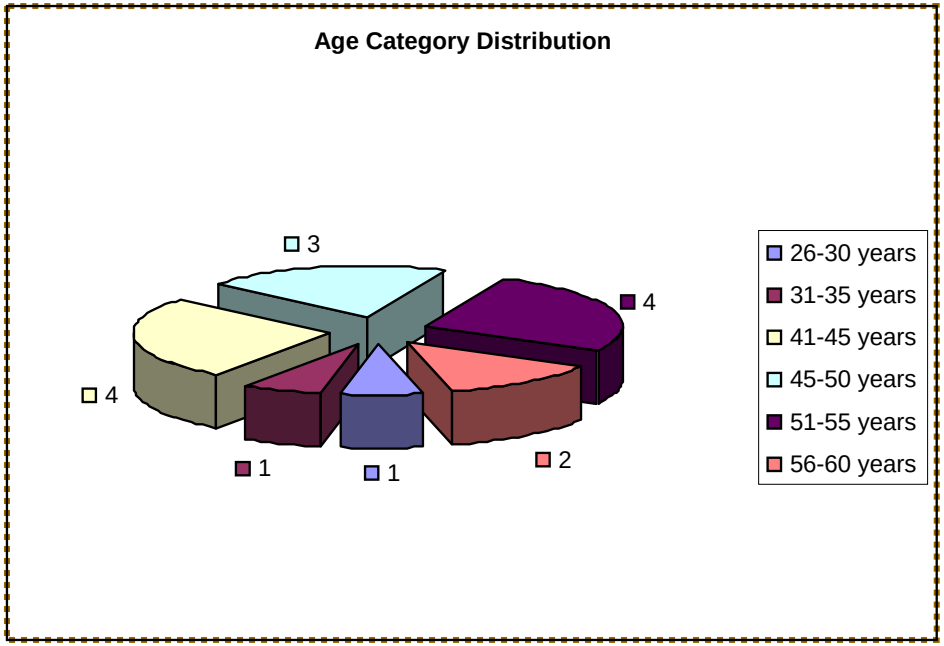
Johns Hopkins University IRB # NA_00010426

Setting

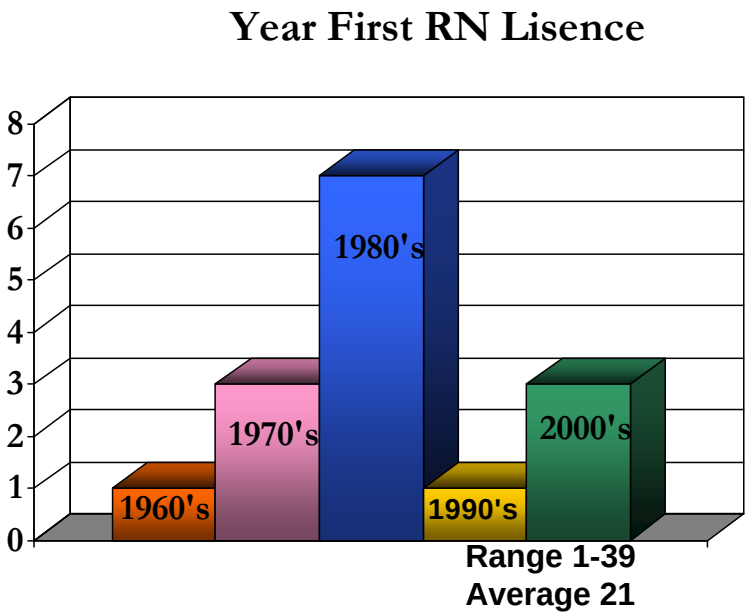
- 37 sim beds
- OP, ICU, Inpt.
- Eclipsys SCM 4.5

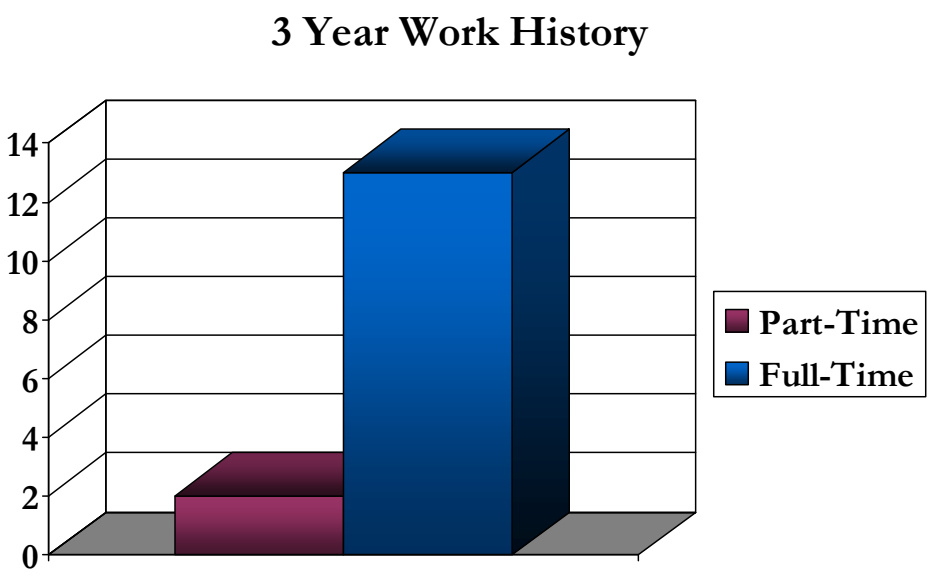
Sample

- RN – at least 1 year of current clinical experience & 6 months of clinical computing
- Aiming for “saturation” - iterative sampling
- Final N = 15
- OR, ICU,
  Psych, Mgmnt,
  Education
- 3 Males; 13 Female



Sample





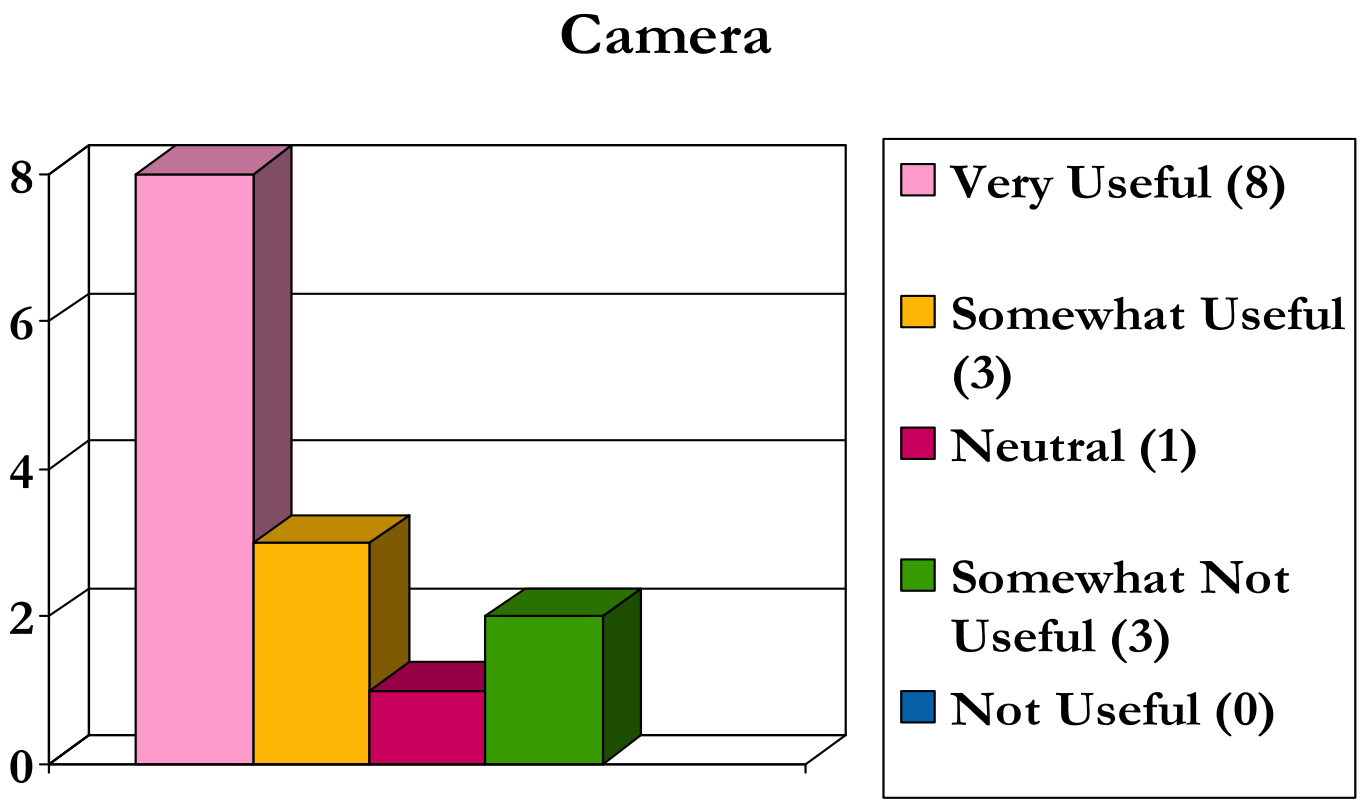
Students?
47% (N=7) enrolled in a degree granting program last 3 years

Results - Themes

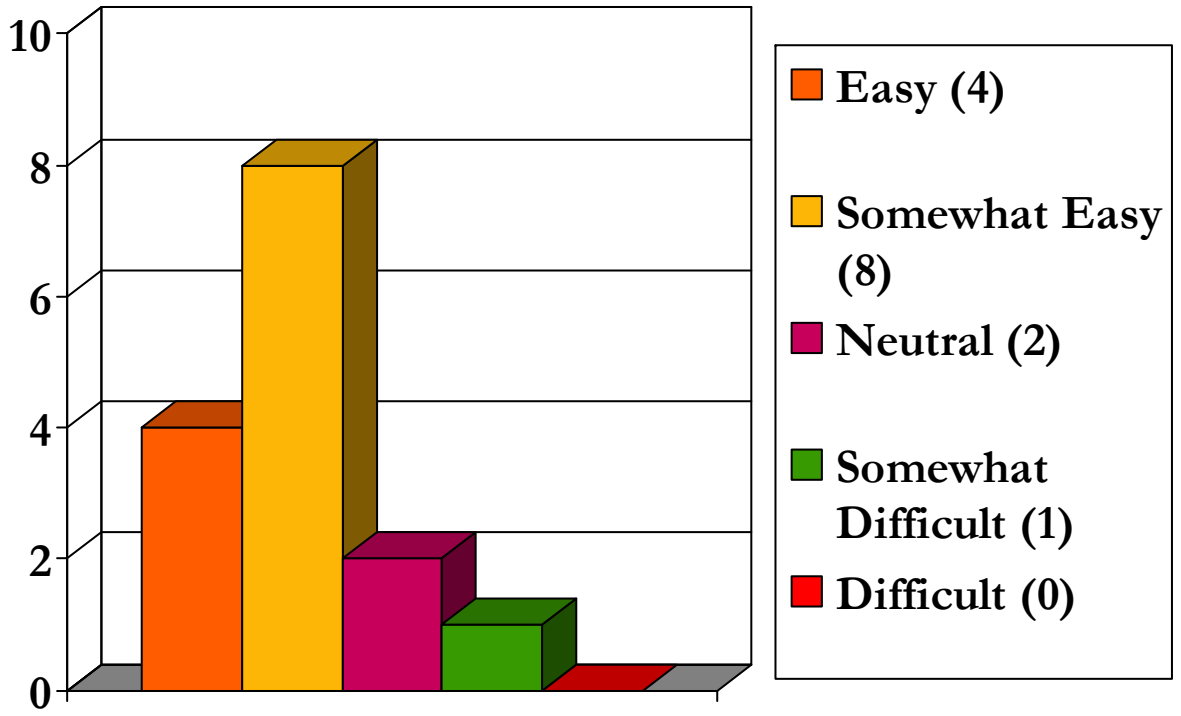
- Input Ease (with subcategories of pen, camera, standard keyboard, and bar code scanner)
- Portability
- Security/Safety (bacterial transmission is included here as an aspect of safety)
- Efficiency Gains
- Visuals/Viewability
- General Ease/Intuitiveness

Input Theme – Camera

- Camera



Input Theme – BarCoder Usability



"I like this 'all in one' feature"

"Pretty cool – and it is an important safety feature"

"The barcoder I use is on a cart that is too hard to push around – having it not located where I need it slows me down"

Input Theme – On Screen

- Zero % - Standard Keyboard
- Tip Tool Unknown
- Most Familiar – On Screen Keyboard
  - Too small
  - Tedious
- Most Favored – Writing Pad
  - Closer alignment with workflow
  - “Surprising” accuracy
- Problem Spots –
  - Tether
  - Editing

Portability Theme

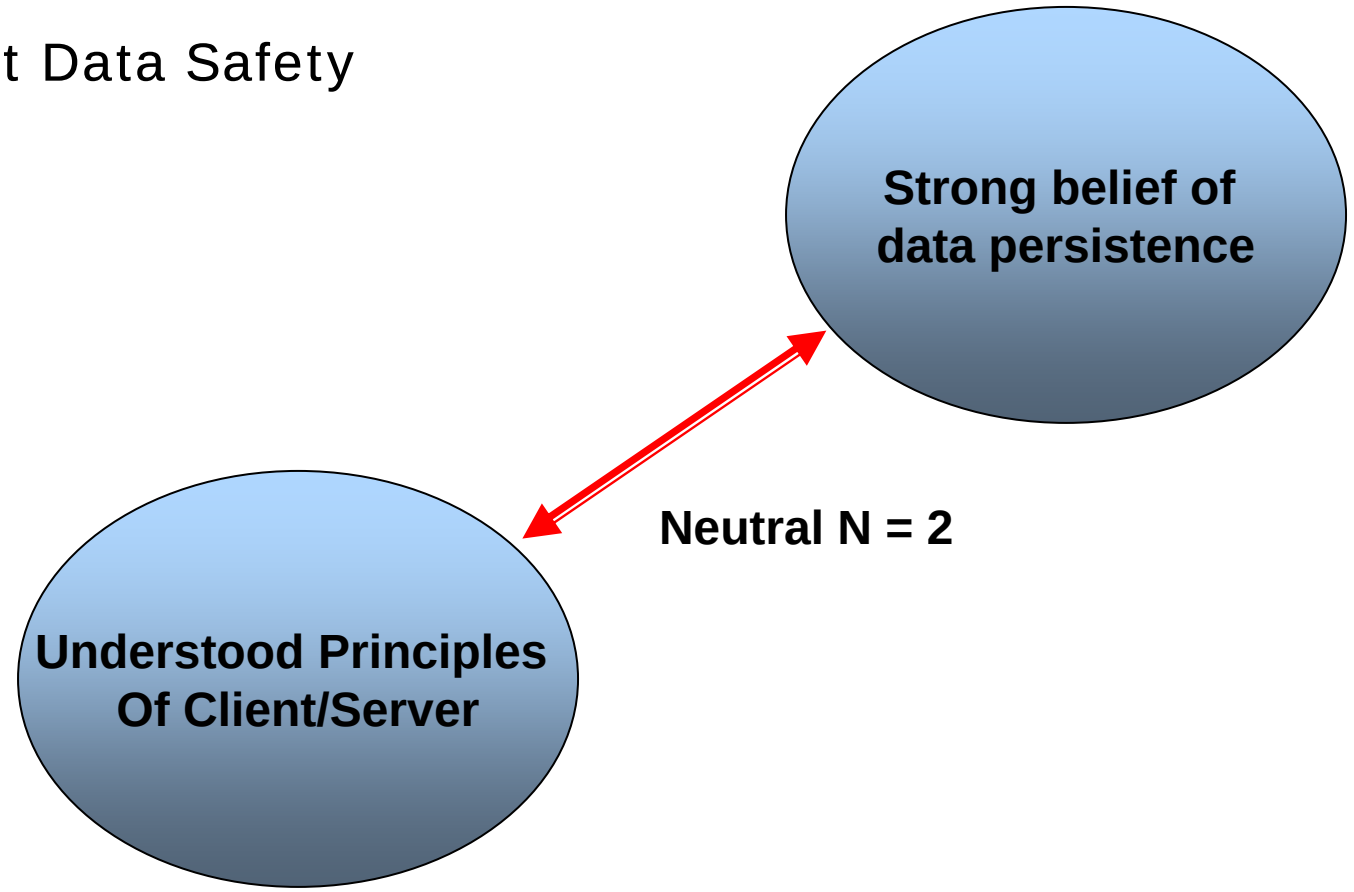
- Overall –
  - Portability highly rated by 90%
  - Battery swapping very easy 100%
  - Handle 80% positively rated
- Issues/Areas for Improvement
  - Weight – decrease weight
  - Add a strap (caveat)

Security/Safety Theme (Disinfections, Data Security, & Theft)

- Disinfection highly important 87%
  - "I work in the OR. We need to be able to do serious cleaning of anything …."
  - "We have those plastic covers on our keyboards now, but ……."
  - "Using keyboard in clinical settings creeps me out. There is no way to ……."

Security / Safety Theme

- Patient Data Safety



Security/Safety Theme

- 87% had no concerns about physical ruggedness. Two neutral.
- Suggestions for Improvement
  - Education to align beliefs
  - LoJack?
  - Strap – virtual or physical

Efficiency Gains

- Wipe-ability
  - High efficiency gain
    - Easier than COW
    - Easy to do, small surface area
- Usefulness of Device/Efficiency
  - 87% “will help my practice”
  - 13% neutral

Visuals / Viewability

- View Anywhere VS Non-View Anywhere
  - Random Assignment – 7 NVA/8 VA
  - Side-by-side comparison at end
- End Result
  - The NVA was less viewable in bright light
  - The VA – harder to clean, more prints/smears
  - No remarkable difference in visualization both very good
- NVA 20% edge over VA (due to VA glass)

General Ease / Intuitiveness

- Overall intuitive score – high
- Adaptive behaviors noted
- Higher level of IT comfort = higher level C5 comfort
- Impact of age
  - Bifocals
  - Arthritic fingers

Overall Analysis

- C5 very well received
- Significant improvement over current POC technologies
- Biometrics huge time saver (not part of study measurement – observational)
- Camera stimulated creative thinking
- Data suggests that older nurses with clinical IT experience adapted easier

Overall Analysis

- Areas for improvement
  - Tether
  - Explore extensible camera & scanner
  - LoJack (CompuTrace or facsimile)
  - Biometric device enablement with EHRS
  - Alternative areas to dock stylus
  - Enhance Tip Tool
  - Tactile enhancement of shutter and OmniPass buttons
  - Improve VA glass
  - Barcode

The Critical Success Factors From the Usability Assessment

- Supporting, not thwarting, workflow
  - Untethering, mobility is critical
  - All-in-one, lose the Llama model
  - Making HIT use the easiest way to practice – not hardest is vital
- Hearing the users voice
- HIT Vendor responsiveness to new technologies
  - Barcoding and digital photography must integrate into EHRS
- Platform developer responsiveness important

Evaluating and Adopting Mobile Platforms

What is the best device for my needs?

	Mobile Clinical Assistant	Tablet PC	Laptop 'Pro'
Mobility	●	◎	○
Infection Control	●	○	○
Medication Administration	●	○	○
Template data-entry	●	◎	○
Versatile/note-taking data-entry	○	◎	●
Large diagnostic images	○	◎	●
Manageability	○	◎	●

Assumes components

MCA: Core Solo, 945, 3945

TB: Core Duo, Crestline chipset, Kedron wireless

NB: Core 2 Duo, Crestline chipset, Kedron wireless, "Pro" version requires AMT 2.5; up to 800 FSB; 4MB cache

Key Considerations in Deploying MPOC Solutions

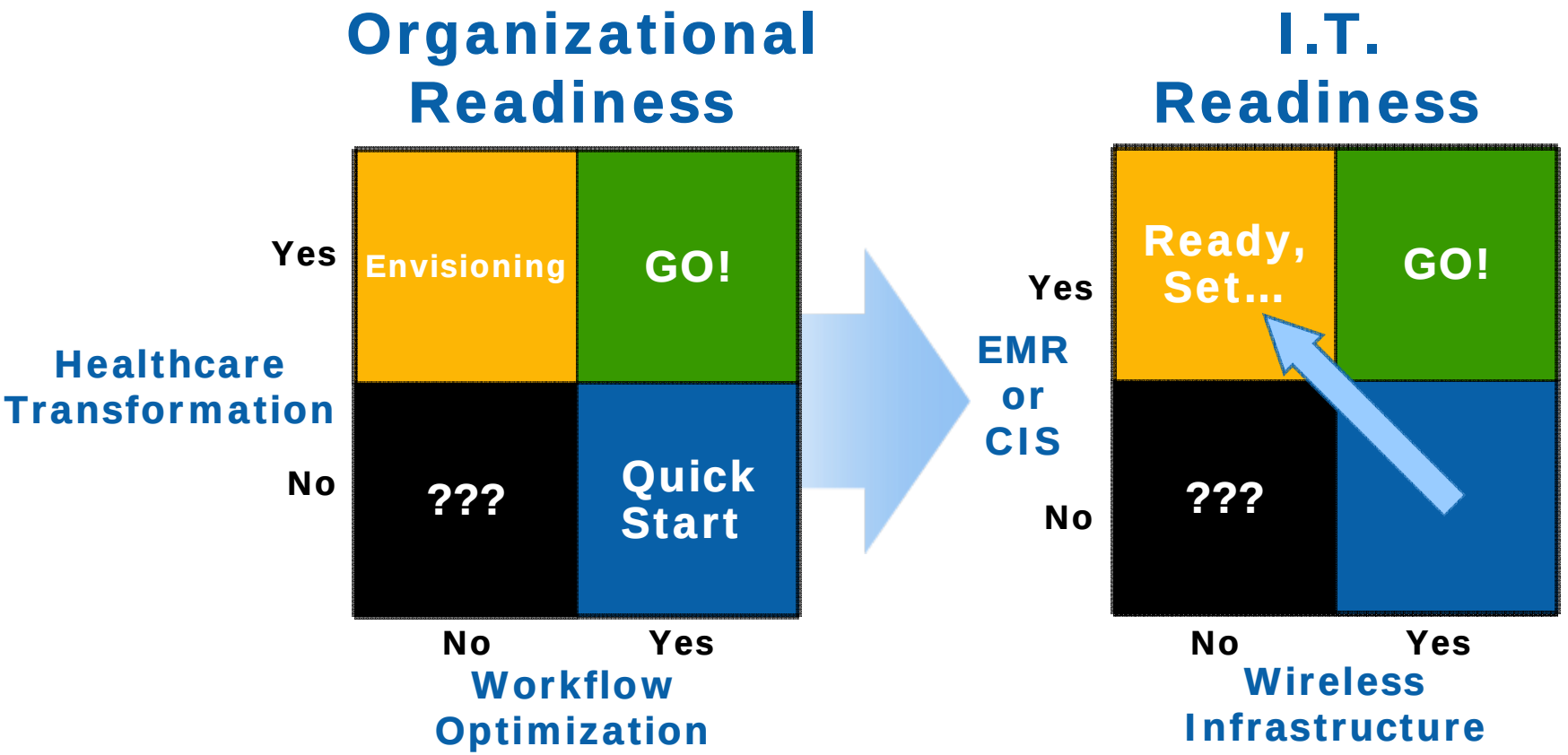
- Network Architecture
- Device Form Factor and Usability
- Security & Manageability
- Emerging Technology Trends (VoIP, RFID)

MPOC Deployment Requires System Integration

- Many major HIS vendors do not have fully integrated mobile access
- No single vendor can provide complete solution today
- Multiple products/vendors may be required
- There are a number of smaller ISV's that have viable solutions
- Each solution has pros/cons

Applications are the KEY

Are You Ready for Mobile Point of Care?



- **Computers are incredibly fast, accurate, and stupid.**
- **Human beings are incredibly slow, inaccurate, and brilliant.**
- **Together they are powerful beyond imagination.**

Albert Einstein

Thank You!