TransformativeMed

A JOURNEY TO API-DRIVEN HEALHCARE INNOVATION AT SCALE

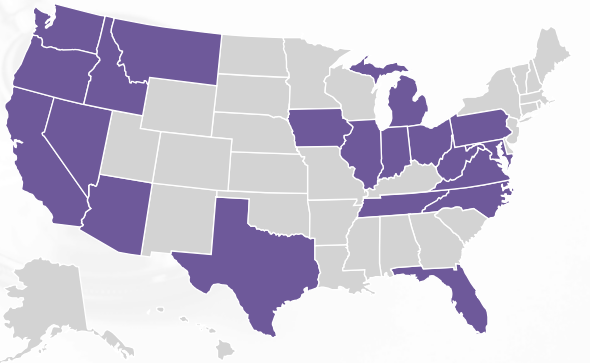
DAVID STONE
CTO & CO-FOUNDER
PRIOR UW APPLICATION ARCHITECT

ABOUT TRANSFORMATIVEMED
QUICK COMPANY OVERVIEW

Market-leading developer of **EHR-integrated apps** focused on acute care [inside the hospital]

- 2011 spin-out from the **University of Washington**
- Early solutions developed by **Dr. Erik Van Eaton** and others under an informatics fellowship while at UW Medicine
- Focused on **workflow optimization**, **clinical communication & collaboration** and **disease management** for both HER-embedded and mobile solutions
- All of our applications use **APIs** access to a robust set of EHR clinical and workflow data
- **120+ U.S. hospitals** use our apps
- **Zero HL7 2.3 interfaces built to date!!!**

Dignity Health
VCU Health
BAPTIST HEALTH
MedStar Health
Trinity Health
ASCENSION
Catholic Health Initiatives
Indiana University Health

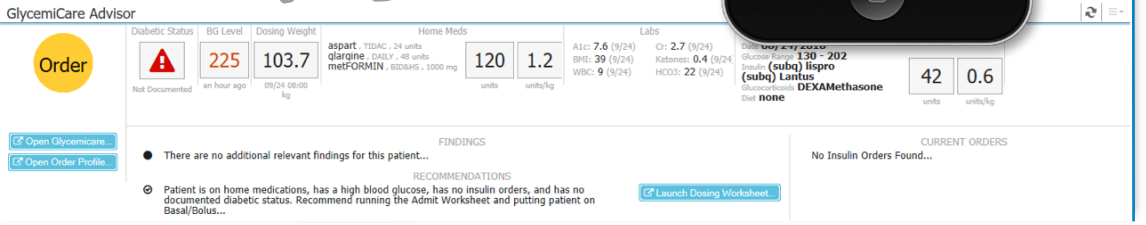


OUR SOLUTIONS & TECHNOLOGY

EHR-Embedded Tabs

EHR-Connected Mobile Apps

EHR Workflow Components



APPLICATIONS & SOLUTIONS

- Daily care rounds
- Enhanced documentation
- Shift handoff communication
- Secure messaging
- *Smart* real-time notifications
- Insulin CDS
- Anti-coagulation CDS

OUR TECHNOLOGY

- Designed for the API-first world
- **Cerner MPages™** & FHIR™-*ready*
- Seamless EHR security and context
- EHR-connected mobile
- EHR workflow components

THE API DATA WE ACCESS & UPDATE

READ

- Demographics
- Encounter details and history
- Prior visit history
- Laboratory results
- Nursing documentation and vitals
- Notes
- ALL other clinical results
- Intake & output documentation
- Medication administration records
- Active and historical orders
- Order set and plans
- Medication therapeutic classification
- Allergies
- Problems
- Diagnosis
- Custom/team patient lists
- Other random EHR workflow data...

WRITE

- Problems
- Diagnosis
- Simple orders
- Variety of results
- Notes
- Medication administration records

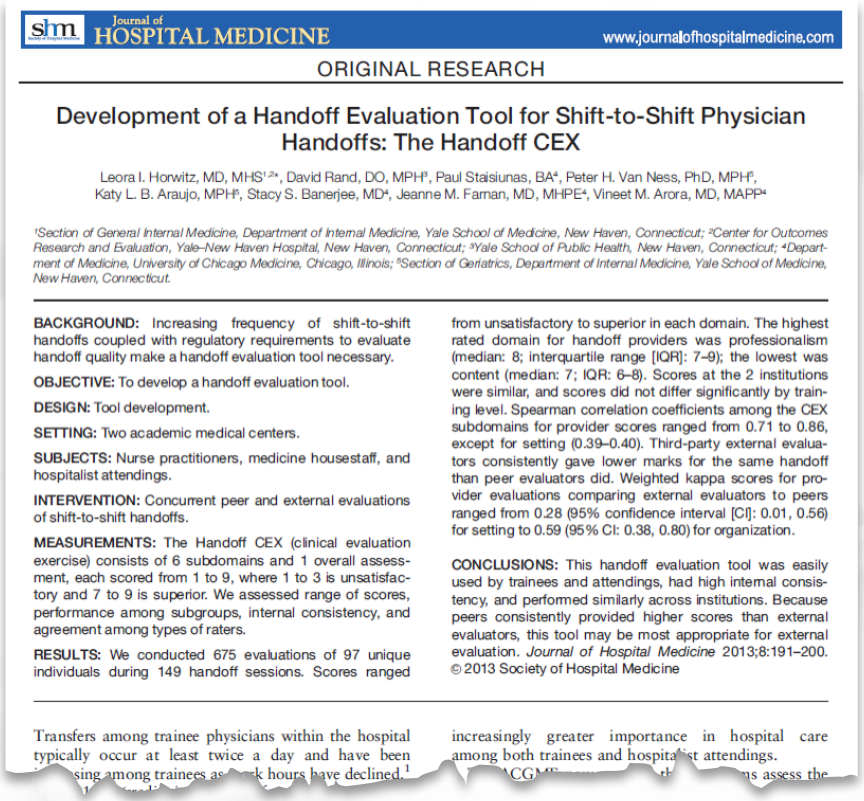
QUICK TOPICS AND DISCUSSION POINTS

1. Our journey from HL7 2.3 to an API-first, EHR-centric world
2. The impact on IT and user adoption
3. The path to commercialization with FHIR

IT ALL STARTED WITH AN APP CALLED...

CORES (COmputerized REsident Signout)

AND AGCME WORKHOUR RESTRICTIONS



shm Journal of HOSPITAL MEDICINE www.journalofhospitalmedicine.com

ORIGINAL RESEARCH

Development of a Handoff Evaluation Tool for Shift-to-Shift Physician Handoffs: The Handoff CEX

Leora I. Horwitz, MD, MHS[1,2*], David Rand, DO, MPH[3], Paul Staisiunas, BA[4], Peter H. Van Ness, PhD, MPH[5], Katy L. B. Araujo, MPH[5], Stacy S. Banerjee, MD[4], Jeanne M. Farnan, MD, MHPE[4], Vineet M. Arora, MD, MAPP[4]

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BACKGROUND: Increasing frequency of shift-to-shift handoffs coupled with regulatory requirements to evaluate handoff quality make a handoff evaluation tool necessary.

OBJECTIVE: To develop a handoff evaluation tool.

DESIGN: Tool development.

SETTING: Two academic medical centers.

SUBJECTS: Nurse practitioners, medicine housestaff, and hospitalist attendings.

INTERVENTION: Concurrent peer and external evaluations of shift-to-shift handoffs.

MEASUREMENTS: The Handoff CEX (clinical evaluation exercise) consists of 6 subdomains and 1 overall assessment, each scored from 1 to 9, where 1 to 3 is unsatisfactory and 7 to 9 is superior. We assessed range of scores, performance among subgroups, internal consistency, and agreement among types of raters.

RESULTS: We conducted 675 evaluations of 97 unique individuals during 149 handoff sessions. Scores ranged from unsatisfactory to superior in each domain. The highest rated domain for handoff providers was professionalism (median: 8; interquartile range [IQR]: 7–9); the lowest was content (median: 7; IQR: 6–8). Scores at the 2 institutions were similar, and scores did not differ significantly by training level. Spearman correlation coefficients among the CEX subdomains for provider scores ranged from 0.71 to 0.86, except for setting (0.39–0.40). Third-party external evaluators consistently gave lower marks for the same handoff than peer evaluators did. Weighted kappa scores for provider evaluations comparing external evaluators to peers ranged from 0.28 (95% confidence interval [CI]: 0.01, 0.56) for setting to 0.59 (95% CI: 0.38, 0.80) for organization.

CONCLUSIONS: This handoff evaluation tool was easily used by trainees and attendings, had high internal consistency, and performed similarly across institutions. Because peers consistently provided higher scores than external evaluators, this tool may be most appropriate for external evaluation. *Journal of Hospital Medicine* 2013;8:191–200.

Transfers among trainee physicians within the hospital typically occur at least twice a day and have been [illegible] among trainees as [illegible] hours have declined.[1] increasingly greater importance in hospital care among both trainees and hospitalist attendings. [illegible] assess the

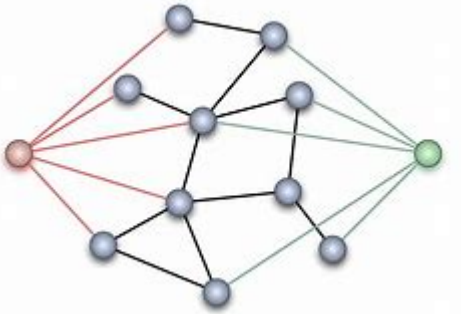
- Web-based app built by the Erik Van Eaton and others in 2003
- Went viral in 2004 across UW Medicine
- Integrated with Cerner using HL7 in 2005
- Saved thousands of hours and improved handoff safety
- Multiple controlled trial published
- Garnered academic interest beyond the UW Medicine

IT ALL STOPPED WITH…

HL7-INTERFACES

"There's this cools app we used at UW called CORES, we should look into getting it here. Our residents are really struggling and need help."

- Multiple physician groups at other health systems were petitioning IT to look into CORES and see what it would take
- One group even created a 10-minute professional video to pitch the solution to leadership
- The quick IT answer was… **"HL7 = NO go"**
- At one point, we offered to give it away to keep he research progressing, but IT still said NO!
- The cost of robust HL7 integration would have been significant and they had an existing backlog of prior requests that was always growing…
- **It just wasn't practical**



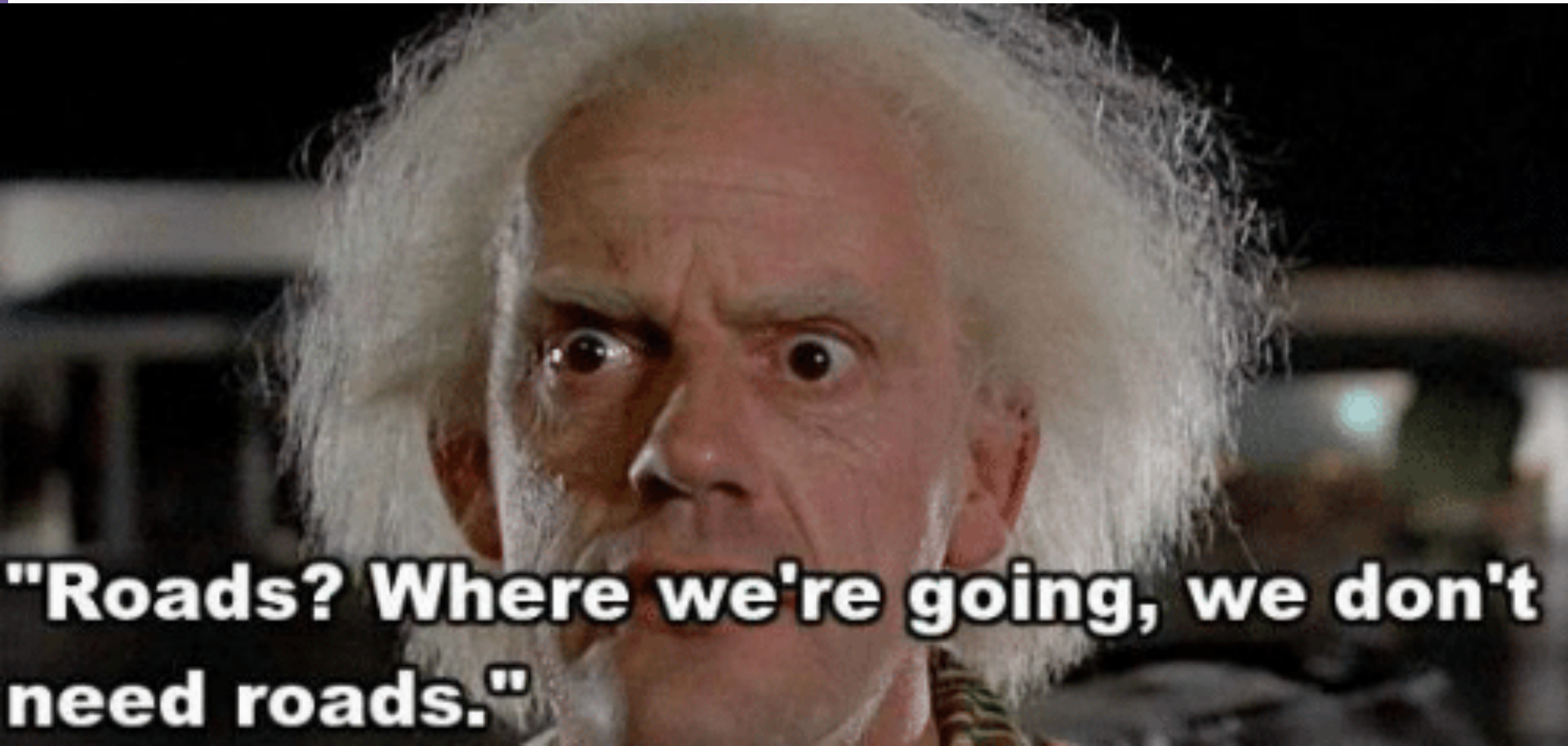
A FORTUITOUS

SOLUTION FOR APP INNOVATION

WITH THE MPAGES TOOLKIT

1. In 2006, UW Medicine and Stanford Children's **proposed embedding web apps into Cerner** along with EHR data access.
2. In 2007, **MPages was born**. It provided the ability to embed contextual, secure web apps into the EHR along with something fairly new: API-like on-demand access to the EHR data using AJAX.
3. By 2008, it was clearly going to be a run-away hit. It **unlocked creativity and innovation that had been sitting dormant for years**.
4. In 2009, we **ported the entire CORES application to MPages**, removing all HL7 interfaces
5. By 2010, a few hospitals were **licensing CORES directly from UW**'s Center for Commercialization
6. In 2011, **TransformativeMed was born** to help commercialize healthcare apps in an API-first world, EHR-centric world…
7. By 2012, we realized we were **WAY ahead of the market curve…** healthcare is slow to adopt technology change and innovation ☺
8. In 2013/4, Cerner had started to develop their first **SMART on FHIR proof of concept** that actually used MPages as the initial architectural underpinnings.

TODAY THE FUTURE IS
SMART ON FHIR



THE IMPACT OF APIs & EMBEDDING ON IT IMPLEMENTATIONS

BEFORE

- IT projects for 3rd party software were highly focused on data integration
- A backlog of HL7 interface requests kept most non-critical projects waiting for years
- HL7 was a barrier and often a reason to say "NO"
- Separate application UIs, repeat authentication and duplication of data entry drove users away from promising innovation
- Out of sight → out of mind

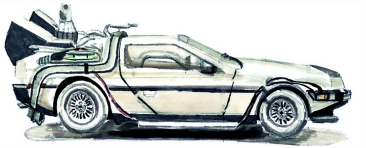
AFTER

- Focused on clinical workflow, impact and benefit. We spend almost no effort engaging with IT technology teams
- MPages requires some basic data mapping, but FHIR will help to improve this with it's semantic approach
- With MPages, integration is no longer addressed as a barrier… this same world view will spread to FHIR
- **Seamless integration drives user adoption and delivers value**

"We prefer MPage applications over other approaches. They align with our strategy of investing in the EHR where our users are already working"

- Christiana Care IT Director

MOVING TO
SMART ON FHIR
A COMMERCIAL PROSPECTIVE



WHY WE PLAN TO MOVE TO FHIR

EHR agnostics, semantic data and standards based. Opening access to new markets such as Epic, Allscripts and Meditech.

WHEN ARE WE MOVING?

We think the time is right to start exploring this transition with hospital partners that have expressed interest. TransformativeMed is unique in that we are already a robust user of API data. Today this is a story about APIs and EHR-embedding. Tomorrow the story will be about SMART on FHIR.

WHY WE HAVEN'T MOVED YET?

Technology maturity, readiness, robustness and awareness

IMPORTANT CONSIDERATIONS...

- Performance and scalability
- App-store economics (fees)
- Versus app-store benefits (sales channel???)
- EHR-vendor control vs. openness
- Market maturity, awareness and timing...