The Digital Doctor
Hope, Hype, and Harm at the Dawn of Medicine’s Computer Age

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The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age
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“The Challenge That Will Dominate Your Career...”
IT Adoption Skyrocketing:
Now >70% in MD Offices & Hospitals

EHR Adoption in US Hospitals. Ashish Jha 2015
The Context:
Two Transformational Trends

Pressure to deliver high-value care

The digitization of the U.S. healthcare system
Richard Baron on the Trauma of Computerizing His Philadelphia Office Practice

“The staff came to work one day and nobody knew how to do their job.”
“We have the capacity to transform health with one thunderous click of a mouse after another.”

US Secretary of Health & Human Services Michael Leavitt, in 2005

“ER physicians spent 44 percent of their time entering data into EMRs, clicking up to 4,000 times during a 10 hour shift.”

Becker’s Health IT magazine, 2013
Arizona General Hospital will be coming to The Grand Canyon State later this year!! Located in Laveen, Arizona, a suburb of Phoenix, Arizona General Hospital is a 40,000 square-foot boutique general hospital.

Services offered include:

• Emergency Room
• Radiology Suite inc. CT, X-Ray, and Fluoroscopy
• Two State-Of-The-Art Operating Rooms
• Outpatient Surgery
• 16 Inpatient Rooms
• NO EMR
We’ve Been Waiting Patiently for Health IT, But…

- Digital radiology: the canary in the coal mine
- The iPatient and scribes
- IT and the birth of new kinds of medical errors
- Some final thoughts on IT and the humanity of healthcare
The Demise of Radiology Rounds

“The man who ruined radiology”
– Paul Chang’s dad
Digital Radiology as the Canary in the Coal Mine

- The digitization of the thing creates the opportunity for infinite distribution (at no cost)
- Social relationships and communication patterns that previously depended on gathering around the thing will wither
- Power relationships mediated by who controls the thing will be renegotiated
- What happens when the thing isn’t the film, it’s the medical record…
“The patient is still at the center, but more as an icon for another entity clothed in binary garments: the ‘iPatient.’… The iPatient’s blood counts and emanations are tracked and trended like a Dow Jones Index, and pop-up flags remind caregivers to feed or bleed. iPatients are ‘card-flipped’ in the bunker, while the real patients keep the beds warm and ensure that the folders bearing their names stay alive on the computer.”

Abraham Verghese, *NEJM* 2008
DALLAS — Amid the controlled chaos that defines an average afternoon in an urban emergency department, Dr. Marian Bednar, an emergency room physician at Texas Health Presbyterian Hospital Dallas, entered the exam room of an older woman who had fallen while walking her dog. Like any doctor, she asked questions, conducted an exam and gave a diagnosis — in this case, a fractured hand — while also doing something many physicians in today’s computerized world are no longer free to do: She gave the patient her full attention.

Standing a few feet away, tapping quickly and quietly at a laptop computer cradled in the crook of her elbow, Dr. Bednar typed away, entering information into an electronic medical record that was accessible to the attending nurse practitioner. The doctor had a single task: type.

The combination of high patient volumes and a complex array of medical specialties means that many emergency rooms are crowded. But the presence of Dr. Bednar and others like her has made a difference.

“Faced with the challenge of millions of new patients, healthcare providers have embraced technology and the supporting software to improve their performance,” said Rich Fischer, regional vice president of sales for Eclipsys, a company that supplies the electronic medical record system that Dr. Bednar was using.

At Texas Health Presbyterian, the number of patients seen in its emergency department last year was more than 184,000. The emergency room is one of the busiest in the nation. Among the volume: 25,100 visits by trauma patients, more than 30,000 visits for the elderly, 25,000 visits for patients with cancer and 15,000 visits for patients with chest pain or heart attacks.

“Imagine if we could have a system where we could do 100 percent of our charting on a computer,” said Dr. Bednar, who has spent more than a decade working in emergency medicine.

The system, a collaboration between Texas Health Presbyterian and Eclipsys, is part of a national trend toward computerization of medical records in emergency rooms. It was designed to allow doctors to spend less time on paperwork and more time with patients. It allows information to be documented immediately and shared with other providers.

In the exam room, Dr. Bednar returned to the computer to type in a final diagnosis — a fractured hand, broken in more than one place — and handed the patient a prescription for painkillers.

“Now I’m done,” she said, smiling. She was texting on her phone. The next patient was waiting in the hall. "I’m going to have to go back to the computer now," she said, and returned to the patient. "Back to work!"

Mark Graham for The New York Times

Dr. Marian Bednar, an emergency room physician in Dallas, left, with Amanda Nieto, 27, her scribe and constant shadow.
The Case

- A 16-year-old boy, weighing 38.6 kg, with a chronic immunodeficiency, was admitted for colonoscopy as part of a workup for GI bleeding.

- The patient was on multiple home medications, including trimethoprim-sulfamethoxazole (Septra ds) 160 mg tablet twice daily for prophylaxis.

- The medical center recently installed a state of the art electronic health record/CPOE system.
The Order and the Aftermath

- At 1:09 pm, the admission orders were written, including an order to administer 38.5 Septra ds tablets.
- 9 hours later, he took this dose.
- 14 hours later, the patient had a grand mal seizure; a Code Blue was called.
- A week later, he left the ICU.
- Thankfully, he’s doing well today.
How Could This Happen?

Can't you do anything right?
The Resident’s Intended Order

One double-strength Septra bid
Ordering One Septra ds With CPOE

sulfamethoxazole-trimethoprim (BACTRIM DS, SEPTRA DS) 800-160 mg tablet 160 mg of trimethoprim

5 mg/kg of trimethoprim × 38.6 kg = 160 mg of trimethoprim = 4.15 mg/kg of trimethoprim, Oral, Every 12 Hours Scheduled, Finite

<table>
<thead>
<tr>
<th>Reference Links:</th>
<th>1. Lexi-Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose:</td>
<td>5 mg/kg of trimethoprim</td>
</tr>
<tr>
<td>Weight Type:</td>
<td>Actual</td>
</tr>
<tr>
<td>Weight:</td>
<td>38.6 kg</td>
</tr>
<tr>
<td>Actual weight:</td>
<td>38.6 kg (recorded 11 hours ago)</td>
</tr>
</tbody>
</table>

⚠️ 160 mg of trimethoprim is the nearest dose that can be administered using available products (a decrease of 17% from the prescription dose).

Administer Dose: 160 mg of trimethoprim

5 mg/kg of trimethoprim × 38.6 kg (Weight as of Tue Sep 10, 2019) = 193 mg of trimethoprim × 1 tablet/160 mg of trimethoprim = 1 tablet × 160 mg of trimethoprim/tablet (rounded to the nearest 0.5 tablet) = 160 mg of trimethoprim = 4.15 mg/kg of trimethoprim

Administer Amount: 1 tablet

(rounded to the nearest 0.5 tablet from 1.2063 tablet)

< 40 kg: Must use weight-based dosing
By policy, doses rounded > 5% must be confirmed/signed by ordering MD.
Resident Returns to CPOE Screen and Enters “160”

*sulfamethoxazole-trimethoprim (BACTRIM DS, SEPTRA DS) 800-160 mg tablet 6,160 mg of trimethoprim*

160 mg/kg of trimethoprim \times 38.6 \text{ kg} = 6,160 \text{ mg of trimethoprim} = 160 \text{ mg/kg of trimethoprim, Oral, Every 12 Hours for PNEUMONIA}

1. Lexi-Comp

<table>
<thead>
<tr>
<th>160</th>
<th>mg/kg of trimethoprim</th>
<th>2.5 mg/kg of trimethoprim</th>
<th>5 mg/kg of trimethoprim</th>
</tr>
</thead>
</table>

Weight Type: Actual, Dosing, Order-Specific

Weight: 38.6 kg

Actual weight: 38.6 kg (recorded 12 hours ago)

Administer Dose: 6,160 mg of trimethoprim

\begin{align*}
160 \text{ mg/kg of trimethoprim} \times 38.6 \text{ kg (Weight as of Tue Sep 10, 2013 0900)} &= 6,176 \text{ mg of trimethoprim} \times 1 \text{ tablet}/160 \text{ mg of trimethoprim} \\
&= 38.5 \text{ tablet} \times 160 \text{ mg of trimethoprim/tablet (rounded to the nearest 0.5 tablet)} \\
&= 6,160 \text{ mg of trimethoprim} \\
&= 160 \text{ mg/kg of trimethoprim}
\end{align*}

Administer Amount: 38.5 tablet

(rounded to the nearest 0.5 tablet from 38.6 tablet)

Notice a problem?
"My resident told me to ignore all the alerts."
Alert Fatigue: A Clear and Present Danger

- One month in UCSF ICUs (70 beds)
  - 2,558,760 alerts
  - One audible alert every 7 minutes
  - What would get a nurse scared?

vs. Boeing’s thoughtful approach to alerts
  - The principles of user-centered design

Drew B. *Plos One* 2014
Order Goes Back to Pharmacy

- Remote pharmacy: Cramped, multitasking, staffing tight
  - Pharmacists simultaneously answering phones, receiving visitors, and manning computers
- Pharmacist receives signed order from MD
- She approves the order, then gets similar alert to residents
- For much the same reason, she overrides it
The Patient’s Nurse

- First year nurse, who was “floating”– unfamiliar with this ward or its types of patients
- Thought this seemed like unusually large dose
- Considers asking charge nurse
  - But she’s busy giving chemo to other patient
- Counts on bar-code medication administration system (BCMA) to confirm that order is right
What Are The Lessons From This Case?
The “Swiss Cheese Model” of Major Accidents & Errors

- Overreliance on the Machines
- Alert Fatigue
- Need for User-Centered Design
- CPOE policies demand extra steps; No hard stops

An Overdose of Septra

Stressed workforce, difficult working conditions, production pressure

No “Stop the Line” culture

James Reason, Human Error
Health IT: The Mother of all Adaptive Problems

“... problems that require people themselves to change. In adaptive problems, the people are the problem and the people are the solution. And leadership then is about mobilizing and engaging the people with the problem rather than trying to anesthetize them so that you can just go off and solve it on your own.”

– Ronald Heifetz, Kennedy School of Government
What Do We Need to Do?

- Promote user-centered design
- Address alert fatigue
- Create local processes/programs to improve care in digital era (notes, communication, etc.)
- At federal level, find appropriate role for government (the Internet analogy)
When Things Will Really Get Interesting
One Final Thought About Health IT and Medical Practice