Best Practices on Reducing Errors During Downtime

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No Conflict of Interest

I have no real or apparent conflicts of interest to report.
Agenda

• Downtime: The Hidden Problem
• Best Practices
  – Available Guidance
  – The Reality
• How do we get Best Practices implemented?
Learning Objectives

• Identify risks and potential errors that can occur during EHR/HIT downtime

• Discuss and develop solutions and best practices for the potential errors in a confidential setting

• Discover how to work with HIT developers and providers to develop solutions
Question #1
What is your longest EMR downtime in the past five years?

• Under 6 hours
• 6 to 12 hours
• 12+ to 24 hours
• Over 24 hours
Question #2

When do you stop reentering ALL data after a downtime?

• Downtime crosses a shift
• Downtime lasts over 4 hours
• All data is re-entered
• We don’t re-enter any data
Question #3

How often do you have downtime drills?

• All staff drill quarterly
• All staff drill annually
• Some staff don’t get drills
• We don’t do downtime drills
Question #4

How sure are you that patients are safe in unplanned downtimes?

• Yes we keep patients safe
• Maybe we keep patients safe
• Maybe we may cause harm
• No, likely we may cause harm
How often downtime gets publicly reported
The Tip of the Iceberg...

7/2012 - Dozens of hospitals lose access to EMRs for 5 hours during a major service outage

8/2013 - 24-hospital system EMR inaccessible for a day due to network problem. Even the backup went down... "families became concerned because they noticed patients were not getting their medications..."
The Tip of the Iceberg...

2/2015 – California hospital EMR went down after HVAC unit burned out… One patient had a positive test result delayed for two weeks and additional cardiac intervention efforts were delayed.

3/2015 - California hospital EMR went dark for a week; clinicians unable to access medical records and had to postpone serious medical treatments.
It’s No Longer Just Software or Equipment Failures...

FOX 11 - A large hospital in Hollywood has enlisted the FBI and the LAPD in its fight against a cyber attack. Hollywood Presbyterian Medical Center says they're in the midst of an "internal emergency."

The attack began last Friday. Hospital workers say the computers have been shut down after the hackers locked patient files in exchange for a ransom.
Uptime Percentages Can Provide False Security

<table>
<thead>
<tr>
<th>Uptime %</th>
<th>Downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>~3 days, 15 hours</td>
</tr>
<tr>
<td>99.9</td>
<td>~8 hours, 46 minutes</td>
</tr>
<tr>
<td>99.99</td>
<td>~53 minutes</td>
</tr>
<tr>
<td>99.999</td>
<td>~5 minutes</td>
</tr>
</tbody>
</table>
Downtime Is Expected in Hospitals?

“Occasional temporary unavailability of EHRs is inevitable... Such unavailability can introduce substantial safety risks to organizations that have not adequately prepared.”

Adapted from the SAFER Guides
Recent (2014) Survey Results

“70% [of 50 institutions] had at least one unplanned downtime greater than 8 hours in the last 3 years. Three institutions reported that one or more patients were injured as a result of either a planned or unplanned downtime.”
Downtime is a Complex Problem

• Downtimes require:
  – Awareness that systems are down
    • Sometimes can be delayed as information is gathered
  – A response to find the solution and implement a fix
    • Sometimes red herrings prevent rapid fixes
  – Data recovery
    • Can be incomplete or poorly coordinated
    • May require restoring from backups, which can be corrupted or missing
Downtime is a Complex Problem

• Downtimes require:
  – Awareness that systems are down (sometimes delayed)
  – Response to find the solution (sometimes red herrings)
  – Data recovery (sometimes incomplete/poorly coordinated)

• Downtimes can be simple or multidimensional:
  – Partial EMR failure
  – Full EMR failure
  – Complete network failure (loss of a data center)
  – Complete communications failure
A Few Downtime Clinical Impacts

• Documented potential hazards include:
  – an increased risk of medication errors
  – unavailability of images
  – canceled procedures

• Other hazards not well documented:
  – Duplicate/delayed tests
  – Diagnosis delay/misdiagnosis
  – Morbidity/mortality?
Downtime Is Not A Common Focus of Quality/Safety Discussions

- **Impact of Electronic Health Record Systems on Information Integrity: Quality and Safety Implications** Perspect Health Inf Manag. 2013: 1c.
  - Downtime mentioned once and not discussed

- **Sentinel Event March 2015 Safe use of health information technology** Joint Commission
  - “Create, make available and regularly review health IT downtime and reactivation policies”
  - “Before going live and as appropriate after implementation, conduct extensive testing, including downtime drills…”
  - “Metrics can include help desk use, system uptime and downtime…”
Who Is Providing Downtime Guidance?

• National Institutes of Standards and Technology (NIST) Data Integrity Draft Guideline – 12/2015

• SAFER Guides – January 2014
  – https://www.healthit.gov/safer/safer-guides

• AHIMA – “Plan B: A Practical Approach to Downtime Planning in Medical Practices”
National Institutes of Standards and Technology
Draft Guideline – December 2015

DATA INTEGRITY

Reducing the impact of an attack

Michael J. Stone
Donald Tobin
National Cybersecurity Center of Excellence
National Institute of Standards and Technology
NIST Covers Protecting Backup Data from Destruction and More

Lots of good references
Comments currently being evaluated
SAFER Guides

Safety Assurance Factors for EHR Resilience

Recommended Practices for Phase 1 — Safe Health IT

1. Hardware that runs applications critical to the organization’s operation is duplicated.
   - Worksheet 1
   - Implementation Status: Fully in all areas

2. An electric generator and sufficient fuel are available to support the EHR during an extended power outage.
   - Worksheet 2
   - Implementation Status: Partially in some areas

3. Paper forms are available to replace key EHR functions during downtimes.
   - Worksheet 3
   - Implementation Status: Not implemented

4. Patient data and software application configurations critical to the organization’s operations are backed up.
   - Worksheet 4
   - Implementation Status: Not implemented

5. Policies and procedures are in place to ensure accurate patient identification when preparing for, during, and after downtimes.
   - Worksheet 5
   - Implementation Status: Not implemented
SAFER Guides Provide Good Directions

1. Hardware that runs applications critical to the organization’s operation is duplicated.

2. An electric generator and sufficient fuel are available to support the EHR during an extended power outage.

3. Paper forms are available to replace key EHR functions during downtimes.

4. Patient data and software application configurations critical to the organization’s operations are backed up.

5. Policies and procedures are in place to ensure accurate patient identification when preparing for, during, and after downtimes.
Examples of More Detailed Guidance in the SAFER Guides

“Policies and procedures are in place to ensure accurate patient identification when preparing for, during, and after downtimes”

- **Examples of Potentially Useful Practices/Scenarios**
  - The read-only EHR system should have user-specific passwords (i.e., should not employ a shared password for all users).
  - There is a mechanism in place to register new patients during downtime, including assignment of unique temporary patient record numbers along with a process for reconciling these new patient IDs once the EHR comes back online.
  - Ensure that paper documents created during downtime are protected using standard HIPAA safeguards and policies.
SAFER Guides Provide Good Directions

6. Staff are trained and tested on downtime and recovery procedures.

7. A communication strategy that does not rely on the computing infrastructure exists for downtime and recovery periods.

8. Written policies and procedures on EHR downtimes and recovery processes ensure continuity of operations with regard to safe patient care and critical business operations.

9. The user interface of the locally maintained backup, read-only EHR system is clearly differentiated from the live/production EHR system.
SAFER Guides Provide Good Directions

1. There is a comprehensive testing and monitoring strategy in place to prevent and manage EHR downtime events.

2. Data and application configurations are backed up and hardware systems are redundant.

2. EHR downtime and reactivation policies and procedures are complete, available, and reviewed regularly.
Despite Common EMRs, Each Organization Develops Their Own Policies, Procedures and Tools ...

**Unplanned Downtime Checklist/Worksheet**

<table>
<thead>
<tr>
<th>Charge Nurse Role</th>
<th>Checked/ Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announce downtime to staff. Instruct staff to listen for overhead pages or view information on Pulse banner bar.</td>
<td></td>
</tr>
<tr>
<td>Review Downtime Procedures with unit secretaries and other staff</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit Secretary Role</th>
<th>Checked/ Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull Out Stat and Routine Lab Requisitions from downtime box - make readily available for nursing to <strong>send with ALL labs</strong> during downtime.</td>
<td></td>
</tr>
</tbody>
</table>

Make available downtime paper documentation:
- All Patients - **Nursing Assessment Record (14-page)**
- Admissions - Nursing Admission Record, Patient & Family Teaching Record, Pressure Ulcer on Admission, Pneumococcal and Influenza Vaccine Protocol
- Have ready as needed - Patient & Family Teaching, Alcohol Withdrawal, Restraint/Non-Behavioral Flowsheet, OR/Procedure Checklist, Universal Protocol Checklist, Discharge/Medication Summary, Stabilizer forms, other unit specific forms.

**Downtime Reports Folder Printing:**

[Image of Downtime Reports folder]
...So Processes Vary Significantly...

### Table 2 – Overview of point-of-care components during downtimes (positive responses calculated based on the percent of Scottsdale Institute members responding positively to each survey item).

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Item</th>
<th>Positive response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware/software</td>
<td>Practices related to downtime, read-only EHR</td>
<td>77%</td>
</tr>
<tr>
<td>Workflow</td>
<td>Have a network-accessible, hospital-wide read-only back-up</td>
<td>85%</td>
</tr>
<tr>
<td>Workflow</td>
<td>Backup data updated at least every hour</td>
<td>33%</td>
</tr>
<tr>
<td>User interface</td>
<td>Test central read-only back-up system at least monthly</td>
<td>62%</td>
</tr>
<tr>
<td>User interface</td>
<td>Downtime, read-only version of EHRs is clearly marked</td>
<td>45%</td>
</tr>
<tr>
<td>Hardware/software</td>
<td>Downtime, read-only EHRs disabled during normal operation</td>
<td>75%</td>
</tr>
<tr>
<td>Workflow</td>
<td>Have a local, clinic-level read-only back-up system</td>
<td>90%</td>
</tr>
<tr>
<td>Internal policy/procedure</td>
<td>Update data in clinic-level read-only back-up system at least hourly</td>
<td>50%</td>
</tr>
<tr>
<td>External rules and regulations</td>
<td>Read only clinic-level back-up system generic password protected</td>
<td>52%</td>
</tr>
</tbody>
</table>
...and Data Recovery Processes Vary

• Typically no SWAT team for data recovery, so it becomes “something else you have to do” among patient care activities

• There is a lack of recognition that scanned paper documents rarely get viewed, often because later users don’t recognize that there was a downtime
  – E.g., medications may be all entered, partially entered or not entered at all depending on the organization’s policy

• Key information can be missed as a result
EMR Tools to Show Downtime Periods are Highly Variable

<table>
<thead>
<tr>
<th>Medications</th>
<th>10/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>(NorFom)</td>
<td></td>
</tr>
<tr>
<td>Comipigan (brimonidine/timolol) eye drops 1 drop, eye left</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 12:00 pending Down Time 16:00 pending 09:00 pending</td>
</tr>
<tr>
<td>albuterol/epitropium nebulizer 2.5/0.5 mg inhalation every 4 hours</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending Down Time 16:00 pending 09:00 pending</td>
</tr>
<tr>
<td>albuterol/epitropium nebulizer 3 mg inhalation every 4 hours</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending Down Time 16:00 pending 09:00 pending</td>
</tr>
<tr>
<td>allopurinol 300 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>amiodipine 2.5 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>budesonide-formoterol inhaler 80/4.5mcg</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>2 puff(s) inhalation 2 times daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>cyclopentolate eye drops 1%. 1 drop(s) eye right every 24 hours</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>escitalopram 20 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>ferrous sulfate SA 160 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 21:00 pending</td>
</tr>
<tr>
<td>furosemide 40 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>hydrocortone-acetaminophen 5--325 mg 1 tablet(s) by mouth every 4 hours PRN</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>lorazepam 20 mg by mouth 1 time daily</td>
<td>Down Time 01:00 --&gt; 09:00 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>morphine 1 mg 2 mg IV Push every 4 hours PRN</td>
<td>Down Time 01:00 --&gt; 13:35 pending Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
<tr>
<td>morphine 1 mg 4 mg IV Push once</td>
<td>Down Time 01:00 --&gt; Down Time 04:00 pending Down Time 09:00 pending Down Time 12:00 pending 09:00 pending</td>
</tr>
</tbody>
</table>

*** An EHR downtime occurred from 10/16/2010 @ 01:00 AM until 10/16/2010 @ 02:30 PM. All medication orders and administration events that occurred during this period will be found in the paper chart on downtime paper MAR documents.***
“WE CANNOT SOLVE OUR PROBLEMS WITH THE SAME THINKING WE USED WHEN WE CREATED THEM”
How Can We Make Things Better?
Should PSOs...

• Receive all downtime information for learning without risk of negative publicity or reprisals?
• Assess reported data to develop detailed best practices?
• Share these best practices nationally as standards that could be required by professional societies/accrediting bodies?
• Work with vendors to incorporate better downtime tools?
• Strive to eliminate downtime as culturally acceptable?
Hypothesis:
We Need To Look At Downtime Like Airlines Look at Engine Failures
How Often Does This Happen?
27 Times Since 1953 ??

**List of airline flights that required gliding**

From Wikipedia, the free encyclopedia

This is a list of commercial airline flights that were forced to glide in mid-flight.

<table>
<thead>
<tr>
<th>Date</th>
<th>Flight</th>
<th>Aircraft</th>
<th>Location</th>
<th>Cause</th>
<th>Result</th>
<th>Total fatalities</th>
<th>Total passengers and crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 February 1963</td>
<td>Miami Airline (irregular air carrier)</td>
<td>Douglas DC-3</td>
<td>East of Seattle, Washington</td>
<td>While on approach to Boeing Field, first the left engine failed and was feathered. A few minutes later, the right engine failed. Investigation showed that both engines suffered bearing failures caused by negligent maintenance.</td>
<td>While gliding, the aircraft was unable to clear a mountain at 3,500 feet (1,066 m) MSL. It crashed into trees and broke up.</td>
<td>7</td>
<td>25</td>
</tr>
<tr>
<td>24 February 1962</td>
<td>Tarom Ilyushin 18</td>
<td>Ilyushin Il-18</td>
<td>Paphos, Cyprus</td>
<td>Fuel filters icing (probable)</td>
<td>En route at 7,000 m (23,000 ft) over the Mediterranean Sea while 70 km (44 mi) from the Cyprus' shore, engine no. 3 lost power, followed by engines no. 1 and 2. Then, at 3,100 m (10,200 ft), 46 km (29 mi) offshore, engine no. 4 also lost power. Belly landing near Paphos, Cyprus after a 45 km (28 mi) glide.</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
Thanks and Discussion Time