What medicine can teach us about being on-call

Daniel Turner
Medicine is relevant to SRE / DevOps / ProdEng

- **Structure**
  - Teams with specialized knowledge
  - All working to support a bigger picture

- **Service Level Objectives**
  - Serious consequences for violations

“Frankly, I don’t see the resemblance.”
Medicine Evolves

- Medicine has been around longer than you or your company
Medicine Evolves

- Medicine has been around longer than you or your company
- Medicine constantly experimenting and validating changes
  - Quality Improvement Projects
  - Books
  - Research topics include: call schedules, time to treatment, ...
Outline

- Why is medicine relevant to production engineering / SRE / Dev-Ops?
- Reducing incidents
- Dealing with being oncall
- Words of warning
About me

- No medical background
  - Shopify is an e-commerce company
- I do have PhD
My Inspiration

- I’m married to a doctor
  - General surgery intern
  - 1st year or post-medical school training
  - Intern year == pgy-1 == residency
- She also carries a pager
- I’ve got a great second hand view
Reducing Incidents
Reducing critical incidents

- Stop them before they become critical
- Rapid Response Team
  - Decreased ICU deaths by 12%
- Anyone can page the rapid response team
  - Have criteria for when you should page as well
  - There are no negative repercussions
Dashboards with instructions

- **Server Resp. Time**: The average server response time. This should be around 200ms, but around deploys, this can peak up to 250ms. Make sure it goes back to the green zone after deploying.

- **Signups**: The number of people who successfully signed up and completed the initial account setup in the last 5 minutes.

- **Error responses**: The number of error responses returned by our servers, in the last 5 minutes. This should be as low as possible, and not exceed 1000. Use this Splunk query to find any obvious patterns.

- **JS Exceptions**: The number of JavaScript exceptions reported to Bugsnap in the last 10 minutes. This should be as low as possible, and not exceed 200.

- **Exceptions**: The number of exceptions reported to Bugsnap, in the last 5 minutes. This should be as low as possible, and not exceed 1000.
Reducing self-inflicted incidents

- Right command, wrong server?
- Easy to forget steps in routine activity
- Makes all-or-none processes error prone
Central Line

- All of the materials you *might* need
- Has a checklist
Checklists

- Not an instruction manual

<table>
<thead>
<tr>
<th>Before the Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand washed by operator and assistant?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>2% Chlorhexidine Gluconate / 70% isopropyl alcohol formulation (chloraprep 2% with tint) applied to procedure site and allowed to dry?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Is all equipment available? (including ultrasound if applicable)</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Use a large drape to cover the patient in a sterile manner</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>Any Known Drug Allergies?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>
Checklists

● Not an instruction manual
● 5 step dropped infection rate from 11% to 0%
  ○ Prevented 8 deaths over 16 months in 1 hospital
  ○ Nurses, not doctors, enforce the checklist
● Medicine can’t automate problems away

BEFORE THE PROCEDURE

- Hand washed by operator and assisant? Yes
- 2% Chlorhexidine Gluconate / 70% isopropyl alcohol formulation (chloraprep 2% with tint) applied to procedure site and allowed to dry? Yes
- Is all equipment available? (including ultrasound if applicable) Yes
- Use a large drape to cover the patient in a sterile manner Yes
- Any Known Drug Allergies? Yes
Server Maintenance Checklist

- I am holding the relevant pagers
- I know how to abort
- I’m logged into the correct host
- Host isn’t serving requests
- Success confirmed
- Unexpected events documented
Prepare for uncommon cases

- Vial of lidocaine is ~$10
- Kit ~$130
- 72% had placement while unconscious
Prepare for uncommon cases

- Vial of lidocaine is ~$10
- Kit ~$130
- 72% had placement while unconscious
- You’d never run out of soap…
- Correctness vs. Efficiency
  - Backups
  - Replication factor
  - Error Budgets
## Oncall hand-offs

<table>
<thead>
<tr>
<th>I</th>
<th>Illness Severity</th>
<th>Stable, “watcher,” unstable</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Patient Summary</td>
<td>Summary statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Events leading up to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>admission</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hospital course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ongoing assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plan</td>
</tr>
<tr>
<td>A</td>
<td>Action List</td>
<td>To do list</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time line and ownership</td>
</tr>
<tr>
<td>S</td>
<td>Situation</td>
<td>Know what’s going on</td>
</tr>
<tr>
<td></td>
<td>Awareness and</td>
<td>Plan for what might happen</td>
</tr>
<tr>
<td></td>
<td>Contingency Planning</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Synthesis by</td>
<td>Receiver summarizes what</td>
</tr>
<tr>
<td></td>
<td>Receiver</td>
<td>was heard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asks questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restates key action/to do</td>
</tr>
<tr>
<td></td>
<td></td>
<td>items</td>
</tr>
</tbody>
</table>
Oncall hand-offs

- Prevent unexpected events that were anticipatable
- I-PASS
  - Helped in 66% sites
- Problem classes:
  - Simple, complex, and complicated
  - Checklists won't help you with complicated

<table>
<thead>
<tr>
<th>I</th>
<th>Illness Severity</th>
<th>Stable, “watcher,” unstable</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Patient Summary</td>
<td>Summary statement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Events leading up to admission</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hospital course</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ongoing assessment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plan</td>
</tr>
<tr>
<td>A</td>
<td>Action List</td>
<td>To do list</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time line and ownership</td>
</tr>
<tr>
<td>S</td>
<td>Situation Awareness and Contingency Planning</td>
<td>Know what's going on</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plan for what might happen</td>
</tr>
<tr>
<td>S</td>
<td>Synthesis by Receiver</td>
<td>Receiver summarizes what was heard</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asks questions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Restates key action/to do items</td>
</tr>
</tbody>
</table>
For each active or likely to reoccur issue:

- Severity
- Summary
  - What’s been done
- Action List
  - What’s in progress
  - What needs to be done
- Contingency planning
  - What to do if it comes back
- Active Listening
  - Receiver summarizes information above

Oncall hand-offs
Dealing with being oncall
So you got paged

- Doctors are individually responsible for a patient
  - Ever wonder why you have to repeat your history or issue every time?
  - The other person said “x” isn’t an excuse
  - Catches mistakes or misinterpretations
  - Also a trip-wire

- Trust but verify
  - Ask to the data not just the conclusion
Getting help

- Escalation chain
  - Nurse -> intern -> sr. resident -> Attending physician -> department chair -> Chief medical officer
  - What would it take for you to page a C level position in the middle of the night?
Work-life balance

- Post call days
  - Acknowledge that after being oncall rest is needed
  - Depends on pager load

- Cross-coverage
  - Requires the ability to escalate, can prevent pages in the middle of the night

- Sometimes the easy solution or even stalling till the rest of the team wakes up
  - Can you temporarily through resources at a problem?
  - Nothing to be ashamed of
Words of Warning
Thinking like a doctor

● The problem with being on-call every other night is you ____ ?
  ○ Have no social life
  ○ Miss half the good cases
  ○ Are sleep deprived
  ○ Will gain weight
Thinking like a doctor

- The problem with being on-call every other night is you ____?
  - Have no social life
  - Miss half the good cases
  - Are sleep deprived
  - Will gain weight

- Being oncall is a great way to learn
- It’s also a great way to burn out
- If call is too onerous people will change jobs, even take pay cut
  - 20% of median neurosurgeon’s compensation is for being on-call
  - High because many refused to take call for less
Summary

- Establish procedures to help oncalls
- Question everything when you get paged
- Acknowledge being oncall is stressful
Shopify Talks @ SRECon

Know Your Kubernetes Deploys
*Felix Glaser*, Infrastructure Security
Thursday, 09:55–10:30, Track 2

What Medicine Can Teach Us about Being On-Call
*Daniel Turner*, Production Engineering
Friday, 12:15–12:40, Track 1

Keep Building Fresh: Shopify’s Journey to Kubernetes
*Niko Kurtti*, Production Engineering
Friday, 14:00–14:50, Track 2
Citations

- Modern tools:
- 1860s tools:
- https://www.journalofhospitalmedicine.com/jhospmmed/article/127418/rapid-response-team-meta-analysis