Communication is Key: Lessons Learned from Testing in Healthcare

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Abstract

Pulsara is a healthcare communication and telehealth platform connecting medical teams across organizations. Since we serve the emergency healthcare industry, software defects could endanger real human lives. Consequently, quality is central to our development process. What is our secret to maintaining high quality in a fast-paced, growing start-up atmosphere where product areas are broad and include mobile, web, and a public API? Communication.

In a healthcare emergency, poor communication can literally mean death, and time cannot be wasted. In software testing, poor communication can mean a drastic decrease in both product functionality and team productivity. Effective communication across teams is key to producing quality products efficiently, and in this paper I share three actionable ways for individual testers to increase communication in their companies.

First, write your bug reports with bulletproof steps to reproduce, so that anyone can not only read and understand them, but also see the problem for themselves. Second, talk to your teammates writing the code you test. Lastly, get a second set of eyes on your work.

Biography

Rachael Lovallo is a software tester driven by a passion for using technology to create positive social change. She currently puts her skills to work as a Senior Test Engineer at Pulsara, a software company that connects healthcare teams to improve patient outcomes and bring acute healthcare into the 21st century.

Rachael is a tester to her core, persistently seeking software defects and rigorously documenting methods to reproduce them. She finds daily fulfillment collaborating with Pulsara's development team to build an intuitive healthcare communication platform that safely handles patient data and truly improves patient outcomes.

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1. Introduction

In the mountains of Montana sits a healthcare technology startup called Pulsara. The company's goal is to improve patient care in emergencies via a platform facilitating medical communication. Testing at Pulsara includes unique challenges, as the platform consists of mobile applications for iOS and Android, a browser application and a public API, with a small team of testers ensuring quality.

The following pages focus on something central to Pulsara's mission and purpose: communication. Picture an emergency such as a stroke, or trauma event, where time passing directly corresponds to tissue lost. Medical data indicates that poor communication can waste time and drastically decrease that patient's chances.

Strong parallels exist between communication in an emergency and communication on a development team trying to ship a high-quality product under time constraints. When good communication occurs, not only do customers receive the product faster and with fewer defects, but the development group builds respect for each other and a greater "sense of team" emerges. This paper will provide the reader with three actionable ways to improve quality through communication in the workplace: 1) write each bug report with bulletproof steps to reproduce, 2) open the door to communication with your co-workers and 3) get a second set of eyes on your work.

2. Write Defects with Bulletproof Steps to Reproduce

2.1 Introduction

If a tester writes bug reports that anyone can read, quickly understand, and reproduce, it saves time. It also improves the chances of the defect getting fixed as opposed to closed as "not reproducible," or "works on my machine."

2.2 Some History

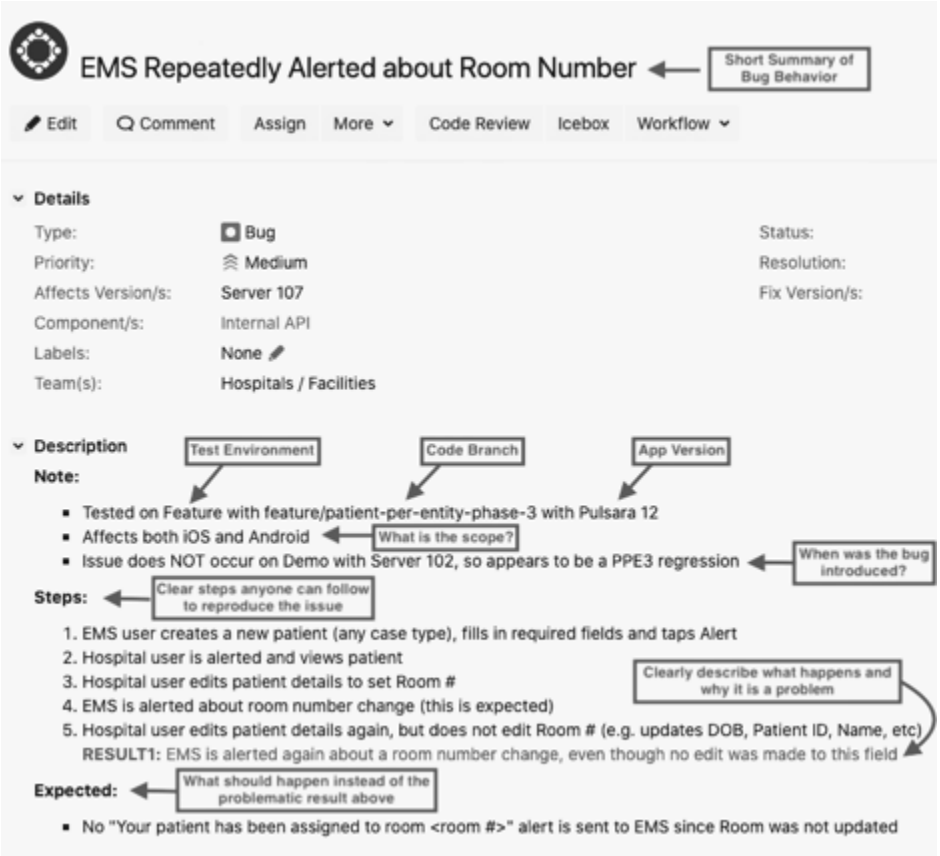
When I began testing software, my developer co-worker and I would often talk through defects as we sat near each other. When I switched jobs, I suddenly felt I was starting from scratch learning to work with new developers at a bigger company. Some co-workers were not even in my building, state, or country, much less a cubicle away. It took trial and error to learn to interact effectively with a new team. Now, at Pulsara, how and when bugs get fixed is a decision that requires more than just my co-worker and I. New issues go to a triage team that decides which defects get fixed and when. The triage team is not made up of people I work with directly, and sometimes the group changes. It can be a communication challenge. I experienced frustration at first because the triage team was regularly asking follow-up questions on my defects and I felt I was wasting my team's time. Worse, bug reports requiring lots of questions can lead to misunderstandings, code churn, and even project delays. I started to ask myself: how can I get any teammate to understand my defect reports without needing to ask follow up questions?

2.3 Standardize Defect Report Structure

I found some simple ways to make bug reports easier for anyone to understand. The first is baked into Pulsara's test process. We have a standard defect report template. We all list steps to reproduce, the problematic result, the result we expected to see, and any other pertinent information, such as build number or environment. Since our defect write-up format is familiar to the wider team, those doing triage

can increase efficiency because they know where to look to understand the issue quickly. Some read the whole report, but some may read the result first, then the environment details and do not need further information.

Example Bug Report:



2.4 Tying it to Medicine

The idea is similar to how medical teams run standardized diagnostic tests when trying to diagnose a patient. For example, a stroke score is a common way to quickly diagnose and determine the severity of a stroke. The EMT might look at a patient's balance, eyes, facial droop, arm drift, and speech one by one and assign each a value of normal or abnormal. The process is quick and gives a result any medical professional can understand and use to determine treatment. Similarly, getting well-defined bug reports into developers' hands increases efficiency and likelihood of the issues getting resolved and shipped. All of this ultimately means a higher quality product in customer's hands.

2.5 One Step Further

In addition to considering structure, try adding color, images, or even videos to your bug reports. For example, make the problem result bright red and bold, or add a video of a clunky UI animation. Researchers have found that people tend to differ in the ways they best assimilate information. The main types are defined as Visual, Auditory, Reading/Writing Preference, and Kinesthetic, or the VARK learning styles [1]. Interestingly, leveraging VARK to help students excel has been debunked. However, few

dispute that people have a distinct preference for one style and take in information most efficiently if it is presented to them that way [2].

This means that going beyond words when documenting a defect makes it easier for recipients to understand. Odds are small that everyone on a team learns best through reading. Aside from using descriptive words within the bug description, play with color, make text bold, and add images or videos to draw attention to important results. The goal is experimentation to see what helps more defects get fixed right away instead of prompting questions from teammates. Additionally, if a tester makes a bug report easy to understand, the developer will appreciate the effort, and that helps build your team.

2.6 Conclusion

To review, use a standardized structure for writing bug reports, similar to how medical staff use conventions like stroke scores. Additionally, get creative with color, or add an image or video of a defect to a ticket to help get the issue clearly presented to any team member, regardless of how they mentally process information. This will lead to your bug reports making sense to the whole team, getting them fixed more quickly and ultimately lead your company to shipping a better product.

3. Open the Door to Communication

3.1 Introduction

One of the biggest time-wasters in testing occurs when testers never directly interface with the people writing the code they test. Imagine grain silos standing side by side in a field. Each stands independently from the others. While functional in a grain storage scenario, silos are inefficient in technology companies where teammates must share information to get a high-quality product out the door fast. Breaking down silos while testing means talking more to the people writing the code you test.

3.2 Bedside Manner in Medicine

The most intelligent and skilled doctor will likely be unsuccessful without “bedside manner”. A doctor without good manners might not listen well to the patient’s symptoms and get the diagnosis wrong. Or the doctor might not be able to communicate to the patient about how to best mitigate symptoms. Established ways exist for health professionals to interface with patients to help them feel heard and open a door for trust. These include talking face to face with open body language, eye contact, and pauses to let the patient talk, among others [3].

3.3 The Science

What’s the science behind talking face-to-face? It turns out communication in person (or on video) is superior to methods like email because, like writing good bug reports, communication is more than words. If teammates talk while in the same room, or in a video call, they see each other’s’ body language, hear tones of voice, and look each other in the eye. This interaction results in a phenomenon called “cooperative communication,” which helps get two talking people on the same page because the shared space and experience leads to similar mental states [4]. That can go for better or for worse. If a tester goes into a discussion showing defensiveness and tension, it is likely the other person will mirror their attitude back, and it will not be a productive conversation. However, if a tester goes into a discussion with confidence, but a willingness to listen, they are likely to get the same treatment from their teammate. Both

will leave the conversation feeling a sense of team. Beyond work-related conversations, the development team at Pulsara regularly schedules “Beer Friday” where shop talk is minimized and we build deeper connection over a beverage of our choice.

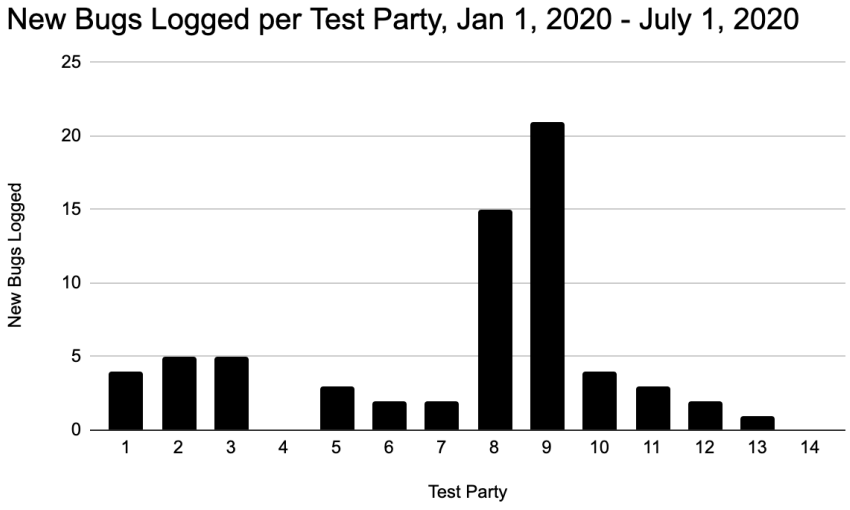
3.4 Techniques

3.4.1 Pair Development

At Pulsara we practice talking to each other in a few structured ways. The first we refer to as Pair Development, and we apply this to tedious test scenarios where we know the functionality will take a few tries to perfect, or to "boomerang bugs” that have been reopened repeatedly. In Pair Development, a tester and developer sit in the same room, or get on a video call. The developer makes a code fix, and the tester pulls the change into their local test environment. By testing then and there with the developer present, another code fix can be made on the spot if defects are found, and the two can test again. They iterate until the functionality looks shippable to both. This means the defect gets fixed within hours as opposed to at least another full day. The process also helps with empathy, as the tester sees the challenging code the developer is augmenting, and the developer sees the testing goals.

3.4.2 Test Parties

Another structured way of talking at Pulsara is via Test Parties, a concept my manager developed. At a test party, we sit down with other testers, but also developers and stakeholders like customer support. We test new functionality in real world scenarios where we take on the roles of EMTs, Doctors and Nurses and try to use our product as they would. The feedback from both the developer, who wrote the code and knows where defects could be hiding, as well as people who have emergency medical backgrounds regularly yields bugs. We also learn more about real-world workflows which then get incorporated into future test efforts. Test parties impact both 1) the short term quality of the upcoming release, and also 2) the quality of future projects.



Notes:

- Outliers with 0 defects found (Parties 4 and 14) were repeated parties for large projects nearing release
- Outliers with >5 defects found (Parties 8 and 9) were initial parties for large projects
- Average = 4.78, Median = 3, Mode = 2

3.5 Conclusion

As Daniel Goleman, author of *Emotional Intelligence,* states: "*The social brain is in its natural habitat when we're talking with someone face-to-face in real time."* [5]. When challenging questions arise, or when a slack thread or email chain has continued for a while without resolution, start a conversation face to face, whether in the same room, or over a video call. Behavioral research suggests that going into the conversation confident and with well-baked questions make it likely co-workers will reflect the tester's attitude, understand, and help. If testers have more information on a problem, tool, or project, they can test more thoroughly. This contributes to a higher quality product with the current work, as well as in future projects.

4. Ask for Feedback

4.1 Introduction

A common story compares working at a startup to paddling one's own canoe, whereas working at a big company is like attempting to paddle a cruise ship. The story does reflect reality, but the mental image appears overly idyllic. Startup work can feel like pushing a loaded canoe upriver with one's teammates. To make it work, each person must set aside their ego, lean on their teammates, and take constructive criticism. At Pulsara I learned to accept coworker's help, and in turn noticed an improvement in the quality of my work, as well as the quality of the product shipped. The third action item distills the lesson I learned on feedback into a simple daily task: ask for a second set of eyes on testing work.

4.2 Do It Yourself Surgery?

Imagine a surgery. You probably picture a team of people clustered around a patient, each person performing specific tasks. However, in 1960 during a Soviet Antarctic Expedition, Doctor Leonid Rogozov performed self-surgery and managed to successfully extract his own appendix [6]. Comparing the mental image of typical surgery with his experience, most would not want to be in Dr. Rogozov's shoes even with his surgical skills, and no one would recommend self-surgery as a best practice. Surgery takes a group of doctors and operating room staff working together to ensure the best outcome for the patient. Most importantly, the standard surgical team consists of one surgeon and one assistant surgeon. The assistant provides another set of hands, and if complications arise the two discuss the best path forward. In other words, the patient has increased chances of a better outcome because there is more than one person's expertise going into the procedure. This is so well known that best practices tell us there should be two surgeons in the room.

4.3 Research Outside of Medicine

Research on teams outside of medicine supports the idea that collaboration between people leads to better outcomes. A concept gaining popularity when developing teams is called "cognitive diversity." It means seeking out team members with different knowledge, or who approach problem solving differently than others. A study from the Harvard Business Review measured how different teams handled a complex problem within a time limit, comparing the minutes taken to solve the problem against measurements of the cognitive diversity of the group. They specifically looked at knowledge processing, which is the extent to which individuals prefer to use their existing knowledge, versus generating it in the moment. They also analyzed perspective, which is whether individuals prefer to use their own expertise or lean on others. The study found high correlation between the teams with high cognitive diversity, and

the teams which performed the challenge correctly the fastest [7], suggesting it is beneficial to have differing experiences and thinking patterns collaborating to ship a successful product.

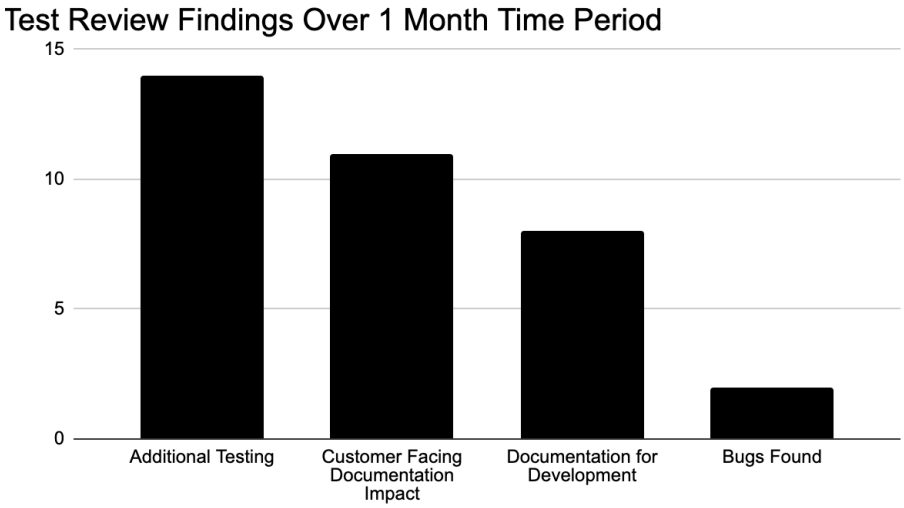
4.4 What Does it Mean for Testing?

Two heads are better than one when facing a testing challenge. How can this information be applied to testing to help improve quality? One way is for testers to individually take initiative to ask for a second set of eyes on their work. Even better, bake regular feedback into the test team's best practices.

4.5 Concrete Examples

4.5.1 Test Review

At Pulsara my manager implemented a "Test Review" practice. My team spends part of our time reading co-workers' testing notes and offering ideas for additional scenarios to cover or bringing up missed areas. Nothing moves to the done status until this happens and being the reviewer and the reviewed are both challenges that help us grow as testers. We have also found defects through test review that would have otherwise made their way into production, as it is customary to ship the product right after QA is complete. Test review is one additional gate ensuring a release is ready.



Note: 119 tickets test reviewed in total

4.5.2 Teamwork

A more informal feedback loop is our test group instant messaging channel. We ask questions there, and offer help if others make an inquiry. Additionally, we leverage past test plans and our test management tool when questions arise about product behavior or testing scope. Lastly, we rarely test projects alone, instead splitting the work with at least one teammate. This helps ensure subtle defects are caught by someone viewing the project with fresh eyes. Additionally, more people learn new functionality and are ready to test future releases without a learning curve.

4.5.3 Pair Development and Testing

Pair Development, as described above represents another collaborative test tool regularly leveraged at Pulsara to keep the feedback loop tight between testers and developers. Similarly, we can implement Pair Testing in which testers collaborate in the same time and space. The practice proves especially useful for collaborative features such as video calling, where sound quality or other issues can be easily missed by a sole tester. Lastly, letting one teammate write tests, and another execute them helps us think of more scenarios, and more comprehensively ensures the quality of the product.

4.5 Conclusion

If a person requires surgery, no one questions the need for a competent team. Similarly, testers should rely on their team for feedback and a second set of eyes. Together they will find more defects and will be more efficient in the future since everyone learns to test the different parts of the product.

6. Conclusion

Communication is like a muscle, and studies indicate that improved skills lead to higher quality products that ship faster. Three concrete ways to improve communication include: 1) writing each bug report with bulletproof steps to reproduce, 2) opening the door to communication with co-workers and 3) getting a second set of eyes on work.

The more testers incorporate these actions, the more they can leverage good communication to get a higher quality product into the hands of their customers, faster. At Pulsara that means helping emergency medical workers communicate better, and ultimately improving patient care.

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