Exercise 2

As this is an informatics ethics course, you will be likely to confront situations where new technology raises social and ethical issues. Often these situations can be challenging both legally and ethically. New technology often raises issues at a rate faster than our social and legal framework can provide precedents and agreed upon patterns of conduct and resolution. There is rarely one right way to resolve such situations and reaching a resolution will undoubtedly require your patience, creativity, and persistence towards finding moral resolution.

The **[National Society for Professional Engineers’ First Fundamental Canon](http://www.nspe.org/Ethics/CodeofEthics/index.html" \t "_blank)** states that an engineer’s most basic ethical duty is “to hold paramount the safety, health, and welfare of the public.” Whether you go on to develop or simply utilize software in your biomedical work – it is your duty as an informaticist to consider the ethical implications of involvement of yourself and those around you as they relate to any given piece of software.

**The story**

Susan Softy is a software engineer at BioMedSoftware. For the past two years she has been working as a test engineer for their product AwesomeHealth, a next generation of EHR. This new EHR enables sophisticated genotype analysis, integration with public data analysis tools, and familial genomic comparisons. This project, which is funded by a contract from The Government, is a very important one for BioMedSoftware. The AwesomeHealth project has provided much needed business for BioMedSoftware, and could lead to a much larger contract if successful. Mindful of its strategic importance, the company had bid very aggressively for the original contract. In fact their CEO Connor Overbearing had "low-balled" it, bidding less than it would take to do the work properly. They felt that was the only way they could beat out their competitors, who were just as hungry for the work. Because of their somewhat shaky financial position, Connor Overbearing was not willing to take a loss on the project, so the project has been underfunded and understaffed. Nevertheless those working on the project have made a heroic effort, working eighteen hour days seven days a week to meet the deadline, because they know how much it means to the company, not to mention their own jobs. They are now very close to success.

A version of the AwesomeHealth EHR prototype has been completed by Harry Hacker’s team and turned over to Susan for testing. Harry was more than a month overdue for when it was supposed to go to Susan’s quality assurance team, even given the round-the-clock hours his team has been putting in due to the understaffing, poor project planning for dependencies, and lack of specific requirements from The Government. Susan has only one week to get AwesomeHealth out the door, instead of six. Susan has run extensive simulations on AwesomeHealth and found that it works as it should except for one little problem. When there are too many patients in the system, it will sometimes lose track of one or more chromosome’s worth of data. The "forgotten" chromosomes will simply disappear, there will be no trace of them anywhere, and they will be ignored in the familial comparisons, differential diagnosis, drug interaction, and other safety tests. Susan has been working with Harry’s team to identify the cause of the problem, and they have traced it to a subtle error in memory allocation and reuse. They are confident that they can fix it, but it will take a month or more to do the redesign, coding, and testing.

Susan meets with her boss, Pat Partner, the project manager, to discuss the implications. She tells him that meeting the deadline is impossible. The contract requires that the company deliver a fully certified, working version of the software in three days for system integration and testing by The Government. The Government has developed a new, get-tough policy on missed deadlines and cost overruns, and Connor Overbearing is afraid that if they miss this deadline, the government will make an example of them. They would be subject to fines and the loss of the remainder of the prototype contract; and they might not be allowed to bid on the contract for the full system. This would have a devastating effect and result in thousands of lost jobs.

Pat considers whether they can do a quick patch to the software before turning it over, but Susan adamantly refuses to release any code that has not been tested thoroughly. There is always a chance that the patch would interact with some other part of the program to create a new bug.

When described to Connor Overbearing, he says to Pat: "Then we'll have to deliver the software as is. "I can't jeopardize AwesomeHealth or the jobs of my people by missing that deadline."

"We can't do that!" exclaims Susan when Pat tells her the news. "That's like delivering a car with defective brakes." "Don't worry," Pat reassures her. "I have contacts in the NIH, so we know their testing plans. They will do a lot of simulations to make sure the software works with the hardware and has all the functionality in the specs. Then they will do live tests, but only on a few patients, with a backup system active at all times. There is no way they will overload the system in any of this. After that they will have some change requests. Even if they don't, we can give them an updated version of the program. We can slip the bug fix in there. They will never see the problem. Even if they do, we can claim it was a random occurrence that would not necessarily show up in our tests. The important thing is no one is in any danger."

Susan says, "Maybe they won't find the bug, but I know it's there. I would be lying if I said the system passed all the necessary tests. I can't do that. Anyway, it would be illegal and unprofessional." Pat says, "You can certify that it is safe, because it is, the way The Government is going to evaluate it." And so she does.

In the end Susan signs off on the software. Conner deliveres it to The Government and makes it through all the preliminary evaluation, including live tests at a small hospital in the Midwest. As a result of these tests, The Government requests some changes in the user interface, and when BioMedHealth delivers the new AwesomeHealth software it includes a robust solution to the problem of the disappearing chromosomes. No one outside of Susan’s group ever learns of the problem. In fact BioMedHealth’s success with the prototype leads to major contracts, giving much-needed business - saving hundreds of jobs and adding hundreds more.

**Susan Softy, Quality Assurance Lead Role-Play Notes:**

* You believe that patients are in danger of receiving the wrong diagnosis or worse, potentially the wrong treatments if the software bug isn’t remedied and tested
* You want to make it clear you believe release without fixing and thorough retesting does not follow best practices
* You want to set an example for your team, who has worked very hard to ensure that the product is safe and effective

**Pat Partner, Quality Assurance Lead Role-Play Notes:**

* You don’t want to let down your CEO, Connor, as he is your best friend.
* You are certain the software is easily fixed as you have 100% faith in Susan and Harry’s teams.
* You know that people’s jobs are on the line.

**Harry Hacker, Software developer**

* You have worked so many hours that you can’t remember the last month you had a day off.
* You have a really good team of developers, but they are also really tired.
* You are worried about one employee, who seems very bitter and its possible that he is intentionally creating malware.
* You wish that the team could get more credit and money for all the hard work

**Connor Overbearing, CEO**

* You have invested a large sum of family money in the company.
* Your reputation is on the line at The Government.
* You know that people’s jobs are at risk and your company could go under.
* You don’t believe that Pat would ship anything other than the best of the best product, as he’s your best friend.

Adapted from Occidental Engineering Case Study: Part 1 by Michael McFarland, S.J.