Hello everyone!

I'm excited to have the opportunity to speak with you all today and share what I do.

My name is Sarah and I love technical writing. I'm going to give you all an overview of working in a diagnostic laboratory and explain how I guide my colleagues to write procedures for the lab.

I'll give you a little background first.

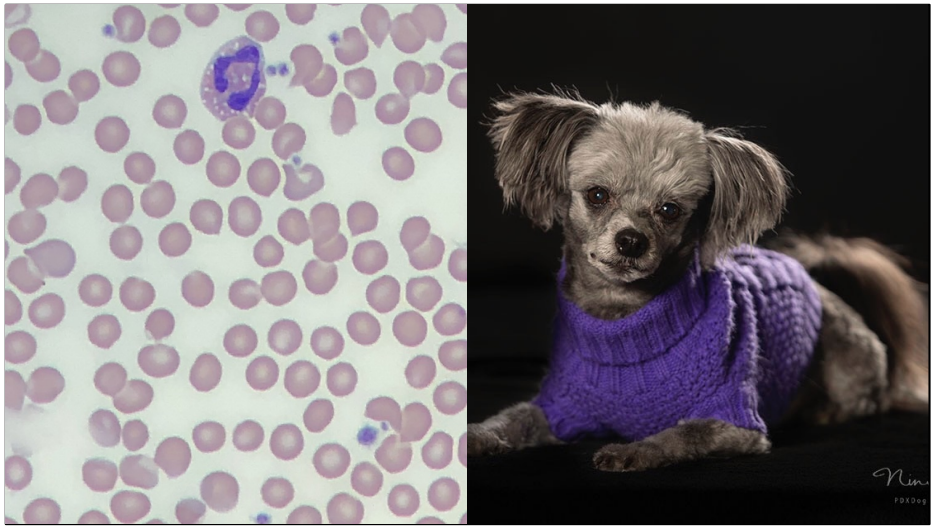
I went to PSU as well and graduated with a bachelor's in biology. I was pre-med but did not end up going to medical school. Instead, I started working in a clinical lab and eventually ended up where I am now, where I am the lead medical laboratory technologist in the Clinical Pathology department.

To give you a short summary of what happens in the diagnostic lab, we examine and test specimens collected from patients. Doctors decide what tests they want to order, send us the samples, and we give them information that helps them make a diagnosis, decide the next steps, or confirm a treatment plan.

Laboratory results have a direct effect on patient care. We have strict guidelines for how testing must be completed. Quality control must be ensured, testing has to be methodical, and there has to be guidelines in place to ensure accurate results you and your care team can rely on.

We do that with well-written procedures.

Standard Operating Procedures (otherwise known as SOPs) are the backbone to a smooth operating lab. They're often written as step-by-step directions, and their purpose is to ensure consistency and reduce variability between technicians.



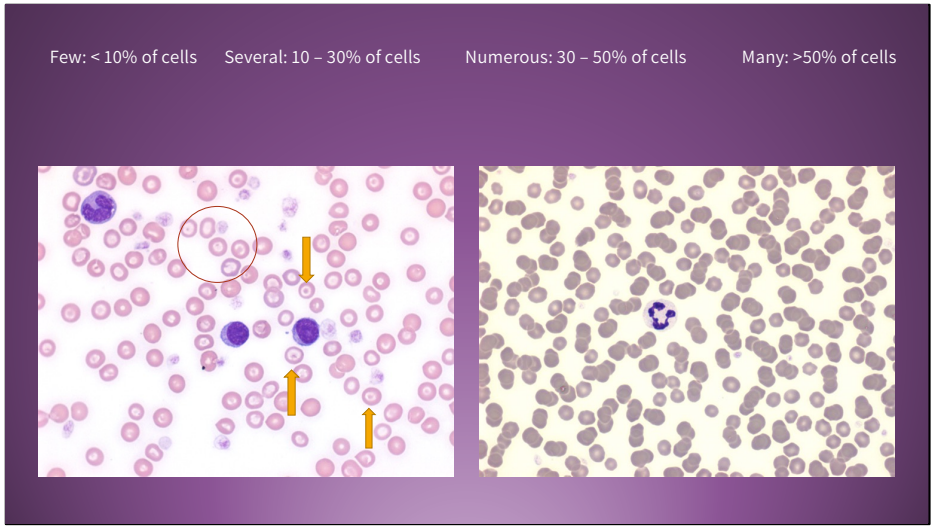
Quickly, I'll give you an overview of what we do in the lab and why it's important to have good procedures.

Science is an art. You have to make some subjective calls when it comes to evaluating morphology on blood smears. While your level of comfort with this comes with time and experience, we have to be able to clearly document how we are evaluating these things with discrete criteria.

In this example: this is what you typically see when you look at a stained blood smear. We look at the blood for every CBC (or complete blood count) we receive. Here you can see lots of red blood cells and one white blood cell, the larger cell with dark purple, called an eosinophil. You can gather A LOT of useful information from what the blood cells look like. The quantity and morphology of the various cells can indicate inflammation, anemia, and various diseases. It's critical that we're able to communicate what we see to the doctors waiting. We need to all report this information the same way. Procedures help us do that.

This example here was a healthy dog. Of course being in the lab, we don't get to see the patients but in this case, this was a routine checkup for my forever friend on the

right, Adella May.

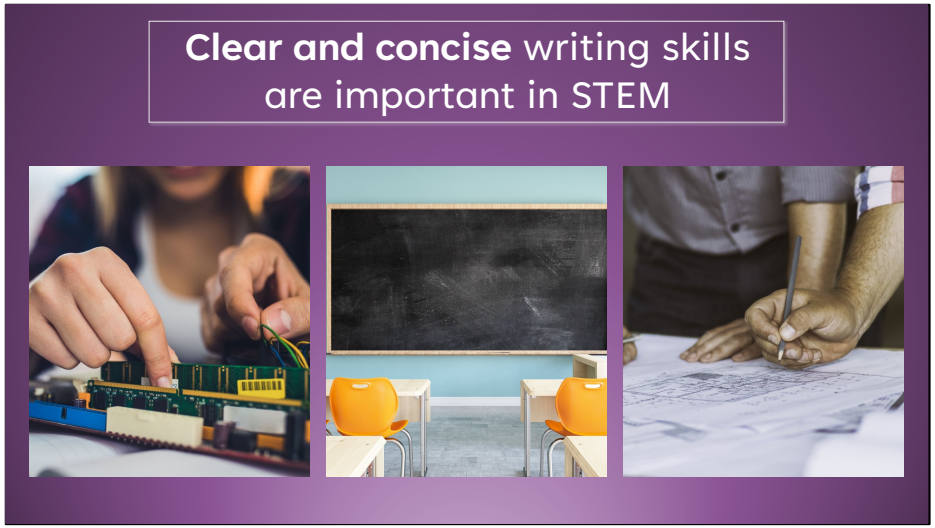


On top you can see the criteria for how we want to judge the morphology of the red blood cells. This is taken straight from our Blood Smear Evaluation SOP.

The picture on the left, you can see some changes in the red blood cells we want to communicate on our report. Some of the red cells, indicated by the orange arrows, look like they have bullseyes right? Those are target cells, which you might see with liver disease.
In the circle, you can see some red cells that appear to have less red in them, indicating there might be lower amounts of hemoglobin. That's information to report if we see this as a trend on the slide.

On the right, some of the red cells appear stacked like coins right? That's called rouleaux formation and it's not uncommon. But in this field, this is a lot. According to our guidelines, everybody should classify this as "many" rouleaux formation – greater than 50% of cells appear to be in rouleaux.

So I hope that gives you an idea of why it's important to communicate to clinicians what we see and for us all to be consistent in how we do that.



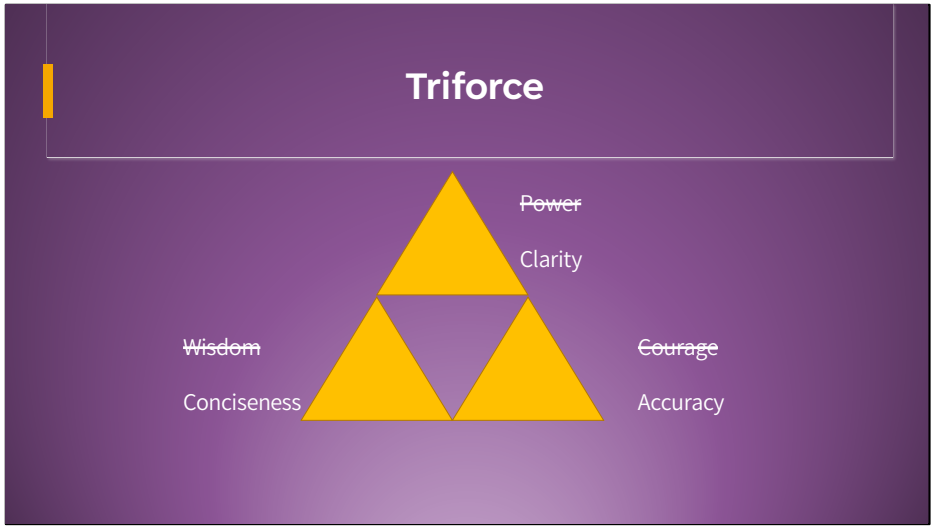
I want to stress the importance of writing clearly and concisely in any job you work in. Especially in STEM.

Whether it's working in the lab, in the software industry, teaching, or wherever you end up – the skills you learn in this class will prove valuable. One of my favorite books about writing Write For Your Life by Charles Wheelan has a great quote in the introduction: He says, "Whatever you do, good writing will help." And that is very true.

Even though more companies could use them, you won't always have technical writers to write documentation for you in most jobs. Programmers have to write good documentation for the code they write, engineers need to utilize good troubleshooting guides, you'll likely end up in a position where you'll be training new employees and having step-by-step procedures will help you in that process. If you work on the client-side of a business, customers need good Getting Started instructions for the products they use. There are a ton of opportunities for using your writing skills.

I took a survey of my fellow laboratorians – everyone from those with bachelors

degrees up to PhD and DVM level clinicians – and 80% of respondents have not taken a technical writing course in college. And they all have to write documents for their work. So you all have an advantage by taking this class – and its going to serve you very well in the future. You all can serve as advocates for good documentation in your careers!



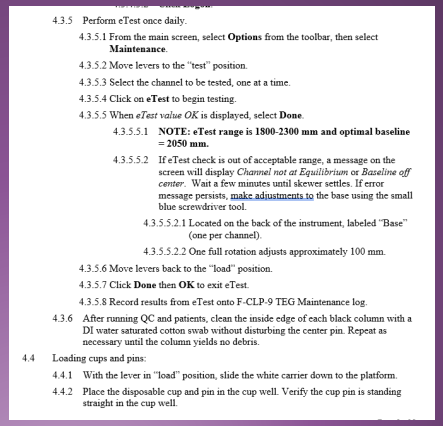
I don't know if everyone is familiar with the video game *The Legend of Zelda* but they use the Triforce, made up of three triangles as you can see here, as a symbol for the balance of Power, Wisdom, and Courage.

Well, I like to say the triforce for our goals in the lab are also the same goals for technical writing! Instead of Power, Wisdom, and Courage (which of course, you could make an argument for!) – we have Clarity, Conciseness, and Accuracy.

In the lab, your report CANNOT be hard to read. Conciseness and clarity are of the utmost importance when your providers (or end users, in the case of technical writing) are scanning for answers. Because, trust me, they're scanning not reading. And of course, we want to put out accurate results our clients can rely on.

The same is all true when it comes to technical writing. We want our documents to be clear, concise, and accurate – all to help our readers.

Write a **step-by-step procedure**



4.3.5 Perform eTest once daily.

4.3.5.1 From the main screen, select **Options** from the toolbar, then select **Maintenance**.

4.3.5.2 Move levers to the "test" position.

4.3.5.3 Select the channel to be tested, one at a time.

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4.3.5.7 Click **Done** then **OK** to exit eTest.

4.3.5.8 Record results from eTest onto F-CLP-9 TEG Maintenance log.

4.3.6 After running QC and patients, clean the inside edge of each black column with a DI water saturated cotton swab without disturbing the center pin. Repeat as necessary until the column yields no debris.

4.4 Loading cups and pins:

4.4.1 With the lever in "load" position, slide the white carrier down to the platform.

4.4.2 Place the disposable cup and pin in the cup well. Verify the cup pin is standing straight in the cup well.

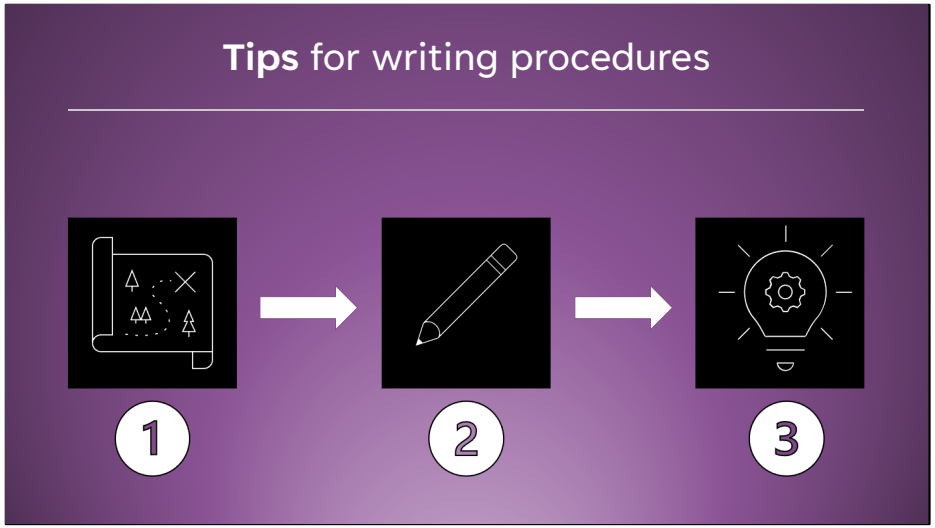
So the challenge in front of you is to a write a how-to guide, right? A step-by-step procedure seems pretty easy but it also can be overwhelming and hard to know where to begin.

I'm going to lay out how we write procedures for the lab and the tips I give my colleagues who do not have any experience writing instructions.

I always tell my colleagues to think of the big picture.

You want to write concise step-by-step instructions so clearly that someone who has never done that procedure before can follow those steps without getting lost.

These instructions can be used not only for someone looking to learn something new but also as a reference for those familiar with the procedure. In the lab, we're writing procedures for a very specific audience. Those with a technical background. But we want everyone who may be responsible for performing that procedure to understand it. For us, that ranges for undergraduate lab assistants to technicians to residents to pathologists with years of experience. Keeping our audience in mind, I want to make sure any one of those folks can follow the steps because our goal is consistency. If we all do something the same way, we eliminate some potential for analytical errors in our work.



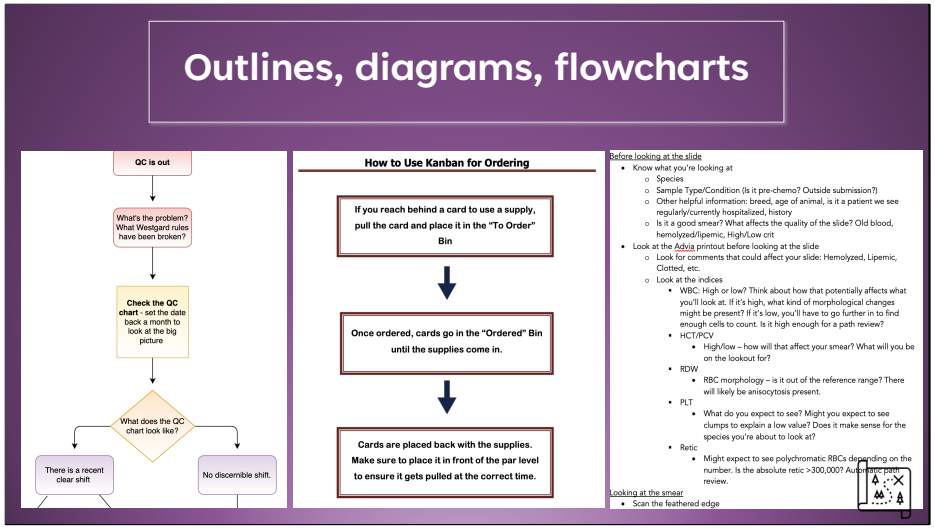
I've distilled down our writing process into three major steps.

We'll talk about how we use SOPs in the lab to create consistency, how I guide our non-writers to tackle the obstacle of being overwhelmed, and how we work together to create procedures that we can use for years with minimal need for maintenance of these documents.

When it comes to writing completely new procedures, it's often expressed how time-consuming, tedious, and exhausting it is to write from scratch. Lab techs frankly get overwhelmed by having to write – the vast majority of laboratorians I surveyed indicated that writing procedures comprises less than 10% of their job duties.

Before someone sits down to write their procedure, I tell them to map out the process they're documenting first. You have to have first focus on the Big Picture so you don't get bogged down in the details too soon.

Here's some important questions to ask yourself: Where are you starting? What are the major points to hit? Where are you going? It's important that YOU understand the process first. Where are your decision points? Map out your Point A to Point B.



So how do you do that?

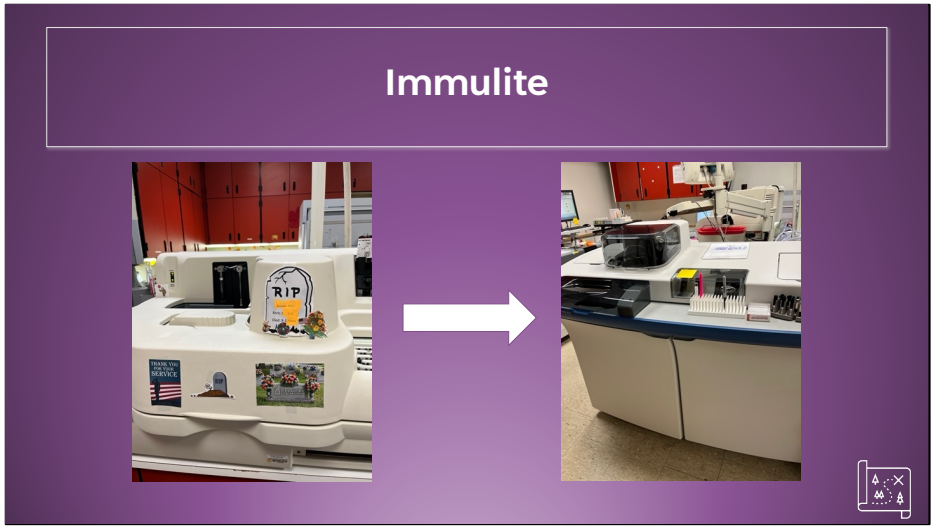
I tell our laboratorians to use whatever makes sense for what you're documenting.

Outlines, flowcharts, diagrams….whatever feels intuitive for you. We're focusing on the major steps first.

Flowcharts go hand-in-hand with procedure writing. You should be able to take a flowchart or instructions and they should make sense and follow the same flow in both layouts.

These three images are all real examples that I have used in preparation for creating documents for the lab. The first one is a troubleshooting flowchart for what to do when our QC is out on our chemistry analyzer. It can be frustrating and we're always racing against the clock to ensure our analyzers are up and running in time for the morning rush so I created a flowchart to help our techs think about the troubleshooting process. Next, I introduced a new ordering system to our lab and needed to communicate how to explain the process in a meeting. Finally, the last image was the outline (or brain dump) for creating a training guide for new techs on

how to evaluate blood smears. It's a complex process and takes a long time to train on so I've been working on creating a training guide to help new techs learn what we're looking for.

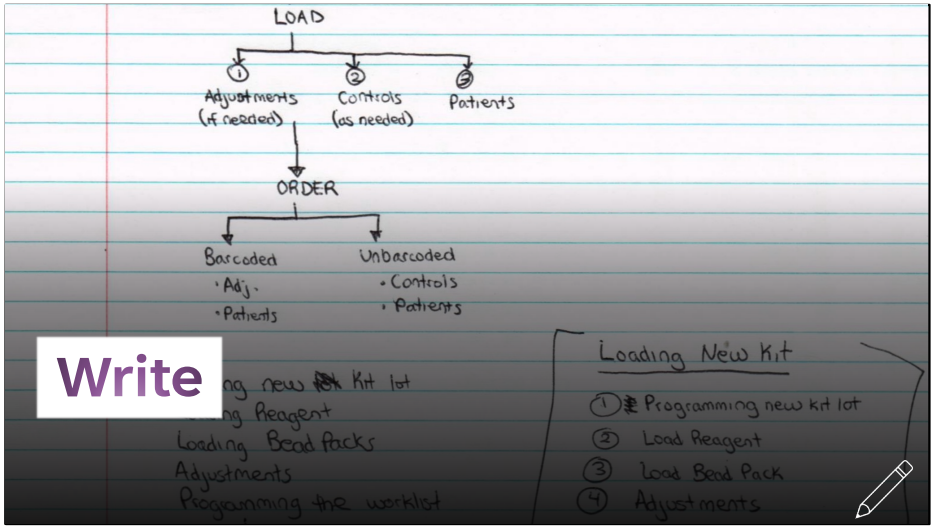


Here is a real example from an experience in the lab.

On the left is the Immulite 1000, an immunoassay analyzer that unfortunately reached the end of its life last year. You can see the remnants of the memorial service taped to the front there. On the right is the Immulite 2000 which we got to replace the 1000.

A completely new analyzer, which was more complicated to run and had a completely different workflow, required the person in charge of its installation to write brand new procedures. It was a lot of work. Startup, maintenance, and the How To for loading samples was all new. There was zero ability to copy/paste from the old procedure to the new. So the technician in charge of the creation of the documents had a hard time knowing where to start.

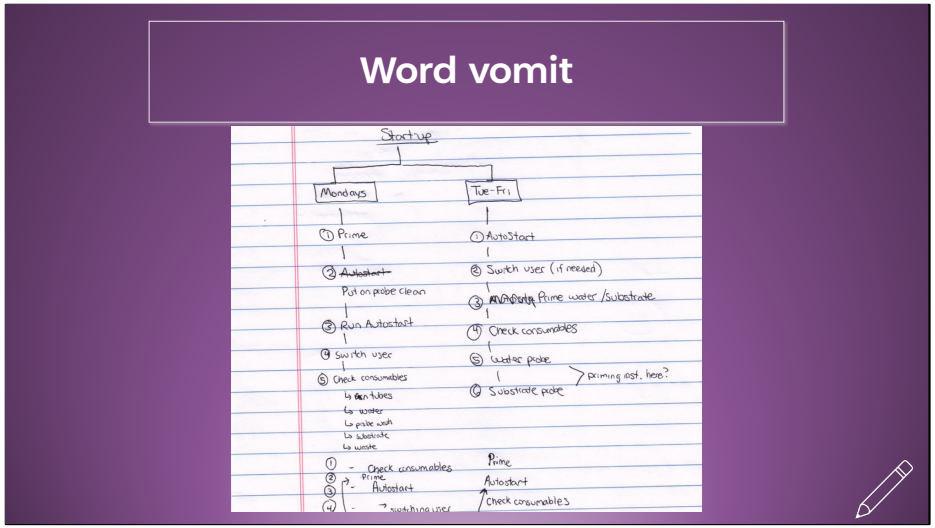
Her initial drafts were difficult to follow – even for me and I was trained on the new analyzer and knew what she was trying to communicate! So we had to have her start from scratch. If these procedures were difficult for me to understand, it was going to be impossible for the techs who had no idea how to operate the 2000. So we started with creating a flowchart of the basic workflow of operation for the Immulite.



And here, in the background, you can see how I mapped out the process for running the Immulite. This was the first step in creating the new procedures.

So our next step is the natural progression. Once you have a bare bones outline completed, it's time to write.

This is our second step in the process and should come naturally as long as you follow your map that you created in the first step.



Here was another basic outline I used for brainstorming the startup procedure.

Once we have a rough outline for your procedure, it's time to fill in those details.

I like to tell our techs that it's time to word vomit to get it all out. It's memorable and helps them know where in the process they can start putting in all the details below the basic steps they outlined in the Mapping step. That way we first make sure we have the most important steps outlined and we know where we need to fill in extra information. Remember, one of our goals is conciseness. We use the outline to guide where we need to elaborate, not add additional information that isn't necessary and may cause confusion.

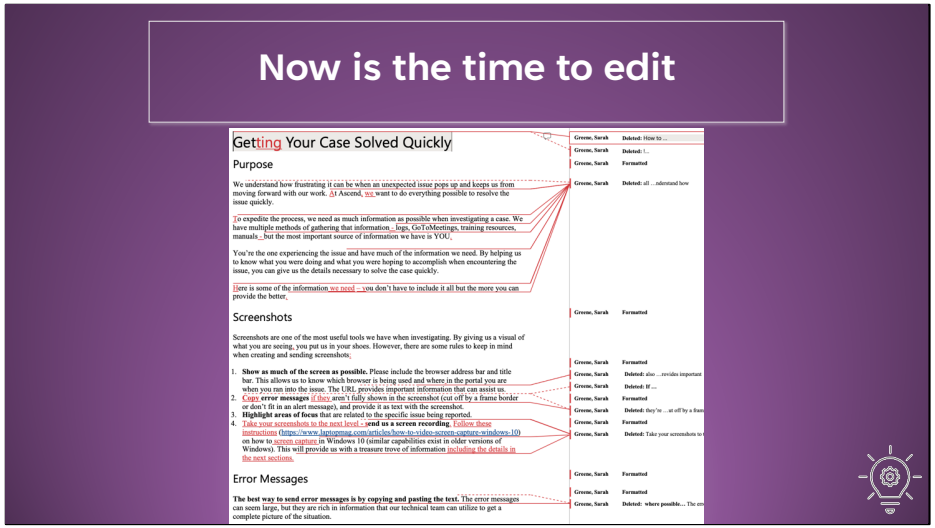
It's important to note to focus on getting all your details out first before you start editing.

In the Immulite example, one hiccup that slowed down the writing process was editing while you go. Listen, I get it, it's hard not to. As you finish one section and you read it back, you want to start making changes.

But try to avoid editing at this point. You want to first focus on making sure you have all your steps. That's what is important. Worry about grammar last.

Okay, our final step is optimizing your procedure. You've got all the information you need, outlined your process, filled in the details, and you're ready to make it the best set of instructions they can be.

There's three sub-steps here that help you fine-tune your procedure while keeping in mind our goals of clear, concise, and accurate procedure writing.



I have to remind our laboratorians that even though in our job, where the smallest details matter, we cannot document every single possibility. Do not get hung up on writing the "what if's".

So many things can go wrong in the lab, and trust me they do go wrong, but we do not list the possibilities in the procedures for operation. That's what troubleshooting guides are for, right?

When it comes to editing, I'm looking to eliminate "should", "might", "could" because clear and concise wins. I want accurate instructions for how to perform a task. That's it. That's what's nice about technical writing, right? It's not like essay writing or creative writing – we're trying to write the least amount possible.

Next, we have other people read and edit the procedure for clarity and accuracy.

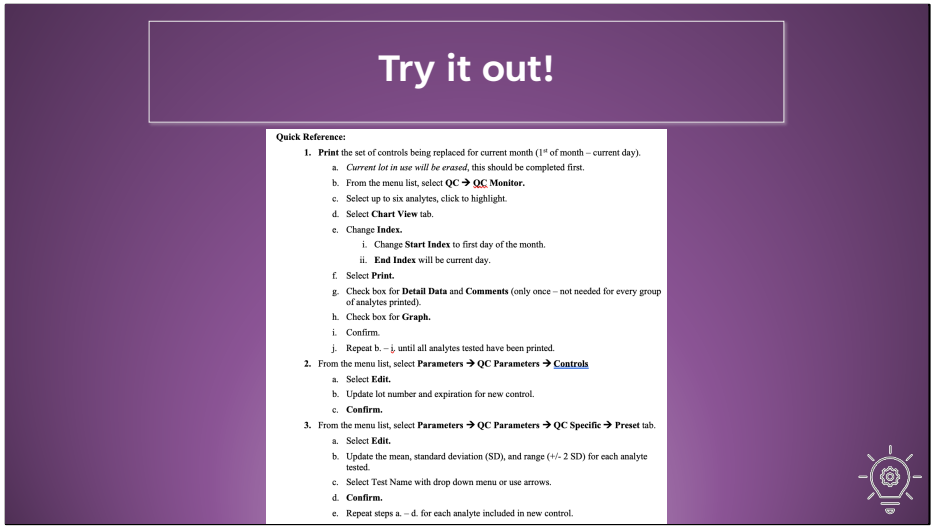
The more trained eyes, the better.

Peer review is really crucial to good procedures because if someone has questions, it's very likely you're missing an obvious step. You can use anybody!

In the lab, we use our colleagues who have a stake in what we're documenting. That could be the undergraduate lab assistants, technicians, managers, pathologists, anyone who might use the procedure.

The reason for this is as the author, no matter how many times you read what you wrote, you can miss important steps because you're too close to it. You need fresh eyes to read your procedure to make sure it makes sense.

In the long run, this makes everyone's job easier when you have well-edited procedures that can be used with minimal editing needed in the future.

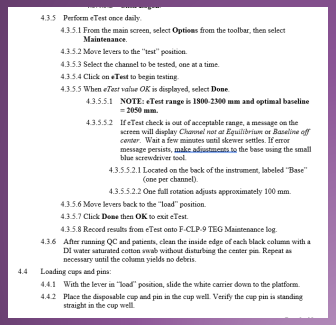


It's also important to try out the procedure. Have someone else do this. Have them take notes if something is confusing or there is a step missing or they get stuck. This is a really crucial step and the ultimate test on whether you conveyed the information and set up your user for success.

It's a great opportunity to try different arrangements of steps, ensure it makes sense in the overall workflow, and gives you an opportunity to play with the organization of your procedure.

All of this makes your procedure a better document that helps your user accomplish the task they need to do without having to search for more information.

Examples from the lab survey



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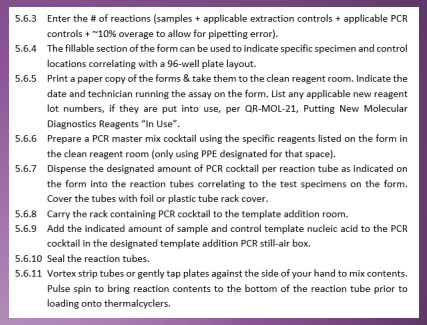


5.6.3 Enter the # of reactions (samples + applicable extraction controls + applicable PCR controls + ~10% overage to allow for pipetting error).

5.6.4 The fillable section of the form can be used to indicate specific specimen and control locations correlating with a 96-well plate layout.

5.6.5 Print a paper copy of the forms & take them to the clean reagent room. Indicate the date and technician running the assay on the form. List any applicable new reagent lot numbers, if they are put into use, per QR-MOL-21, Putting New Molecular Diagnostics Reagents "In Use".

5.6.6 Prepare a PCR master mix cocktail using the specific reagents listed on the form in the clean reagent room (only using PPE designated for that space).

5.6.7 Dispense the designated amount of PCR cocktail per reaction tube as indicated on the form into the reaction tubes correlating to the test specimens on the form. Cover the tubes with foil or plastic tube rack cover.

5.6.8 Carry the rack containing PCR cocktail to the template addition room.

5.6.9 Add the indicated amount of sample and control template nucleic acid to the PCR cocktail in the designated template addition PCR still-air box.

5.6.10 Seal the reaction tubes.

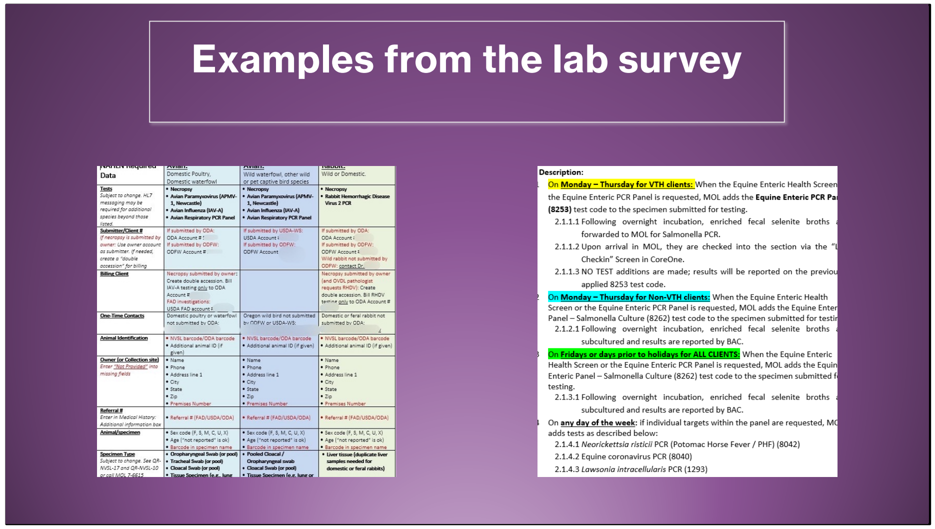
5.6.11 Vortex strip tubes or gently tap plates against the side of your hand to mix contents. Pulse spin to bring reaction contents to the bottom of the reaction tube prior to loading onto thermalcyclers.

Let's take a brief look at some of the lab procedures here.

In my survey, I asked for specifics on what folks found helpful in their procedures – either written in the lab or from a manufacturer. Here's the highlights of what folks though are helpful:

Concise step-by-step instructions for the task at hand. Either clear bullet points or numbered steps.

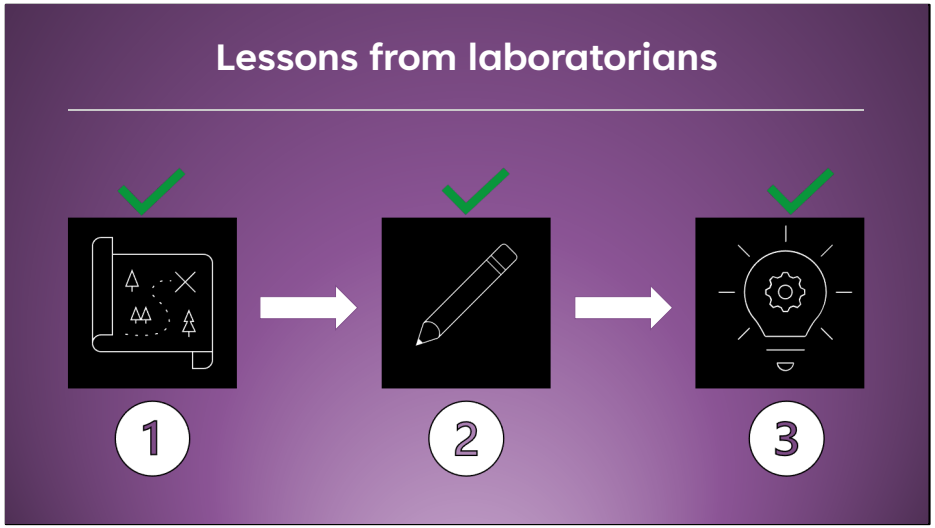
The use of bold and italics to break up walls of text (remember, many users are scanning your document, not reading word-for-word) and to highlight actions while interacting with user interfaces.



And two more examples techs cited – these are real SOPs in different lab sections.

The use of color helps, especially when you’re scanning for the information you need at the moment.

Charts are also very helpful for the day-to-day operations. There is A LOT of information to remember and nobody is expected to memorize it all. That’s why good documentation is critical – if the information is presented in a helpful way, it’s easy to find what you need, especially in stressful situations when you’re in a rush.



Let's summarize what we've talked about.

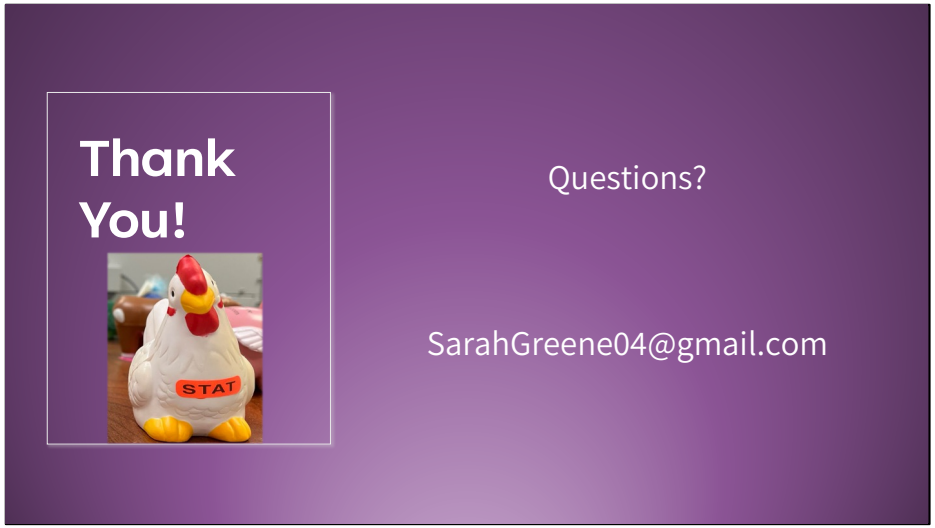
Procedures being the absolute backbone to the laboratory, we need everyone on board with writing, revising, and advocating for the development of great docs.

The biggest advantage is that it makes your job easier! It makes training easier, it makes answering client questions easier because you know exactly where to turn for answers, and it helps you do your job efficiently and consistently.

Mapping out your process helps make sure you have a Big Picture Understanding of what you're documenting. Utilizing flowcharts, outlines, and diagrams helps kickstart the writing process and avoids that dread of having a blank page in front of you.

As long as you follow your outline, all you have to do is fill in the details.

Finally, optimizing your procedure means taking the time to edit for conciseness, clarity, and accuracy by having others review your work, trying it out, and using that feedback to streamline your procedure.



I hope that helps you all get a glimpse into the importance of procedures and technical writing in general.

The big takeaway I want you all to remember is that you do not have to be an expert to write procedures. As long as you can clearly communicate a step-by-step process, and focus on clarity, conciseness, and accuracy, you can write a How To on any topic.

With all that, feel free to reach out to me if you have any follow up. My contact info is on the screen.

Does anyone have any questions?