WORKING REMOTELY-COMPUTER SPECIFICATIONS

While our profession of Medical Dosimetry generally lends itself to being remote-friendly, working on-site has remained the predominant expectation. Amidst the global pandemic caused by COVID-19, many of us have been thrust into the world of remote work. Whether we consider ourselves to be tech savvy or not, it can be overwhelming to immediately be required to duplicate our work environments at home. To aid in our quest of creating the perfect home office, here is a general review of tech specifications to consider.

THE BEST COMPUTER SETUP FOR PLANNING

Any setup that works for you is really all that is needed. That said, there are specifications and "extras" that you can find to provide a little more efficiency and even enjoyment while working from home.

Computer Specs

RAM

Random Access Memory, or RAM, is one of the most important components to look for when considering a computer or laptop. With the increased need to run more and more applications, the demand for more RAM has continued to increase over the years. A machine with 8GB of RAM was at one time a great machine but now that technology has improved, it is now a mere starting point for any work computer. For laptops, 12-16 GB are common due to size limitations but for desktops that may be used for years to come, one may need 16-32 GB of RAM.

CPU

The Central Processing Unit, or CPU, is often the next thing to consider when purchasing a new computer. The CPU is the main component of a computer where most calculations are completed. With respect to CPUs, some considerations may be the number of cores and threads.

While early CPUs had a single processing core, today you may see laptops and desktops with 4 (quad) to 16 cores with most general-purpose CPUs being in the 4 to 8 core range. In addition to having multiple cores, a CPU may be described as having even more threads, e.g., 4 cores with 8 threads. When a CPU has more threads than cores, this means "multithreading" is being utilized. In other words, each core is able to multi-task and complete two (or more) tasks at a time. The ratio of threads-to-cores will tell you the number of tasks each core can process at a time.

Another term you may see with regard to CPUs is "clocking" or "over-clocking". This is beyond the scope of our requirements as is often associated with gaming.

CPUs come from a variety of manufacturers and some examples are Intel and AMD. Today, most computers you review will come with either a 7 or 9 generation Intel (e.g., i7-8700k, i9-9900k) or AMD (Ryzen 7 3800XT, Ryzen 9 3900XT) processor. The examples provided are

quality examples but other processors may provide you with the power you need. If you're looking to compare processors, here's a great tool: https://cpu.userbenchmark.com/

GPU

The Graphics Processing Unit's (GPU) main function is to manipulate and alter memory to accelerate the creation of images. While the CPU may have 4 to 8 large cores, the GPU will have hundreds of smaller cores. This high number cores is ideal for utilizing parallel computing which allows it to break complex problems into millions of separate tasks that can be completed all at once. In general use terms, a dedicated GPU is not necessary. In more advanced use terms, such as the use of AutoCAD, advanced gaming, or machine learning, dedicated GPUs can prove to be highly valued. Dedicated GPUs range in 2 to 12 GB of dedicated memory with a middle-of-the-road option being the Nvidia GeForce GTX 1080 Ti.

Monitors

Possibly one of the biggest advantages of working on-site in an office setting is having access to multiple monitors. While the addition of a second monitor can be costly, it can go a long way in providing added proficiency and even improved work enjoyment.

One possible solution to adding a second monitor is the use of a spare TV. While computer monitors are optimized for use with computers, a TV can often be an adequate solution. The main thing to consider when deciding whether to use a TV is the connection type of your laptop or computer. If you're having to buy a new TV, you may want to consider spending a little more for a computer monitor because when comparing cheap TVs to cheap monitors, the monitors will provide better features that are optimized for use with computers, i.e., size, lag, and image sharpness.

Size and Resolution

Size can be a deciding factor when choosing whether to use a TV or a computer monitor. Most TVs are in the 32-50 inch range. While this can be nice when binging your favorite Netflix show, this can actually create more strain on the eyes when using it as a monitor. Generally speaking, when viewing a TV from the recommended distance, the picture is sharp. When viewing it at a closer distance, as when using a computer, the image can become "fuzzier" and creates more strain on the eyes. When comparing a smaller computer monitor (24-27inch) with the same resolution, the picture will appear much sharper at shorter distances.

When considering resolution, it's important to consider the amount of use and expected longevity of use to account for future advances in technology. Depending on your preference, the optimal resolution will be 1080p on the low end, 1440p in the middle, and 2160p (4K) in the upper range. If you're looking to purchase a new monitor or TV, this decision may be made for you as the resolution you select will likely coincide with the amount of money you want to spend.

Refresh Rate and Response Time

Some lesser known specifications to consider are the refresh rate and response time. With respect to general use, refresh rate and response time mostly affect the perceived lag from user interactivity such as with the mouse.

Refresh rate refers to the number of times the screen updates, or refreshes, its images every second. This is measured in hertz and will likely range from 60 Hz on the lower end up to 240 Hz. Refresh rates most commonly seen in general purpose are 60 and 75 Hz. Avid movie watchers or gamers may opt for a higher refresh rate in the range of 120 to 240 Hz.

While refresh rate is fairly straight forward, response time can be a little more technical. A monitor's response time is measured in milliseconds (ms) and measures the amount of time it takes for a pixel to go from black to white and then back to black. This relates to image "blur" or "ghosting" where the eye still perceives the previous picture due to slow response time. For general purpose, a monitor's response time may be 4-5ms whereas for more advanced use, it may be 1ms.

Connection Types

The various connection types are HDMI, DVI, Display Port, and VGA. While each connection has different implications in what is transferred (video and audio versus video only), the most important consideration is when opting to use a TV as a second monitor as not all computers can connect via HDMI.

Operating System

The operating system is the software that supports a computer's basic functions. Most notably are Microsoft's Windows (e.g., 10), Apple's OS X (e.g., Catalina), and the open source Linux (e.g., Ubuntu) operating systems. Most people likely fall into the Windows or MAC category and choice of operating system is solely up to user preference. IT departments often have requirements for each of the operating systems so that may be a consideration when setting up your home system.

Internet Connections

Like most things in technology, internet connections can be overwhelming.

Modems and Routers

The modem connects the internet to your home from your internet provider. The router connects to the modem and your devices connect to the router. Without the internet, a local area network (LAN) can also be created by connecting devices to a router that is not connected to the internet.

Many people opt for the internet provider to provide the modem and router (often in the form of a combined device), but there are many other options available for those of us who are a little more interested in their technology. Purchasing your own modem and router, though, can also provide other benefits such as personalized security, customizable control, stronger connections through the home, etc. However, this comes with the added responsibility of maintaining security updates and keeping up with technologic advances.

No matter which route you take on selecting your modem and router, the main consideration is to ensure it is compatible with your internet speeds. Also consider its placement. In an ideal situation, the modem and router will be placed centrally in the home to provide the most coverage.

Connection Types

There are two basic ways to connect your computer to the internet, directly to the router using a CAT5 cable and wirelessly via Wi-Fi.

Connecting via Wi-Fi has the advantage of being able to connect anywhere within range. The downside is the signal gets weaker with distance and barrier types. One of the most common issues that internet customers face is the difference in the speed that is paid for and the speed that registers on individual devices during a speed test. Wi-Fi connections can often be limited to a fraction of the speed provided due to the signal being affected by distance and barriers. If this is a problem you experience, two possible solutions are direct connections and “mesh” networks (discussed later).

A direct connection essentially maximizes the connection speed as there’s very little interference unlike a Wi-Fi connection. However, direct connections can be limiting because they require a cable to be connected directly to your computer. Unless you’re willing to run CAT5 connections through your home, or lucky enough to already have them, you may be limited to the space in which you place your modem and router. Long runs of CAT5 cable can have a slight effect on internet speed but should still provide better connection speeds than Wi-Fi.

Internet Speeds

Speaking of speeds, it’s important to consider what you’re trying to accomplish when choosing an internet speed package. Most likely, your on-site office has much faster internet speeds being a business than the typical home. That said, you may not notice a difference when working from home, especially if you’re using a cloud-based system that is built on a series of servers used for your calculations, etc. If you do notice a difference in lag, time to calculate, etc., then a bigger package may be in your future.

One of the main things to consider with respect to internet speed is the number of devices your home will be utilizing. When you consider phones, laptops, desktops, TV streaming services, and tablets, each person in a home may easily have 3 or 4 devices connected at a single time, not to mention smart devices like Nest thermostats, security cameras, and virtual assistants like Alexa. Because of this, you will want to take this normal usage in to account when adding in your work responsibilities.

For the reasons discussed, a minimum speed to consider may be in the 25 to 100 Mbps (Megabits per second) range. If your home has a lot of devices and you’re used to a very fast connection at work, then you may opt for something in the 300 to 600 Mbps range. If that’s still too slow, then you may want to jump up to the 1000 to 2000 Mbps (or 1 to 2 Gigabit range). As mentioned before during the modem and router discussion, you’ll want to ensure your modem and router are rated for the speeds you’re paying for. Many routers are only rated for up to 600 Mbps so this would limit a 1000 Mpbs service to 600 Mpbs.

Wi-Fi Connections

Beyond the minimum considerations for connecting your home to the internet, other things to mull over are enhanced connection systems for large homes, Wi-Fi version, and security.

Enhanced Connection Systems

If you're living in a large home or have multiple levels to your space and have suboptimal internet connectivity, you may want to consider an enhanced connection system such as a "Mesh" Wi-Fi system. You might have heard of a Wi-Fi range extender or booster. These have their uses but from a connectivity standpoint. Mesh systems are a substantial improvement.

Range extenders work by providing another signal for the area of the home it is located in with a new name (e.g., HomeWiFi and HomeWiFi_EXT). This can be beneficial by improving the signal in areas of a home where there was once a "deadspot." That said, many devices don't change to the new signal automatically until they are completely out of range of the originally connected signal. Mesh systems, on the other hand, work by providing the same signal throughout the home on the same network name allowing devices to switch as needed. If you'd like to learn more about how mesh Wi-Fi system work you can visit: https://dongknows.com/mesh-wi-fi-system-explained/ and for a comparison of mesh systems and range extenders you can visit: https://www.pcmag.com/how-to/wi-fi-range-extender-vs-mesh-network-whats-the-difference.

Wi-Fi Versions

When considering a new Wi-Fi system, another thing to consider is the Wi-Fi version. Currently the most common version is Wi-Fi5. A newer version, Wi-Fi6, is also available. Advantages to the new system are faster speeds (9.6 Gbps versus 3.5 Gbps) and an increase to the number of compatible devices that can be connected via the new 6 GHz band (currently most devices use the 2.4 GHz and 5 GHz bands). These new devices will of course need to be 6E compatible so considerations for Wi-Fi6 or Wi-Fi6E will likely have more to do with future proofing your new investment than with maximizing the immediate benefit. Learn more about Wi-Fi 6 and 6E by visiting: https://dongknows.com/wi-fi-6-explained/#:~:text=Initially%2C%20Wi%2DFi%206%20is,providing%20more%20contiguous%20spectrum%20blocks..

Wi-Fi Security and HIPAA

Security may perhaps need to be our number one priority in our transition to working remotely. Your IT department may have certain requirements or provide a VPN, but when setting up your home network, you'll want to ensure it is at the very least password protected and is set to WPA2 security to enforce the use of passwords. For more information on securing your home Wi-Fi system, visit: https://www.wired.com/story/secure-your-wi-fi-router/.

One very important thing to consider is the new potentially afforded opportunity to work remotely, other than your home. Public networks (e.g., coffee shops, hotels, etc.), should be assumed to not be secure and likely are transmitting unencrypted data. This means that anyone with the knowhow can monitor the network and read the data that's being transmitted in plain English. This is obviously not a good situation to be in, whether looking at PHI, using passwords, or viewing your own personal information.

To combat this, you can purchase your own VPN (Virtual Private Network) service that will encrypt all data sent and received over the network. Essentially, the VPN creates an encrypted tunnel through which all of your data is sent and received. That said, not all VPNs are created

equally and should certainly be researched thoroughly. There are free VPNs, but a general rule of thumb to follow with most technology services is that if you're not paying for a service, you are the service. VPNs aren't overly expensive, ranging from $2 to $4 per month for SurfShark and NordVPN, respectively, for their 2-year contracts. You can learn more about VPNs by visiting: https://www.pcmag.com/news/what-is-a-vpn-and-why-you-need-one and https://www.comparitech.com/blog/vpn-privacy/nordvpn-vs-surfshark/.

IT Considerations

Chances are you will need to verify with your IT department that you have all of the correct information and privileges needed to remotely log in to your work computer and/or your cloud-based TPS. For cloud-based TPSs you may also need special certificates installed in your web browser to allow secure connections to your work applications. For email you may need to ensure you have secure access from home and/or your mobile device. Some IT departments may have their own VPNs setup so that may need to be a discussion as well. You can also refer to their expertise when considering personal VPN services.

Summary

Adjusting to a new work situation can be stressful and having to set up a new home office that may or may not be permanent with so many different technologies can be both expensive and overwhelming. Working remotely also has many advantages and can provide a great work-life balance. Hopefully this information will aid in making sound investments that benefit your home office.