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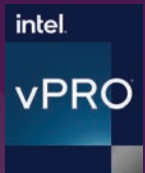
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# Remote Radiology

Improving teleradiology for your healthcare organization while boosting clinical workflows and providing personalized patient care



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# The evolution of teleradiology

Advances in healthcare delivery and digital technology, along with a growing demand for 24/7 medical imaging services, have greatly expanded the need for teleradiology in recent decades.

Initially viewed as a way of facilitating after-hours emergency consults and allowing radiologists to avoid overnight calls, off-site radiology has evolved into a well-established practice integrated in many healthcare organizations' care-delivery models.

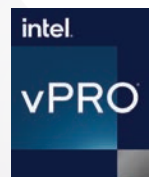
Today, the teleradiology market is expanding considerably and is expected to grow into a \$40.6 billion industry by 2033.<sup>1</sup> Emerging technologies such as artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) have the potential to further transform this field, contributing to new growth in upcoming years.

## Benefits of off-site radiology readings include:

- **Faster turnarounds**, shortening the time to diagnosis and potential treatment
- **Flexible work options** and improved productivity for radiologists
- **Increased access** to subspecialized care and expertise, especially in underserved and outlying areas
- **Reduced costs**, staffing challenges, and resource constraints

While healthcare organizations still have to overcome some teleradiology hurdles, this model is here to stay. Demographic changes, healthcare industry dynamics, and technology advancements have converged to favor this approach to care delivery.

What are the aspects that your healthcare organization needs to consider to embrace and make the most of teleradiology?



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# The radiology workforce: in short supply, burnt out, and demanding flexibility

A rapidly growing demand for radiologists, a retiring workforce, and other factors are widening the talent gap.

Demand for radiologists continues to rise as the population ages and advances in medicine require more imaging services. Yet radiology is facing a global staffing shortage, which will be exacerbated as waves of baby boomer clinicians hit retirement age. Burnout and the desire for better work-life balance are also impacting the profession.

Some geographies around the world, such as developing countries, are experiencing an ever higher need for radiology specialists and years of expertise. In some cases, care providers in these locations cannot serve patients with specialized radiology cases as often as they would in developed regions.

Teleradiology can help solve these challenges by promoting access to remote radiology specialists. Off-site reading can especially benefit small towns and rural healthcare providers who have resource constraints and are not able to maintain full-time radiologists on staff. Likewise, health organizations in remote geographies and undeveloped nations could connect with remote experts to increase access to care.

Here's how the evolving workforce trends influence the drive toward home reading.

## Global radiology faces staff shortage

The need for imaging and diagnostic services has been growing much faster than the radiology workforce. The vacancy rates for radiologists are the highest they've been in two decades, with some subspecialties seeing double and triple increases in vacancies in the past two years.<sup>2</sup>



**2X-3X**  
increases in vacancies  
in the past two years

The clinician workforce will continue to shrink as large numbers of baby boomers approach retirement, far outpacing the number of new radiologists entering the field. Among U.S. diagnostic radiologists, for example, 53% were age 55 and over in 2021 and 82% were 45 and older.<sup>3</sup>

**53%**

age 55 +

**82%**

age 45 +

The aging population will further increase the need for radiology as older patients require more imaging. The World Health Organization estimates that 22% of the world's population will be over 60 years old by 2050, nearly double the proportion in 2015. The numbers of older adults will grow exponentially in the next three decades as well — doubling for individuals aged 60 and older and tripling for those 80 and older.<sup>4</sup>



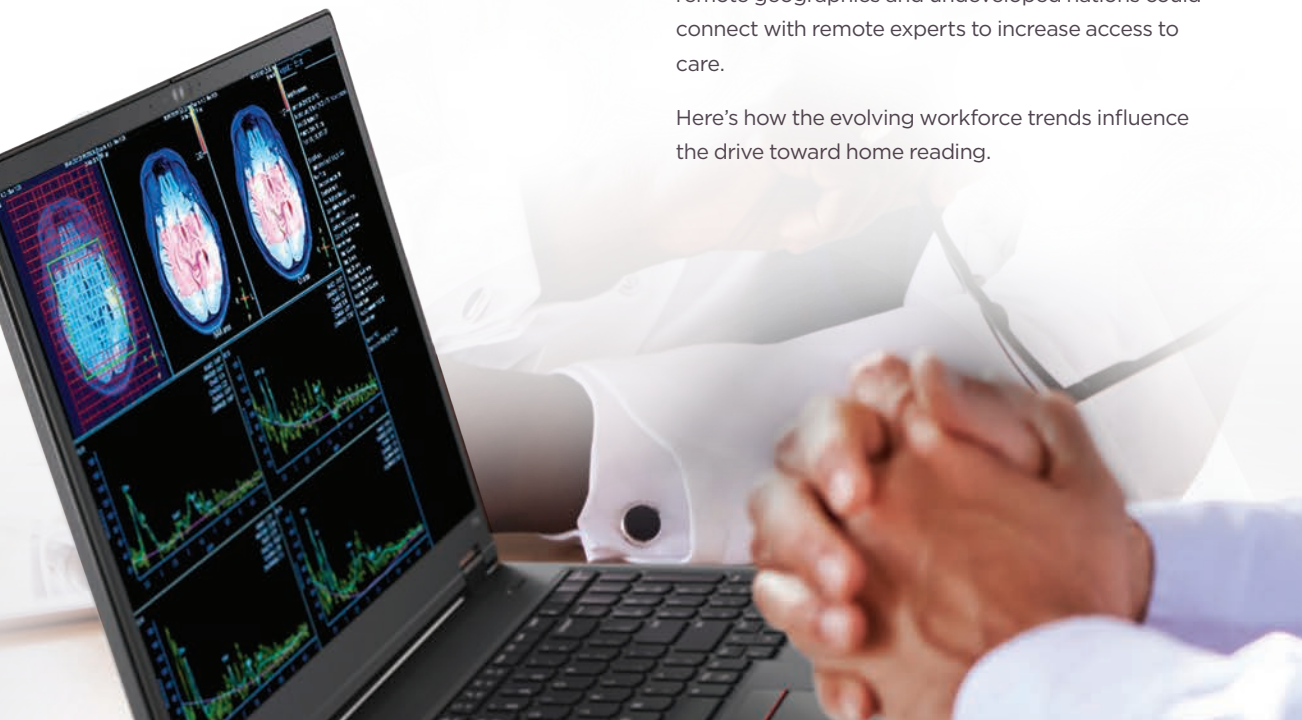
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## Burnout hits hard

The growing demand for radiology, exacerbated by the staffing shortage, has increased the workload per radiologist by 78% over the span of a decade.<sup>5</sup> The long work hours, along with decreased professional fulfillment, are among the primary factors leading to burnout, which hovers at 54% among radiologists (an uptick from 50% three years ago).<sup>6</sup>

Isolation has contributed to burnout as well. Digital imaging has confined radiologists to reading rooms or home setups, progressively diminishing their direct interaction with patients and colleagues.

Among all clinicians, 43% report that burnout has strong or severe impact on their lives. Research shows that intent to leave is related to burnout rates,<sup>7</sup> which means that many radiologists may consider leaving the profession or retiring early in search for a better balance.



# Younger generations reshaping the workplace

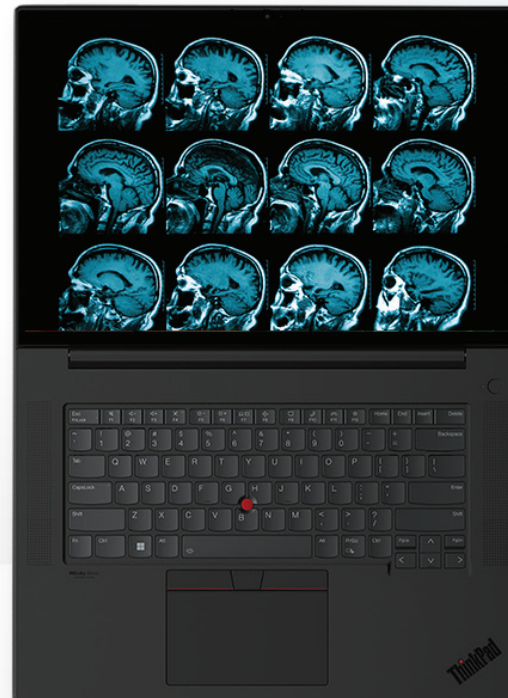
Gen Z and millennial generations will comprise 62% of the U.S. workforce by 2025,<sup>8</sup> bringing a cultural shift to the workplace — and enormous implications to a field like radiology.

## Prioritizing workplace flexibility

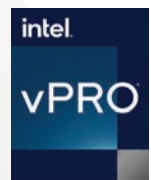
Born after 1995 and in the firm grip of a digital nation, Gen Z and millennial generations share the same values around better balance and workplace flexibility. They view flexible work — including remote and hybrid workplaces — as a must. They also believe that flexible work options increase their productivity.

These beliefs have huge ramifications for radiologist recruitment. An overwhelming majority (97%) of business leaders across multiple sectors including healthcare believe that a distributed workplace model will help recruit new talent.<sup>9</sup>

These digital natives are demanding not only flexibility but also more advanced technology. Rather than increasing isolation, millennials view home reading as a significant benefit, and hospitals are funding home reading workstations as a way to appeal to these younger employees.<sup>10</sup> To support a seamless and easy transition between the clinic and home, workstations need to provide the same computing power clinicians have on site, including towers and hardware such as specialized keyboards and dictation microphones.

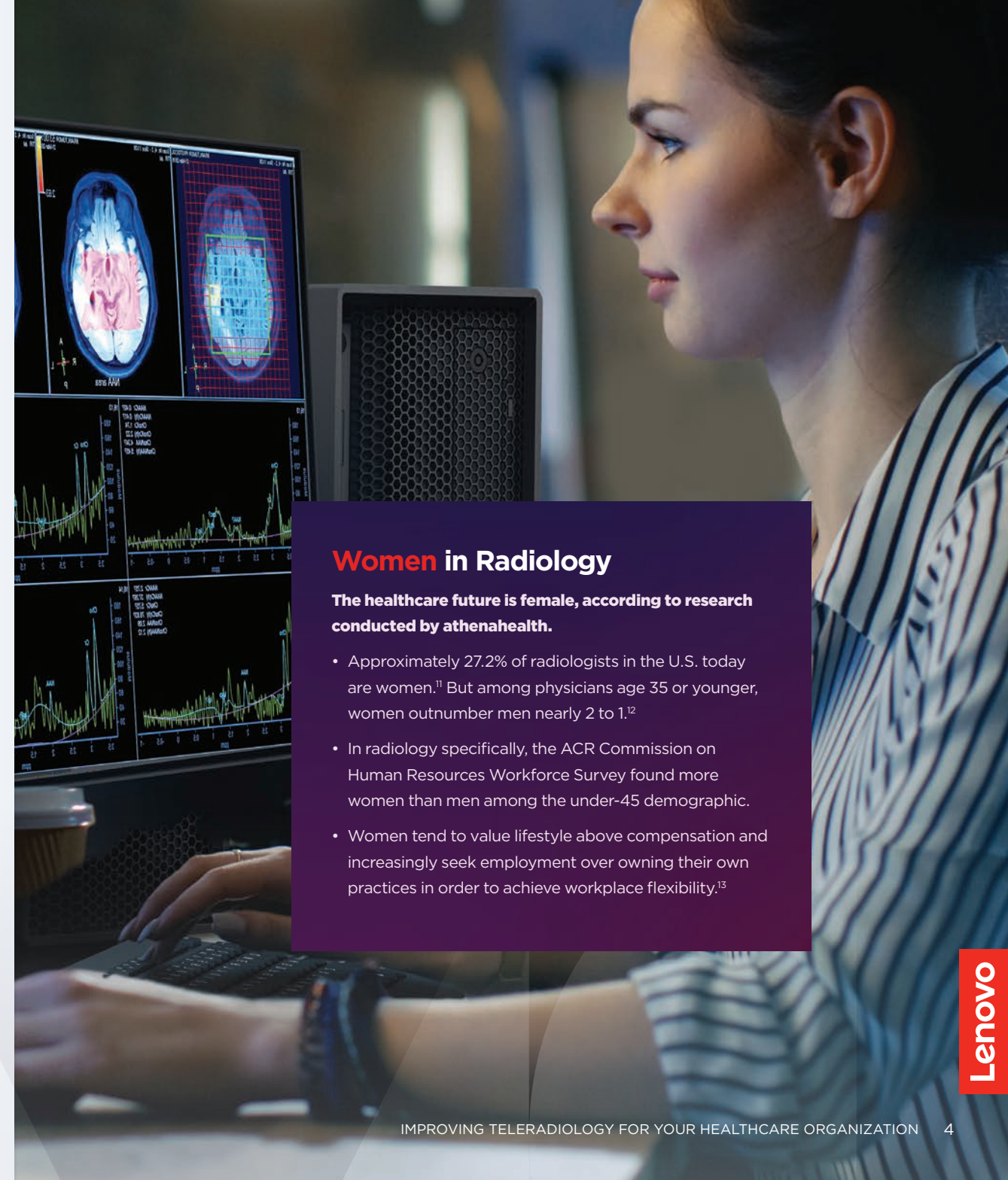


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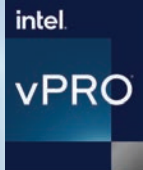
## Women in Radiology

**The healthcare future is female, according to research conducted by athenahealth.**

- Approximately 27.2% of radiologists in the U.S. today are women.<sup>11</sup> But among physicians age 35 or younger, women outnumber men nearly 2 to 1.<sup>12</sup>
- In radiology specifically, the ACR Commission on Human Resources Workforce Survey found more women than men among the under-45 demographic.
- Women tend to value lifestyle above compensation and increasingly seek employment over owning their own practices in order to achieve workplace flexibility.<sup>13</sup>

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# The new normal: virtual health and remote radiology



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Healthcare delivery has evolved, with modern technology empowering clinicians to provide quality care anywhere, anytime.

Hybrid and remote workplaces offer physicians the flexibility and convenience to deliver their services and care virtually from home, boosting their productivity as well as improving their work-life balance.

Healthcare delivery organizations are signaling that now is the time to prioritize home reading models. These models enable radiologists to collaborate with other care team members anywhere while increasing access to care and subspecialties. Emerging technologies such as AR/VR are also helping transform collaboration, allowing radiologists to analyze enhanced, highly detailed and high-fidelity images from home.

## Expand access to care 24/7

The rapid growth of emergency radiology and the rising prevalence of target diseases such as cancer, pneumonia, and cardiovascular conditions have created a bigger need for timely and accurate reading that transcends the bounds of time and geography. Internal and external teleradiology services have expanded their presence around the world to meet the changing trends in medicine and gaps in after-hours service.

These teleradiology groups are providing services at scale by putting together teams of full-time and part-time radiologists from across geographic locations. They are equipping their workforce with workstations that ensure productivity and efficiency. These purpose-built workstations support real-time videoconferencing collaboration and seamless workflows that integrate worklists, PACS, voice-recognition dictation, secure access to electronic health records, operational support, and more.

## Support radiology subspecialties

While most imaging centers prefer their radiologists to be generalists, teleradiology provides more opportunity for subspecialization in areas such as breast imaging, cardiac imaging, and neuroradiology. Subspecialization not only streamlines work for the radiologist; it also improves patient care and provides personalized care.

Interpreting images by highly proficient specialists is more prone to accuracy and less likely to produce false positives or necessitate unnecessary follow-up imaging.<sup>14</sup> Clinical studies also indicate that specialized reporting substantially diminishes the time required for radiology report turnaround.<sup>15</sup>

# Empower care team collaboration across the globe

Solutions like remote reading help care delivery organizations meet population health and value-based goals by increasing collaboration across reading locations.

Health systems are deploying clinical communication technology that connects the entire organization on one secure platform. Within that platform, groups and teams are easily built around patients, making it simple for all members of a patient's care team to collaborate on treatment plans.

Multidisciplinary teams are replacing the traditional assembly-line approach to care delivery. Paired with system-wide digital communication tools, this gives radiologists the opportunity to participate in direct patient care — regardless of location.

## Embrace the future of radiology

Emerging AR/VR technologies are helping enhance teleradiologists' work life and expanding training opportunities while improving clinical outcomes.

Radiologists working from home can collaborate remotely with colleagues and specialists with AR video conferencing. With AR, they can also boost productivity by creating flexible, expanded personal spaces while gaining a full multimonitor experience anywhere.

VR 3D visualization enables new opportunities in patient imaging. Radiologists can easily manipulate 3D images and view different angles, getting a more complete picture and precise information on the patient health.



AR and VR also bring advanced, immersive training experiences — from simple, 360-degree videos of real-time settings to adaptive, virtual environments — anywhere it's convenient. Radiologists can learn new skills in risk-free environments that are easily accessible remotely. With highly detailed scans, they can mark up, highlight, guide, and consult with peers and other professionals in real-time from home — giving them the confidence of practicing new skills before applying them on the job.

To embrace this future of radiology, teleradiologists need AR/VR ready workstations with powerful CPUs and GPUs that can handle HTTP live streaming (HLS) workloads.



# Technology advances in step with teleradiology trends

Whether driven by a global disruption event or demographic and industry shifts, technology has risen to meet the challenge. Technology continues to evolve to improve clinical workflow and improve patient care delivery from anywhere.

For radiology specifically, that means streamlined devices, higher imaging resolution, and tighter security. The governance and quality control issues that once plagued IT leaders have been resolved with the newest advances in remote reading technology.

As healthcare organizations look to optimize remote reading for radiologists, they need to consider several factors...

## Flexibility

Small is the new big. Where remote workstations once mirrored reading room setups with bulky, costly towers, today's towers offer flexibility and pack the power of desktops into a workstation. Designed to provide both performance and value, these towers enable teleradiology departments and groups to scale remote reading services cost-efficiently.

Powerhouse workstations that feature a compact and sleek form factor are another option that provides flexibility and versatility while delivering high performance for data-heavy imaging applications. Their clutter-free design can accommodate any space, including small home setups, and adapt to the environment to allow for a customized workspace with multiple monitors.



### What to look for:

- Small workstations like the ThinkStation P3 Tiny that have a chassis under 4 liters in volume and offer full, superior performance and military-grade reliability
- Supercharged processors such as Intel® Xeon® and Core™ to handle PACS software
- High-speed DDR memory for faster image processing
- Support for VR-ready graphics card
- DisplayPort™ ports on board to support multiple independent displays
- MIL-SPEC testing to ensure reliability and durability
- Built-in security features, including integrated software- and hardware-based protection
- Workstation docking station capable of driving multiple diagnostic monitors and a ThinkVision® display for worklist tracking
- Add-on accessories, such as advanced keyboards, pointing devices, and dictation microphones, to customize workspaces according to radiologist preferences
- Workstations offering full-performance computing power and integrated cameras, speakers, and mics in a compact form factor
- All-in-one, compact workstations that combine flexibility with the power, performance, security, and speed required for remote reading



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## Diagnostic monitors

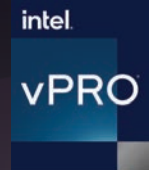
Medical monitor resolution has a tremendous impact on the accuracy of a radiology read. High-resolution consumer displays are sufficient for emergency consults and second opinions, but true diagnostic remote reads require specialized diagnostic displays.

Diagnostic displays should meet criteria such as the American College of Radiology's guidelines for standardizing display quality to ensure consistency of care.

Attaching a powerful ThinkStation P3 to a monitor like the Lenovo ThinkVision or a diagnostic display from our partners like LG and Barco is just one way Lenovo can provide the high-quality diagnostic solution you need.

### What to look for:

- Luminance of at least 350 cd/m<sup>2</sup> (450 cd/m<sup>2</sup> for mammography) to provide more visible shades of gray for easier detection of subtle details
- Pixel pitch of 200 to 210 and display size of 21- 33" to present more data and reduce the need for panning and zooming
- Compliance with the DICOM Part 14 grayscale standard display function (GSDF) to ensure quality



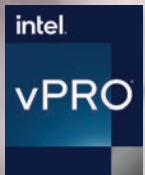
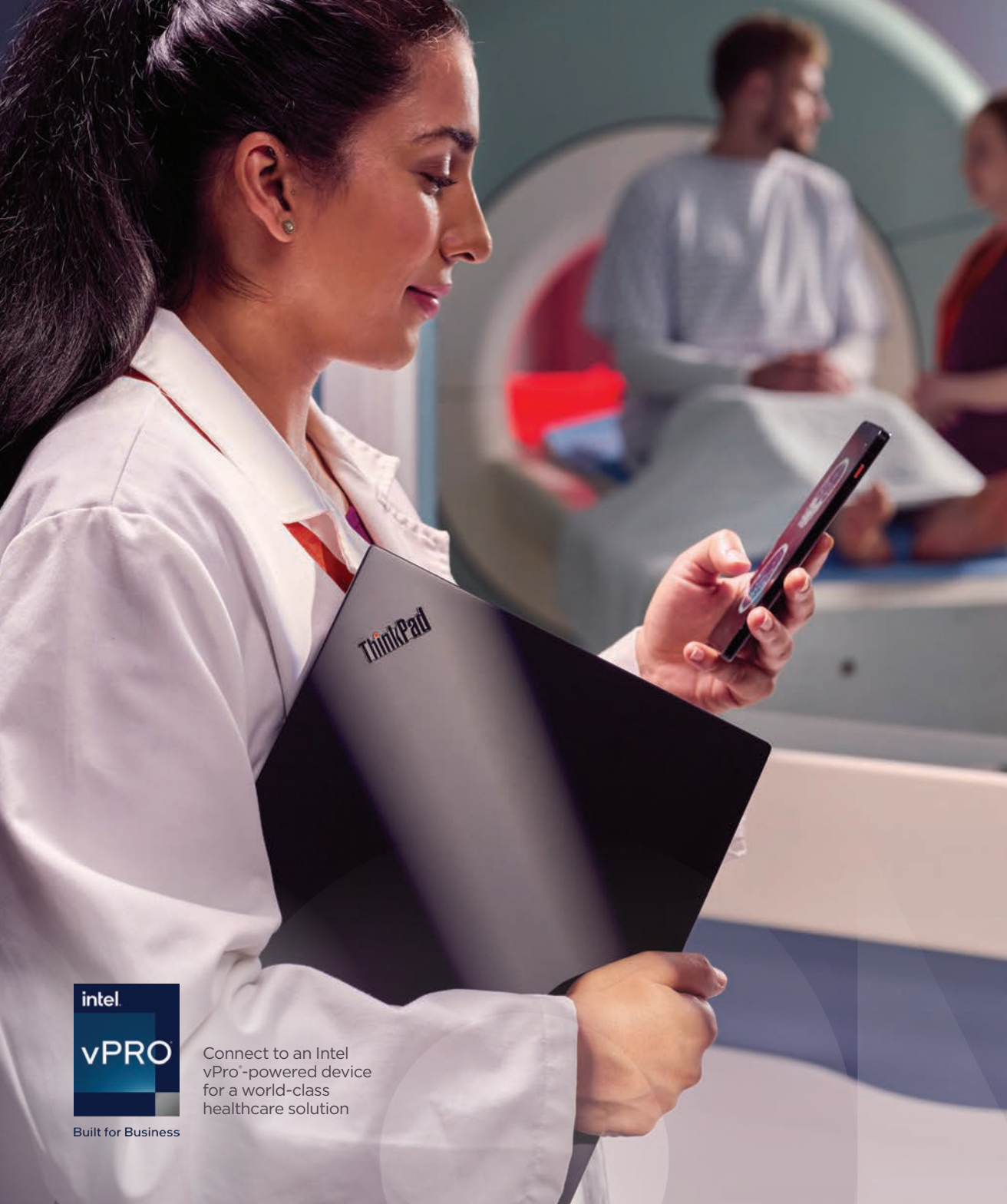
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## Mobility

When mobility between work environments is needed, towers can be supplemented with mobile workstations that offer high processing power. A portable device combines form and function to provide versatility, allowing radiologists to work in multiple settings or within the same workflow setup.

Graphics processors with both internal and external components are easy to add and can enable superior image processing. Further, if maintenance is ever required, the clinicians can simply (and quickly) drop the laptop off with the IT department — allowing healthcare organizations to cross IT house calls off the budget line.

### What to look for:

- Supercharged processors such as Intel<sup>®</sup> Core™ to handle PACS software
- High-speed DDR memory for faster image processing
- Display with a 16:10 aspect ratio for increased screen real estate

- Low blue light and option of X-Rite Pantone<sup>®</sup> calibration
- Choice of discreet or integrated graphics
- Built-in, IR camera with privacy shutter
- Built-in, multi-layered security features
- Enhanced security on Intel vPro(R) platforms provide below-the-OS hardware security, combined with extras like a fingerprint reader and Kensington Nano Security Slot
- Add-on accessories, such as dictation microphones, additional monitors, docking stations, smart glasses and VR headsets to power productivity



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## Security

Regardless of its physical location, a teleradiology station still falls under the responsibility of the on-premise IT team. While portability adds convenience, it also increases the potential for data breaches due to theft, negligence, or malicious attacks. Patient records are especially valuable for cybercriminals, but the hybrid workplace and the adoption of the cloud make it more challenging to secure endpoints and data anywhere.

With more data in motion across more networks — and radiologists accessing this data outside of the more secure on-premises environment — the attack surface has greatly expanded. Compliance with regulations is also more difficult in a remote environment. The newest workstations solve these challenges by incorporating best-in-class, integrated security controls to protect devices, data, identities, and online personas.

Built-in security is paramount to protecting teleradiologists and sensitive data. This includes components such as rigorous supply chain security and hardware that's engineered to be secure starting at the chip level. Features such as multi-factor authentication and privacy filters help ensure that only authorized personnel can access devices and view data. Additional multi-layered controls, such as AI-driven endpoint protection, full-scale encryption, and remote wipe, give IT teams the ability to seamlessly and consistently implement security for remote workstations.

### What to look for:

- Advanced password protection and authentication technologies to prevent unauthorized access in the event a device is lost or stolen
- Remote management capabilities for monitoring and maintenance
- Secure supply chain for safety and quality control during the manufacturing process
- BIOS-based smart USB protection to prevent unauthorized data downloads by blocking unsecured devices from connecting to USB ports
- Next-generation autonomous antivirus like SentinelOne® that uses AI and ActiveEDR to predict, prevent, and stop even zero-day attacks
- Privacy screen filters to protect against visual hacking
- Encryption services like Windows BitLocker and WinMagic that protect data from prying eyes
- Intel vPro® platform, which brings hardware-enhanced security features, modern remote manageability, and PC fleet stability to help end users contribute at the highest level

## Teleradiology workstations need to stand up to any environment.

To ensure they are tough and reliable, look for workstations that undergo MIL-SPEC 810H testing, which includes methods and procedures covering low/high temperature, vibration, dust, and shock.



# Simplified device and infrastructure solutions

Teleradiology demands more flexible, customizable, and scalable solutions that don't require upfront investments. Simplifying the IT environment with as-a-service solutions accelerates provisioning, helps IT teams optimize resources, and provides radiologists with access to the latest technology.

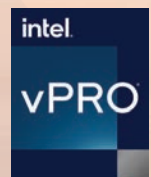


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## Lenovo TruScale IaaS and DaaS solutions

meet all these parameters, helping healthcare organizations to simplify IT management and optimize assets while improving productivity and security.



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## Infrastructure-as-a-Service

Infrastructure-as-a-Service (IaaS) helps you quickly build and scale your IT infrastructure as you cater to the rapidly growing demand for teleradiologists. Designed for hybrid and remote workplaces, the IaaS model provides a cloud-like experience, which means you can benefit from the right solutions at the right time.

The pay-as-you-go model allows you to accurately predict your budget and optimize spend while you take advantage of hybrid and multi-cloud environments, limitless storage, and high-performance computing.

### What to look for:

- A modern cloud platform — from edge, to core, to cloud — that enables you to scale on premises or to public cloud
- Infinite storage with perpetual as-you-grow expansion with no preset limits, as well as nondisruptive refresh
- Cloud-based management to simplify and automate your storage environment for reduced risks and higher availability
- Safeguards that include physical on-premises security, capacity control, and data protection
- Around-the-clock technical expertise and consistent global support

## Device-as-a-Service

Another solution built for the modern healthcare workplace, Device-as-a-Service (DaaS) provides flexible, fully customizable options based on your organization's needs. You can simplify IT, streamline configuration and deployment, equip teleradiologists with the latest high-performance devices, and enhance security.

DaaS enables you to modernize your remote or hybrid workplace and deploy the right mix of workstations and services. DaaS boosts your IT team's productivity while allowing them to support your growing cadre of radiologists working from home.

### What to look for:

- Expert support and end-to-end lifecycle management and services, including secure device disposition
- Built-in security that ensures devices and data have robust protection against threats targeting remote environments
- Flexible finance options that ensure affordability and offer a fixed, predictable monthly fee
- A mix of devices that includes the latest and most agile technology
- Customizable service levels that accommodate your organization's changing needs

# About Lenovo Health

Lenovo Health is powering the future of healthcare and life sciences technology to transform the experience of patients who receive care and the providers who deliver it.

Our solutions streamline care in a simple, scalable way that directly impacts the quality of patient and clinician experiences. Designed for productive, collaborative, secure engagements in the office, at home, and virtually, our solutions help healthcare delivery teams adapt to the changing care landscape.

The future of healthcare is only as good as the strength and reliability of the technology behind it. Lenovo Health solutions are unwaveringly powerful, reliable, and secure — and ready to help IT teams modernize, empowering them for whatever the future holds.

If you're ready to optimize remote reading for the radiologists in your organization, Lenovo Health can help. Contact your Lenovo partner or business representative today to learn how to future-proof your care delivery.

Contact your Lenovo Health Account Representative or local Business Partner.

## Learn more at

<https://techtoday.lenovo.com/us/en/workstations>  
and [www.lenovo.com/healthcare](http://www.lenovo.com/healthcare)

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