



Eight Workflow Pitfalls that Impair a Practice's Efficiency

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The multimillion-dollar question

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The answer lies in impaired workflow, something that almost every radiology group faces at some level.

Executive Summary

At a time of declining reimbursements and other practice challenges, it's more important than ever that radiologists work as cost effectively and productively as possible. By analyzing your practice's workflow you can identify and avoid common pitfalls that can compromise efficiency.

Once you understand your own situation, you can consider best practices and solutions — such as a distributed reading platform — to achieve significant efficiency improvements.

Situation Overview

While most radiologists have made the transition from film-based analog interpretations to digital interpretations via Picture Archive and Communications Systems (PACS), the majority are still remarkably far from reaping the potential efficiency benefits of this digital transition. In fact, some may now find themselves actually less efficient than in the days of film-based reads. Before digital, analog reading workflows had evolved to maximum possible efficiencies over several decades. Then digital technology paved the way for PACS, Radiology Information Systems (RIS), voice recognition and teleradiology. However, yesterday's workflows hamstring today's technologies. The result: compromised efficiency.

The Impact of Worklists on Workflow

Gaps in efficiency need to be identified by analyzing what drives your workflow. Typically, this is obvious by examining the main worklist your practice uses to assign cases to its radiologists. Practices generally fall into several categories of workflows:

Traditional Digital Workflows

- *PACS-Centric Workflow*. Radiologists work primarily off the PACS worklist.
- *RIS-Centric Workflow*. Radiologists work primarily off the RIS worklist.
- *Dictation-Centric Workflow*. Radiologists work primarily off the voice recognition system worklist.
- *Paper-Centric Workflow*. Radiologists use stacks of paper, often from control sheets from the RIS,

Each of these workflows has its staunch proponents. The problem with these conventional workflows is that they are typically driven from “dumb” worklists. These are retrospectively and passively sorted lists: sorted by time, modality, location, or a combination of these parameters.

The key issue with these worklists is that they do not offer real-time feedback. Concepts such as load balancing of studies and prioritization of cases according to specific turnaround time needs are not usually considered.

Due to these constraints to flexibility, many practices actually continue to work off of paper despite having both PACS and RIS worklists — an inefficient and error-prone system that robs the practice of the productivity that digital platforms can otherwise provide.

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How can millions have been invested in PACS, RIS, voice recognition, and teleradiology systems without reaping the rewards of greater efficiency? The answer lies in impaired workflow, something that almost every radiology group faces at some level.

Consider these costs of inefficiency:

- Declining per-study reimbursements require efficiency gains to make up the losses with higher volume.
- Successful recruiting and retention of radiologists requires competitive salaries. However, if your workflow is not efficient you will have trouble maintaining market-competitive salaries for your radiologists.

Advanced Workflows

Custom Workflow driven by Workflow Engine Software. This new type of worklist is custom built for the exact workflow of a given practice. This takes into account case turnaround time requirements, the various subspecialty assignments, and the overall group size.

This workflow drives case assignments based on factors such as subspecialty, turnaround time requirements, and workload balancing across the practice's radiologists. It also assigns cases based on license and credentials — particularly critical to multi-state teleradiology practices as a protection against radiologists doing unlicensed interpretations.

Compared to a passive worklist that only changes as new patients are added or as existing cases are read, an active worklist on a workflow engine dynamically rearranges case assignments. For example, an emergency brain MRI will go to the top of the neuroradiologist's worklist even if older, but less critical, cases are in queue.

For added convenience — and efficiency — each radiologist gets an individual, continually updated worklist, which, on a web-based system, is available wherever, whenever they choose.

Eight Workflow Pitfalls

Factoring the worklist your practice uses, you can improve your workflow by avoiding as many of the following efficiency pitfalls as possible.

- 1) Dumb Worklists
- 2) Vision-Dependent Workflow Navigation
- 3) Comparison Cases on Film or Disk
- 4) Working from Multiple Worklists and Multiple Computers
- 5) Inadequate Bandwidth/Network Bottlenecks/Poor Caching
- 6) Multiple Disparate PACS/RIS, and Dictation Systems in Multiple Locations
- 7) Physicians Performing Non-Physician Work
- 8) Outdated Non-Updateable Systems

1. Dumb Worklists

Situation:

When cases are not prioritized based on turnaround time or cases are actually lost from a digital or paper worklist, you greatly increase your chances of clinician inquiry or complaint regarding case status.

Furthermore, the simplest of the dumb worklists (such as on a PACS) allow radiologists to arbitrarily choose whatever cases they will read. In fact, nearly all currently used worklists allow radiologists to jump ahead to grab cases out of order. When this is done for self-serving reasons — such as skipping a difficult case to grab an easier one— it is referred to as *cherry picking*.

Cherry picking makes a mockery of any attempts to prioritize studies. This path of least resistance behavior is just human nature — or perhaps radiologist nature.

Regardless, it is an anti-team behavior can have adverse effects on your group's morale. It unfairly distributes work and hurts patient care by delaying turnaround time on complex cases.

In addition, a dumb worklist may assign cases to a single radiologist in a single location, making the turnaround times dependent on that radiologist's availability. Due to the demands of clinicians, procedures, contrast consents — not to mention lunches and nature — the chosen radiologist may not be available. A “solution” that is at the mercy of such factors is not a complete solution.

By load balancing across radiologists and locations, you effectively access a larger pool of potential readers, eliminating dependency on one radiologist's availability.

Many radiologists perform teleradiology with case assignments on older-architecture, point-to-point DICOM teleradiology systems. This can limit the ability to load balance cases across multiple radiologists and multiple locations. The result is asymmetric workflow distribution across a practice, with some radiologists sitting idle while others feverishly read. More modern Web-server architectures tend to better support such load balancing as they permit simultaneous downloads to multiple locations and radiologists.

Solution:

The best way to avoid the pitfall of the dumb worklist is to switch to a workflow driven by an intelligent worklist. This will minimize client complaints, stop cherry picking, and enable load balancing to provide the greatest consistency of turnaround time.

2. Vision-Dependent Workflow Navigation

Situation:

This pitfall is the issue of application proficiency. The key point is that in performing the many and varied computer tasks, the radiologist must be practiced, fluid and coordinated.

Another way to think of the pitfall is by understanding that image interpretation, at its core, is a radiologist looking at an image. Whenever your radiologists' eyes are not on a diagnostic image they are compromising both productivity and accuracy. Therefore, anything that requires radiologists to remove their eyes from an image is a potential impairment to workflow efficiency. The common culprits:

- Worklists
- Computer program menus
- Toolbar icons
- Keyboards
- Dictation screens

This is an all-too-common problem and the most likely issue to be overlooked because it "only costs a second here or there." Invariably, a large-group demonstration of tips that will save a few seconds here or there will draw eye rolls from some in the audience. But a check of the math shows that saving three seconds per study would amount to an extra study per radiologist per shift.

Needless to say, a simple analysis of your application interactions can go a long way.

Solution:

Ideally, a radiologist should have as much "eyes free" navigation of the reading platform as possible. If possible, right-mouse menus and toolbars should be avoided in favor of keyboard shortcuts, particularly if they can be mapped to supplementary mouse buttons or other some other human interface device (such as a dictation mic, grip, jog dial, or foot pedal).

Your radiologists should be able to perform virtually every common PACS function without interrupting image scrolling or taking their eyes off the images. Your workflow tools should also empower the radiologist to minimize the time spent looking at the dictation screen.

Some half-jokingly predicted that with digital imaging radiologists would all be herded to the geographic center of the country where they would read films in stalls like dairy cows. Fortunately it turns out that those stalls are rather pleasant and, more importantly, they are customizable.

Predictability and consistency in things like hardware and desktop preferences offer an important advantage to intelligent workflow distribution and will enhance your efforts to instill applications proficiency in your radiologists. Making a radiologist move from site to site with his favorite mouse in his pocket is no way to effect this change.

3. Comparison Cases on Film or Disk

Situation:

One of the most frustrating workflow experiences is having to compare a case on your current PACS with the patient's relevant prior exam on film, an older PACS system, or an outside CD/DVD.

It is an experience that can be mentally — and sometimes physically — straining because the light box or accessory viewing monitor is not within easy reach. It can also be frustrating because the controls on the viewer from the external CD/DVD are likely unfamiliar.

Solution:

With the issues of patient identification, lack of interactive PACS tools, and differences in scale and technique, there is no longer any role for analog film in radiology. Film digitizers are now affordable enough that any practice of any size should have one if necessary, and software is available to turn tiled film sheets into stacked digital images.

If you can't commit to such a digital transition, consider building up an old-case archive within the new PACS to provide a temporary solution before transitioning to the new PACS system.

You should be able to import external CD/DVD data into your PACS system. This is particularly important in a distributed practice so you can avoid shipping films and disks between reading sites. Unfortunately, some systems are not flexible enough to allow this without risking data corruption, and some CD/DVD cases are not in an importable DICOM-DIR format.

4. Working from Multiple Worklists and Multiple Computers

Situation:

Although every practice has to choose a primary worklist to drive their workflow, many practices persist in the use of multiple worklists. This is often due to the lack of integration between applications.

What's more, using two or more computers creates user confusion as the radiologist typically needs to shift back and forth between multiple keyboards, and multiple mice.

Solution:

Use one worklist — it's that simple. Ideally, that worklist should:

- Launch the PACS images
- Open the RIS study information
- Open the dictation window

To get past the problem of multiple computers, go beyond desktop integration to achieve application integration (see the sidebar for details).

5. Inadequate Bandwidth / Network Bottlenecks / Poor Caching

Situation:

Many hospitals have an inadequate hosting environment or suboptimal connections to the Internet. Applications hosted on servers from within the hospital or within its data center might work fine within the hospital local area network but often are suboptimal for use over the internet.

Also, hospitals often have low-capacity encryption devices which essentially place a cap on the available bandwidth to those outside the firewall.

It is amazing how tolerant radiologists can be when using teleradiology systems. On legacy telephone-based teleradiology systems, radiologists became accustomed to waiting for cases to download. In the modern era, it should be unacceptable for a radiologist to have to wait for data to transmit after a case is launched.

Solution:

When it comes to bandwidth, faster is always better. But it is also always more expensive. Simply put, you get what you pay for. Everyone worries that their expensive new computer equipment will become outdated soon after it is purchased. If you skimp on bandwidth, though, your system will be outdated even before you have it up and running. Jump in with both feet. Get the fastest system your budget allows and avoid the heavy cost of radiologist inefficiency.

All data transfers should occur before the case is viewed. Such pre-delivery of data is termed *caching or pre-caching*. Of all the strategies for overcoming bandwidth limitations,, image caching is likely the most effective..

Even over a high-speed Internet connection, however, cases take time to transmit, especially in the era of large multidetector CT studies. Consider the cautious use of compression at visually lossless settings to accelerate transfer times over existing bandwidth resources.

If a workflow engine can predict and prioritize the cases which are the next most likely to be viewed, then all of this transfer time can occur in the background while the radiologist is actively reading an existing case. On a well-designed system, the radiologist should perceive no performance degradation or delay between cases when using a PACS onsite versus using the same PACS as a teleradiology system.

Diagnostic Workflow: Problems

On a problematic system, you can wait seconds, even minutes between cases for data to download. If this takes 2 minutes on average per case, over a 120-case workload, this totals 4 hours of wasted time. (Remember how significant a three-second time savings was over the course of a year.)

Poor bandwidth or poor caching measurably impairs efficiency and can destroy the economics of a distributed practice.

6. Multiple Disparate PACS, RIS, and Dictation Systems in Multiple Locations

Situation:

In mid-to large-size groups with multiple locations, often the locations are not part of the same healthcare system and do not use the same brand of software applications. As such, these groups work off of multiple different workflows — which are, by their very nature, inefficient.

Each system comes with a different workflow, and a different username and password (which for security reasons must change all too frequently). Each different brand of system has its own unique software user interface. Not all PACS even use the same keyboard shortcuts or navigational controls. That means when rotating to a different facility a radiologist may work at a lower efficiency due to lack of system familiarity.

In a distributed practice, it is challenging to work on multiple different systems. This can result in radiologists working in a “war-room” like environment filled with computers that they need to rotate between to do their reads. At best, these practices use a paper worklist composed of faxes. At worst, they don’t have a real master worklist between applications and instead work on individual disjointed worklists.

The conventional alternative is even worse: driving between facilities or working in isolation from the rest of the group in a single facility. This results in wasteful travel time, poor ability to balance workloads, diminished capacities for specialization and intra-practice consultations even for large groups. Finally, as a practice grows, a heterogeneous set of workflows is not scalable.

Solution:

If your group wishes to grow and improve efficiency, it is critical to minimize your number of different systems. While it might not be possible to rid your practice of the multiple systems that the affiliated hospitals are dependent on, it is possible to aggregate your work (or at least your inter-facility load balancing work) across your facilities onto a single-reading platform.

Such a reading platform can be the one and only reading platform for a practice, which overlies all of the heterogeneous facility systems. In this way, a distributed practice uses a single worklist to drive a unified workflow.

7. Physicians Performing Non-Physician Work

Situation:

One of the most common causes of malpractice suits involves the miscommunication of results – particularly the failure to notify clinicians of important findings. In a typical practice, a radiologist might waste precious diagnostic time trying to track down clinicians, who seem to make reporting results more difficult than serving subpoenas. Such administrative work can be an obstacle course that frustrates and distracts the radiologist while eating up a good part of their workday.

After multiple attempts, a radiologist might forget about the notification task altogether. This not only compromises efficiency, more it can inadvertently lead to serious patient care issues.

Solution:

In any organization, the staff member who is paid the most should be limited to what only they can do. Radiologists are more expensive than phone operators; radiologists should not be working the phones.

Radiologists should certainly be available for phone consultation, but should not be tracking the whereabouts or phone numbers of the ordering or on-call clinician. (See “Best Practice: Clinician Finder” at right)

8. Outdated Non-Updateable Systems

Situation:

This problem is created by legacy systems which required substantial upfront capital to install but then remain relatively stagnant throughout their life cycle. For example, a hospital or imaging center typically seeks return on investment on the software but does not have the budget for major upgrades.

As a result, your group is stuck with outdated and inefficient software for years to come.

Solution:

This is perhaps the most serious workflow pitfall of all since it limits your ability to maintain state-of-the-art technology and it is, for the most part, out of your control.

Your best recourse, if no new system software is forthcoming, is to modify the existing applications to gain any efficiencies you can.

Best Practice: *Clinician Finder*

In one proven model, there is a call center staffed with people who do the behind-the-scenes, non-physician work of tracking down clinicians and technologists. This functionality is built into the workflow engine/reporting software.

Once a radiologist sees a critical finding on an image, a single mouse click triggers a critical finding call request to the call center. The exact time of the request is stored in the software as an audit trail. As soon as the clinician is found and comes onto the phone line, the radiologist is connected for the call. Neither party spends any time on hold.

Savvy Investments to Increase Efficiency

One way to escape most, if not all eight pitfalls is to consider investing in an overlying distributed reading platform. These Web-based systems are more affordable than the legacy systems (which tend to require expensive “big iron” workstations and on-premise hosted software). Nothing will restrict your synchronization and upgrade options more than some immutable, off-the-shelf software product.

Application Service Provider (ASP) and Software as a Service (SaaS) offerings allow you to avoid upfront large capital purchases and typically are available for a subscription or per-case fee.

These systems can even be hosted by the provider, saving you significant data center and IT personnel costs. Costs are shared across the customer base and your share is charged to you within the subscription fee.

The software is deployed and updated automatically via the Internet, ensuring that you always have access to state-of-the-art functionality. And unlike the integration issues you may face with your on-site system, your practice benefits from the advanced integrations already achieved between the PACS, RIS, and dictation systems.

Best Practice: *Application Integration*

Desktop integration puts all of a radiologist's work applications onto a single computer, though it can still have multiple viewing monitors. Application integration takes integration to the next level by getting the individual software applications such as the PACS, the RIS, the dictation system, and even the advanced visualization (3D) software to behave as a single functional unit. This level of integration begins with a single worklist that launches all of the software components needed for case viewing and dictation and allows for synchronized utilization of multiple applications

In typical workflows the RIS order, PACS images, and dictation file are opened from different lists and with different mouse clicks, exponentially increasing the risk of that worst practice nightmare: the dictation of the wrong images for a given patient.

Synchronizing these applications to launch together with a single mouse click essentially eliminates this risk while also streamlining workflow, and this is just one of the many such synchronizations you can perform in consultation with your vendors or with automation software and input devices.

Unfortunately, such levels of integration can be easier said than done. RIS/PACS integration may require cooperation between competing software vendors. More modern Web-based PACS systems tend to make integration easier by means of URL-integration. This means PACS images can be launched by any worklist that accesses the Web address of the images (as determined by the patient demographics).

Regardless, however, integration of RIS/PACS and a dictation system, is one of the single most important safety-improvement measures you can implement.

Understanding Load Balance

A distributed reading platform provides an intelligent worklist that determines the ideal radiologist at that moment in time for each case. (The intelligent worklist assigns cases to radiologists on the basis of the radiologist's credentials, specialty, and current workload.)

This case assignment feature is an effective way to load balance studies across multiple radiologists. For example, if all other factors are equal, a simple case assignment algorithm will give the new case to the radiologist with the shortest worklist. This tends to prevent situations where one radiologist is bogged down with a large worklist while another may have no work to perform.

A larger distributed practice can take advantage of load balancing across its reading locations especially if it leverages overlapping of shifts to maintain the greatest consistency of turnaround times.

In a non-distributed practice, there is no load balancing across facilities and limited ability to leverage overlapping shifts. The level of staffing in such a facility during a shift results in turnaround times that are relatively proportional to the hourly case volume at any given hour. The smaller the practice, the more the case turnaround time is held compromised by the health, availability and mood of a single radiologist. In larger practices, variances in daily performance or availability of radiologists are masked by the overall pool of radiologist capacity.

Conclusion

The expected efficiency gains of the digital era have not been fully delivered to radiologists due to workflow issues. By analyzing your workflow for likely pitfalls and working to resolve them, you can achieve greater efficiency.

Most of the pitfalls described in this white paper are the result of legacy systems provided by facilities to radiology groups for "free." Unfortunately, many of the solutions to the situations noted here require investment in upgraded or new systems, custom integrations, or IT infrastructure.

Unfortunately, "free" legacy software isn't free. Its cost comes in the form of decreased radiologist productivity. Major efficiency gains among your practice's radiologists not only pay for the technology, but are also your best way to defend against continually declining reimbursements.