



# Diagnostic Radiology Workflow with “at-a-glance” Air Traffic Control-like Methods Ensuring Patient Safety

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## Background/Problem Being Solved

Radiology departments have a variety of processes for managing patients undergoing general diagnostic exams, for example ICU CXR, OR miscounts, interdepartmental x-rays, and fluoroscopy. We present a physical process/ workflow that maximizes patient safety, similar to a companion high reliability organization: air traffic control and the methodology applied to controlling aircraft with handoffs ensured.

## Intervention(s)

We describe general diagnostic workflows that apply an “at-a-glance” process similar to air traffic control methods where physical flight strips have shown to be effective in combat trauma imaging triage. In addition to scheduled exams, each new exam study has an audible indicator and a physical location for displaying printed exam requests representing patients in various phases/locations. Our CT section also has a visual indication based on printed requests and color and location of folders, however, for this work, we focus on general diagnostic imaging.

## Barriers/Challenges

Paper driven workflows in radiology are continually questioned, for example “why don't we go 100% digital?” or “why do we move these requests from here to there?” Also, some might think that paper driven workflows are not “informatics” since no computers are involved; on the contrary, workflow processes ARE INFORMATICS by definition; computers or not.

## Outcome

Upon opening an additional hospital, we refined a paper driven workflow with consistent success in managing patients undergoing diagnostic radiology exams and procedures. We describe a positive chain of custody process of each patient with little to no opportunity to “drop the ball.”

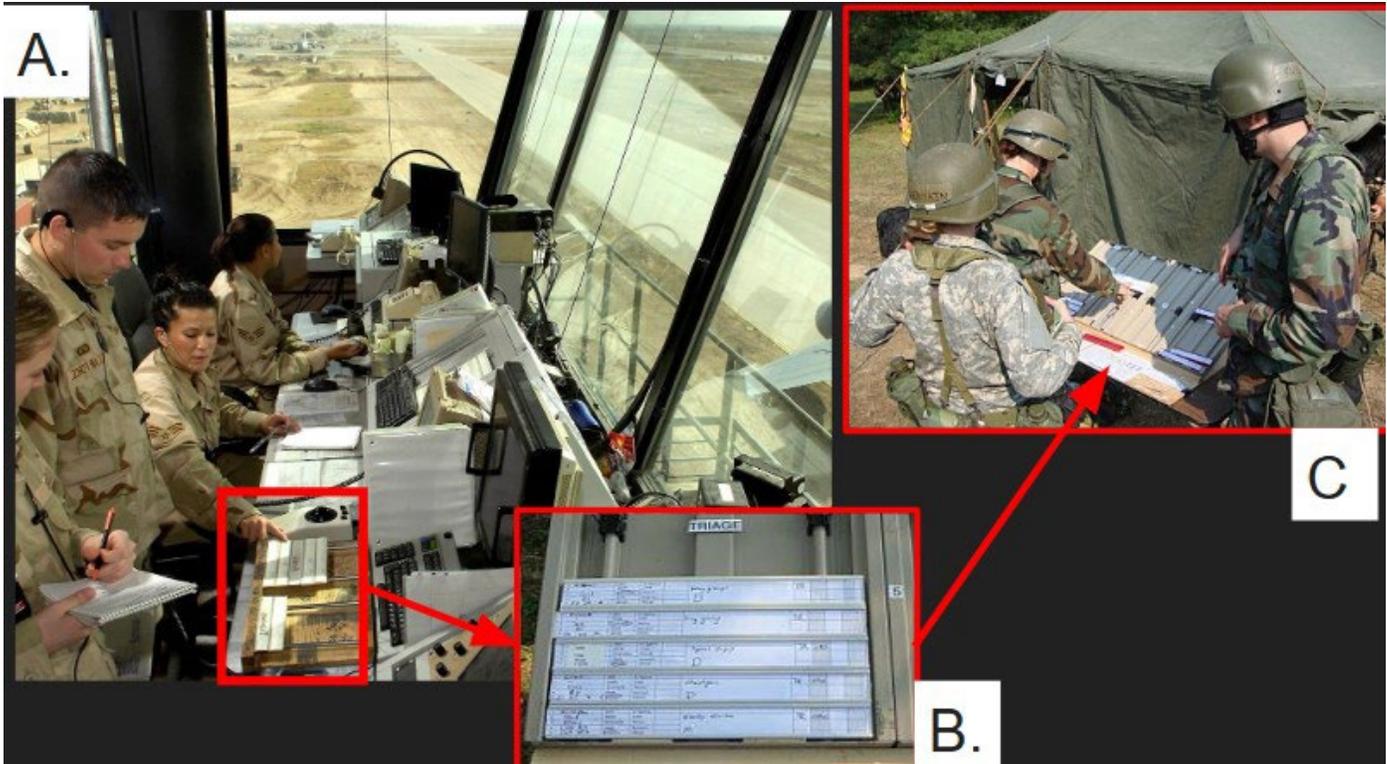
Technologist inputs that have worked in nearby medical centers and those recently out of training, overwhelmingly favor paper driven workflows over those completely digital. They share stories of where the ball was dropped, a patient had been waiting where technologists essentially forgot about them, where paper would have prevented the oversight. We plan on “a show of hands” during Q&A for those claiming to be 100% digital (since we believe there will be fewer, easy to count!).

## Conclusion/Statement of Impact/Lessons Learned

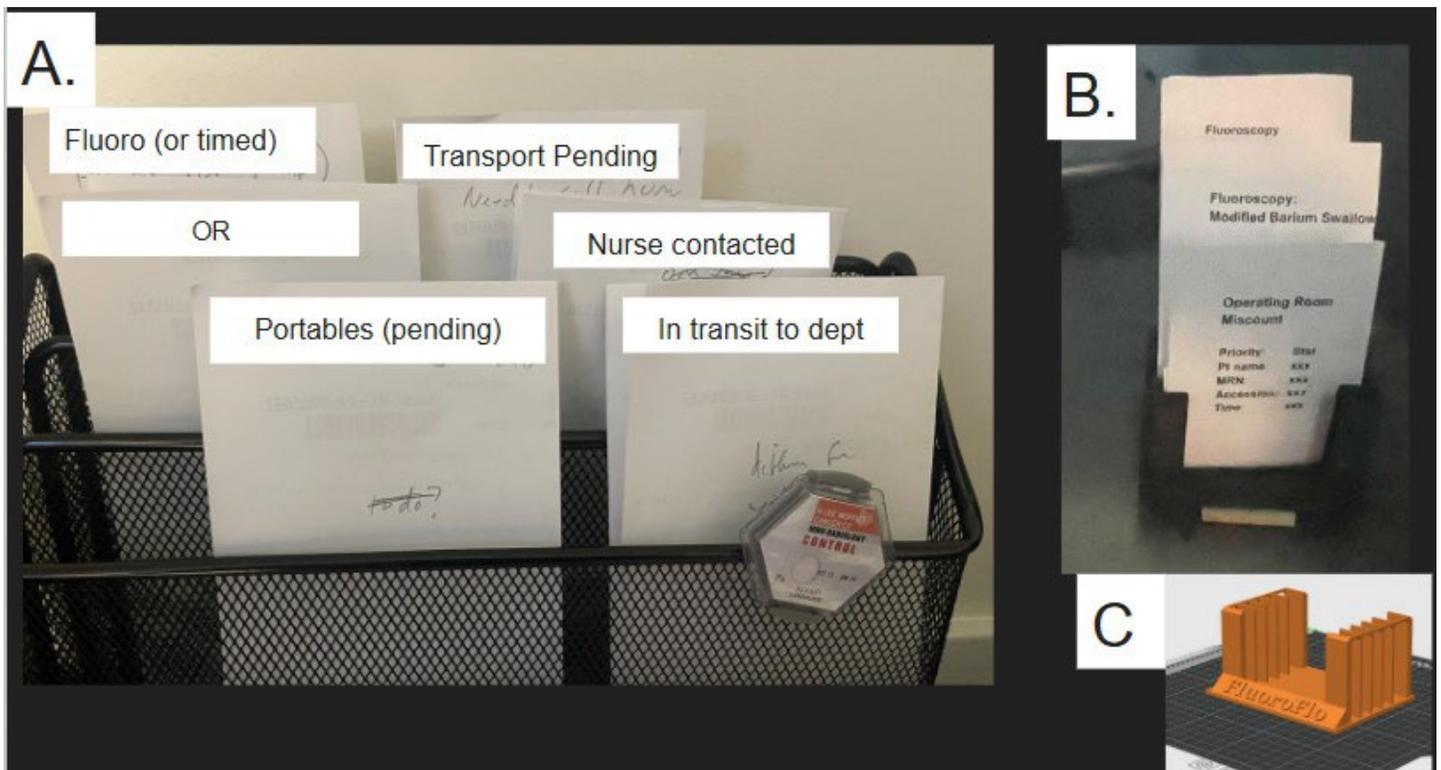
Patients have been known to be overlooked in some completely digital radiology workflows; for this reason, our center is not doing away with paper driven processes in the foreseeable future. Our paper requisitions maintain a physical chain of custody of each patient with an instant "visual contract" as to status at all times.

We share a clever display of paperwork driven by priority, location and status. If nothing else, our successful experience may help justify other imaging departments that continue to have a paper-driven workflow.

### Figure(s)



**Figure 1A.** shows air traffic controllers (in this case, the US Air Force in a control tower) using physical flight strips to "triage" airplanes for take off and landing clearances. Like healthcare organizations, airline operations are a comparative high reliability organization, where solid handoffs are critical. Air traffic controllers around the world insist on the physical process (there is no tolerance for control+alt+delete when two planes are on a collision course at the same altitude).



**Figure 2A.** shows our diagnostic radiology display for technologists with six categories of paper, labeled here to mimic actual requests (PHI-free). This system leverages a small vertical document holder with three slots divided into six categories where each folded request rests in each of the slots, depending on status. When a technologist returns from the OR or doing an ICU portable (for example), they can immediately see upon return to the control area what is pending where, and prioritize next patients appropriately. The radiologist covering diagnostic radiology/fluoroscopy can see instantly if they need to prioritize an OR miscount vs. a post IR lung biopsy to R/O a pneumothorax (for example). **Figure 1B.** demonstrates an example diagnostic radiologist workflow including fluoro, biopsy follow up, OR miscounts and other diagnostic imaging stats. Once exams have been logged, they are folded in half by technologists, with handoff to the radiologist. Some radiologists then fold the request again to fit into this 3D printed letter holder where they can see patient name, MRN, and exam pending dictation. We make the “flouroflo” .stl file available for those interested in 3D-printing and adopting similar workflows. This example indicates to the radiologist there are two fluoro cases to dictate, however, only after interpreting a stat OR miscount that the surgeon needs to know (e.g. is there a retained needle or sponge), before closing the patient.

## Keywords

Administration & Operations; Clinical Workflow & Productivity; Provider Experience; Quality Improvement & Quality Assurance