Streamlining Throughput with the Implementation of a CT Coordinator

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EXECUTIVE SUMMARY

- Imaging departments today are challenged with streamlining processes to keep up with advancements in healthcare, the increasing complexity of imaging studies and procedures, and bundling of charges for services rendered.
- Ordering providers are often required to get insurance pre-authorizations for imaging orders, and what is pre-authorized must be the study/procedure performed or reimbursement is not guaranteed. Insurance companies have inhibited radiologists from providing optimal service by placing restrictions on changing orders per radiologist protocol to best meet the individual needs of each patient.
- Many healthcare systems that are using a central scheduling model are losing money due to scans and procedures being inappropriately ordered and pre-authorized. Implementing a computed tomography (CT) coordinator can streamline throughput of imaging services in radiology departments.
- The CT improvement project described here used a Lean methodology Plan-Do-Check-Act (PDCA) approach to increase the effectiveness of an organization’s ability to maximize process efficiency and revenue.

As technological advancements are made and demand increases for imaging services, evidence-based throughput strategies must be employed to improve the effectiveness of an organization’s ability to increase process efficiency. The following computed tomography (CT) improvement initiative is a process change that utilized the Plan-Do-Check-Act (PDCA) Lean methodology approach to streamline throughput of outpatient CT studies at Sacred Heart Health System (SHHS) in Pensacola, Florida. This article will outline the assessment, planning, implementation, and outcome phases of the change process. Volumes associated with the improvement initiative, anticipated costs of implementing the change on a full time basis, and a summary of the reimbursement data to identify the potential profit margin of the new process will be reviewed.

Assessment/Planning

Identified failure points in the CT processing system were adversely affecting patient safety and satisfaction, employee satisfaction, efficiency, effectiveness, revenue, and workflow of daily operations in this division of the imaging department (Figure 1). These failure points included:

- Scheduling discrepancies
- Ineffective communication with community healthcare providers and patients
- Inadequate patient education
- Bottlenecks in throughput specific to lab processing
- Employee dissatisfaction due to the inefficient workflow
- Patient dissatisfaction with the oral contrast consumption protocol

By eliminating non-valued steps in the process using the Lean Six Sigma PDCA approach, and re-distributing task responsibilities, adversely affected components of the system were revised to improve throughput while creating a new high quality, evidence-based process (Figure 2). The change process promotes an ease of workflow; is aligned with the mission, values, and vision of the organization; and complies with both state and Joint Commission regulations. Stakeholders include leaders and front line personnel from imaging, pharmacy, lab, outpatient services, and education department, as well as the providers in the community and patients receiving medical services.
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Figure 1. Current Outpatient CT Throughput Process

- Identified high risk patients get lab work done prior to scheduled imaging appointment
- Appointment made through hospital Central Scheduling Department
- Physicians Office/Specialists order CT scan
- Lab work starts
- Patients arrive on scheduled scan date
- Non-contrast scan performed
- Procedure explained, Consent obtained, IV started
- Patient returns home

Failure Point: Incorrect exam requested, ineffective communication with referring physician, patient not properly educated on timeframe expectations for dosing and scan.

- Questionnaire indicates previous reaction to contrast that was not identified by provider prior to scan date
- Reschedule patient for pre-medication and scan to be performed at main hospital
- Lab draw complete, patient returns to CT waiting area for lab result posting
- Patient sent to lab for Blood Draw
- Oral contrast dosing begins (approx. 1.5 Hours)
- Patient monitored for reaction
- Patient returns home

Failure Point: Patient dissatisfaction—dosing timeframe/wait time

- Safe lab parameters—oral contrast administered (approx. 1.5 Hours)
- Patient returns home

Failure Point: Unsafe lab results—patient to follow up with physician

- Rescheduled

- Oral contrast administration

Contrast Media Reaction

- Beside reaction
- Treat reaction
- Rescheduled

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**Figure 2** - Proposed “Lean” Outpatient CT Throughput Process

- **Physicians Office/Specialists order CT scan**
- **Appointments made through Central Scheduling**
- **Contrast Studies**
- **Patients with history of contrast allergy receive pre-medication prior to appointment date**

**CT COORDINATOR**
- At risk patients provide order for lab draw with result confirmation that CR & eGFR are WNL prior to scan date
- Questionnaires will be completed
- Patients will receive contrast administration education
- Scan date/time reviewed and questions answered
- Liaison for doctors offices
- Obtains lab results from outside agencies
- Communicates with CT Control desks for AMP, main hospital, & Imaging Navigator for optimal scheduling
- Pre-Authorized Add on patients – POCT lab draw with Stat result

**For Non-contrast Studies**
- **Procedure explained, Consent obtained, IV started**
- **Patients arrive on scheduled scan date**
- **Scan is performed with IV contrast**
- **Patient monitored for reaction**
- **Contrast Media Reaction**
- **Unsafe lab results – patient to follow up with physician Rescheduled w/Hydration**

**Non-contrast scan performed**
- **Patient Returns Home**

**Procedure**
- Patients with history of contrast allergy receive pre-medication prior to appointment date
- **Patients arrive on scheduled scan date**
- **Procedure explained, Consent obtained, IV started**
- **Scan is performed with IV contrast**
- **Patient monitored for reaction**
- **Contrast Media Reaction**
- **Unsafe lab results – patient to follow up with physician Rescheduled w/Hydration**

*File Room to escort patients back to CT scanner area at Main Hospital*
A literature search was conducted to compile evidence-based research data to support the improvement initiative. The following were components of the proposed change:

- A revised contrast questionnaire form was constructed to remove non-valued information and improve workflow.
- A blood draw competency for technologists was devised to ensure proficiency of front line personnel in performing point-of-care (POC) blood draws to eliminate the bottleneck occurring with lab processing.
- A CT coordinator role was developed to decrease scheduling discrepancies and improve communication with providers and patients (Figure 3).
- A coordinator checklist was devised to ensure patients would be prepared and comprehensively educated on their scheduled intervention prior to the day of the procedure (Figure 4).
- The system was revised so that patients would have a choice to consume oral contrast at home versus at the facility prior to scheduled scans.

The Joint Commission was contacted to ensure that the proposed changes were in compliance with the organization’s regulations and standards. Multiple meetings were held with stakeholders within the organization during the planning phase to ensure that the finalized process was a collaborative integration of ideas that could be implemented successfully. The Institute of Medicine’s (IOMs) six aims for improving quality care and the “Radiology 21st Century Quality Indicators” were used as a framework to substantiate the proposed improvement initiative. A healthcare organization that achieves major gains in meeting the IOM’s 21st Century Aims for Quality Care will be far more effective at meeting the needs of patients seeking medical services (Figure 5).1

### Implementation

Due to budget constraints, an additional full time equivalent (FTE) was not initially granted for the proposed CT coordinator role. An internal CT technologist expert was briefed on the change initiative and asked to participate in piloting the CT coordinator position. The new process was piloted two days per week with minimal overtime cost to the organization. A staff meeting was held with all employees involved in the pilot process prior to its launch to formally present the improvement initiative, instruct staff members on the change process, and answer questions.
At this meeting, all vested employees were verbally instructed on the imperative team approach that must occur during the pilot phase of implementation in order to substantiate sustaining and standardizing the evidence-based change. Starting on a culture changing journey is challenging for all employees involved, but the transformation empowers personnel to improve the quality of services rendered. As implementation of the initiative ensued, meetings continued to be held with stakeholders to revise and refine identified workflow issues associated with the piloted process to further improve throughput. As proposed changes were implemented, outcomes reflected success. After evaluating the remarkable initial outcome data, the FTE for the CT coordinator position was granted by the hospital’s executive board. The change process has been successfully implemented and sustained on a full time basis since 2012.

**Volumes**

Volume data depicting the need for change and reflecting the success of the CT improvement initiative was derived from tracking:

- Scheduling discrepancies
- Cancellations
- Reschedules
- No shows
- Budgeted versus actual number of scans performed
- Number of patients requiring labs prior to procedure
- Patient satisfaction
- Employee satisfaction
- Early, on time, and late start times
The central scheduling department consists of non-clinical personnel who are responsible for scheduling all imaging studies for five Ascension Health facilities, including SHHS. The complexity of CT imaging studies and interventions presents a challenge for non-clinical staff members tasked with appropriately scheduling scans and procedures. In the first pilot month of the CT improvement initiative, 39% of the procedures scheduled were found to have discrepancies. Several of these discrepancies involved the scheduling of certain types of scans in multiple time slots when only one time slot was needed to complete the procedure. Catching these discrepancies in advance has allowed the CT coordinator to open up inappropriately scheduled time slots to schedule additional scans, improving throughput and revenue.

The CT coordinator has been able to ensure that patients are properly scheduled and prepped for their procedures prior to the day of the scan, minimizing discrepancies to reduce cancellations and reschedules. Patients are contacted and reminded of their upcoming scheduled procedures to minimize the no-show rate. The results indicate a positive downward trend that can be, in part, attributed to the piloted change process. The CT coordinator verifies that the scan/procedure ordered is indicated, pre-authorized, properly scheduled, and performed, decreasing reimbursement discrepancies.

Expected annual net revenue per scan is roughly 34% of the billable amount. Increasing capacity by one scan per week can increase annual net revenue from anywhere between $12,216 to $286,981 according to the billable amounts charged by the hospital for services rendered. An increase of one scan per day can yield, annually, between $61,084 and $41,434,908 depending on the type of scan performed.

The Medical Executive Committee at SHHS approved the implementation of a newly revised contrast policy prior to the start of the improvement initiative pilot process. It is important to continuously evaluate and update system processes to minimize the use of outdated information and maximize evidence-based practice. The first order of business was to ensure the implementation of this best practice policy to promote patient safety. Since lab processing was already considered a failure point in the throughput process, the number of at-risk patients that were falling under the new policy versus the old policy was tracked to further substantiate the benefit of a process change. The number of at-risk patients requiring labs prior to procedures incrementally increased after the implementation of the revised contrast policy; this data supports the proposal that lab draws should be completed prior to the day of the scheduled scans, and point-of-care blood draws should be performed on same day add-on patients in order to reduce bottlenecking, maximize throughput efficiency, improve patient satisfaction, and positively impact revenue.

Early, on time, and late start time volumes were tracked to gauge workflow during the first several months of the piloted change process. An improvement in workflow will positively impact throughput. Decreased wait times improve process efficiency; maximizing efficiency positively impacts revenue.

Outcomes

Metrics to evaluate the effectiveness of the improvement initiative included tracking:

- The monthly measured volume of outpatient procedures
- Early, on time, and late procedure start times
- Cancellation, re-schedule, and no show trends
- Discrepancies found on piloted days of the month
- Captured time slots

It is important to continuously evaluate and update system processes to minimize the use of outdated information and maximize evidence-based practice.
Employee satisfaction can decrease staff turnover, which in turn decreases human resource marketing, hiring, and training costs. A survey was administered during the sixth piloted month of the change process to gauge the level of impact that the improvement initiative was making on employee satisfaction. One hundred percent of employees surveyed agreed that the change process improved their job satisfaction, allows them to focus more on patient safety and satisfaction, and improves the overall quality of the medical services provided in the CT division of the Imaging Department. The improvement initiative has positively impacted the culture of this Imaging Department division.

Cost and Reimbursement

The anticipated cost associated with transitioning the CT improvement piloted process into a sustained change initiative required minimal financial investment; approval of one FTE was the only requirement for sustainability of the CT coordinator position outside of the purchase of a locked storage cabinet in the outpatient setting to house POC supplies and contrast media. Having more than one technologist trained to function in the coordinator role allows for rotation to minimize burnout, and promotes maintenance of technical skills to perform studies in the hospital, emergency department, and outpatient settings. Additional resources are not required to establish a rotating coordinator system, but it is recommended that the individuals working in this position have the level of experience and knowledge needed to effectively and efficiently schedule and process patients for complex studies.

Procedures in the CT division of the Imaging Department are billed by scan type. As previously stated, 34% of the billable amount is an approximate total net revenue average percentage for all payer sources combined. This percentage was used for determining the net revenue and profit margin for the change process.

The active role that the CT coordinator has played in fixing scheduling discrepancies to open additional time slots has increased revenue for the organization. The expected net revenue generated by these captured time slots, and the appropriate ordering, scheduling, and pre-authorization of scans yields a positive projected annual net profit margin even when the investment for project sustainability is subtracted out at the current rate of success. Scan types are expected to vary from month to month so fluctuations are expected in the projected annual net revenue. Captured time slots and reductions in cancellations, re-schedules, and no shows are reflected in a reported 22% increase in outpatient net revenue over the projected revenue for the three piloted months of this project.

Conclusion

This initiative was sustained to improve throughput in the outpatient CT division of imaging departments, but has concepts that can be applied to several other divisions. Clearly defining and exceeding the goals, objectives, and anticipated outcomes with minimal cost validates that the CT coordinator is a value added position. Tracking volumes has been an important component to substantiate the correlation between the pilot process and the increase in revenue. Using initial outcome data to calculate and reflect a recognizable increase in net revenue to support the proposed full time implementation of the change process. The change process is an efficient, effective, and equitable change to improve revenue, patient safety, and promote both patient and employee satisfaction.

References

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Continuing Education

Streamlining Throughput with the Implementation of a CT Coordinator

Home-Study Test

1.0  Category A credit  •  Expiration date 2-28-18

Carefully read the following multiple choice questions and take the post-test at AHRA’s Online Institute (www.ahraonline.org/onlineinstitute)

QUESTIONS

Instructions: Choose the answer that is most correct. Note: Per a recent ARRT policy change, the number of post-test questions has been reduced from 20 to 8.

1. Which of the following is not a benefit of using the PDCA framework as a model for process change?
   a. The use of specialty trained leaders called Black Belts, Green Belts, or Master Black Belts to manage and oversee the change process.
   b. Lean process that allows all stakeholders to actively participate.
   c. Expetitious and repetitive process for continuous improvement
   d. Decreased organizational burden

2. Patient dissatisfaction with the initial CT throughput process included all but which of the following components?
   a. Oral contrast dosing
   b. Lab/blood work processing
   c. Education
   d. Image quality

3. Identified failure points in the imaging department with the initial throughput process included all of the following except:
   a. Scheduling
   b. Communication between ordering providers, patients, and the radiology team
   c. Staffing
   d. Patient education

4. Components of the “Lean” change process include all of the following except:
   a. Implementation of a CT coordinator
   b. Decentralized scheduling
   c. Checklist to ensure comprehensive care
   d. Revised contrast questionnaire

5. Allowing patients to pick up and consume oral contrast at home prior to a CT scan appointment complies with The Joint Commission regulations.
   a. True
   b. False

6. Data collected to evaluate success of change process includes all except:
   a. Cancellations, reschedules, no-shows
   b. Patient satisfaction
   c. Employee dissatisfaction
   d. Budgeted versus actual number of scans performed

7. A component of the PDCA model is the:
   a. Steering committee
   b. Tollgates
   c. Sponsor and champion
   d. Ongoing training and active participation

8. The CT coordinator role includes all of the following except:
   a. Manage staffing levels
   b. Liaison for referring providers
   c. Verify correct scan is ordered
   d. Liaison for patients