Creating an Outpatient Center of Excellence in CT

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CT examinations represent a substantial portion of the workload for many radiology departments, and optimizing service delivery is a critical function to ensure customer satisfaction. This article describes how the Six Sigma methodology was used in the radiology department at a large academic hospital to improve the patient experience and increase CT capacity while reducing waste and improving staff satisfaction. The 5 distinct phases of Six Sigma are reviewed as they apply to our CT Center of Excellence project: define, measure, analyze, improve, and control. Process metrics used in this project include the percentage of outpatient CT exams started within 5 minutes of the scheduled appointment time, and the number of studies with protocols selected >48 hours before the CT exam is performed. Outcome metrics include monthly department expense per scan and CT Press Ganey "standard test and treatment" mean scores. An approach to developing interventions is described based on identifying critical sources of variation, ranking these by creating risk prioritization numbers, performing root cause analysis, and utilizing the failure mode and effects analysis tool to prioritize possible solutions. Finally, the key features of action plans and a control plan are reviewed.

Key Words: Six sigma, patient satisfaction, outpatient imaging, practice quality improvement

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INTRODUCTION

Medicine has been transformed by the use of CT, which has risen dramatically because CT provides enhanced diagnostic information and improves patient care. At our academic hospital, the CT department includes 32 budgeted staff full-time equivalents (FTEs), the majority of which are CT technologists (29 FTEs). The department operates 9 scanners and provides services for outpatients, inpatients, and emergency department patients. CT exams of the head, chest, and abdomen are the most common exams—each protocol is based on the provided indication or signs and symptoms of the patient. Our department performs a total of approximately 90,000 scans annually.

A multitude of factors are driving radiology departments to improve the patient experience and efficiency of CT-related services, including decreasing imaging volume, declining reimbursement, and a transition to value-based reimbursement linked to outcomes such as patient satisfaction and cost of care. Service delivery is one of the prime functions of a radiology department; these departments must understand the critical role of process in customer service delivery and satisfaction [1]. Active engagement of all staff involved in the radiology imaging chain is necessary to deliver safe, effective, and timely services [2]. However, a variety of complaints that have an impact on the patient experience can arise in a busy CT department, as indicated by the following excerpts:

CT technologist: "The phones are constantly ringing and I can't focus"; "I'm still waiting for a protocol;"

Radiologist: "What does the script say?"; "No one is answering the phones in the department;"

Patient: "When are they going to take me, my scheduled time was for 1:00 PM?"; "No one told me I would have to drink anything."

Six Sigma is an organized problem-solving methodology that begins with the fundamental premise that quality is defined by ***conformance to requirements***—with *requirements* determined by the customers of a process [3]. This article describes the use of this methodology in our department to improve the patient experience and increase patient throughput (our customers' requirements). Six Sigma has previously been used in radiology departments to decrease MRI report turnaround time and the number of staff FTEs needed [4], reduce patient CT wait times and eliminate a backlog of reports in a film library [5], and decrease complaints from physicians while improving patient satisfaction [6]. The Six Sigma methodology consists of 5 distinct phases: define, measure, analyze, improve, and

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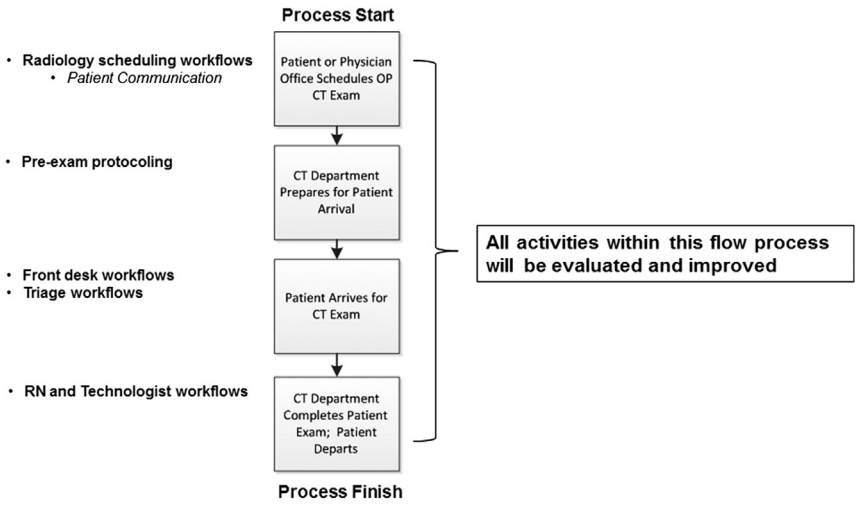

Fig 1. Process flowchart for outpatient CT process at the University of Pittsburgh Medical Center Presbyterian Hospital. OP = outpatient; RN = registered nurse.

control. Each phase is discussed as it applies to the CT Center of Excellence project at our hospital.

DEFINE PHASE

CT examinations are an important component of the overall revenue stream of the University of Pittsburgh Medical Center (UPMC) Presbyterian Hospital, and it was recognized that focusing on the "critical-to-quality" processes and listening to the "voice of customer" (VOC; our patients), would create the potential to increase capacity, increase market share, and decrease the average cost per CT scan. Performing just one additional CT scan per weekday could create a significant increase in the annual contribution margin for the hospital. The first step of this project was to *define the project scope*, which is one of the most critical aspects of the Define Phase, as the scope statement creates a blueprint for the project and prevents unplanned "detours" commonly known as *scope creep*. Scope statements should identify relevant start/stop points of the project and clearly identify "out of scope" processes.

The scope of our project was to improve the process designated "Outpatient CT experience for patients at UPMC Presbyterian," starting at the point of scheduling the exam and ending at the completion of the exam. All internal operational activities evaluated for change and improvement included:

- Radiology scheduling;
- Pre-exam protocoling;
- Front-desk workflows;
- Triage workflows;
- Nurse/technologist workflows.

The CT department is the only modality that is in scope for this project. All other radiology modalities are out of scope owing to unique workflows and protocols.

The Six Sigma methodology utilizes an *iterative approach* to problem solving, beginning with a process flow diagram that progresses through a series of steps that become progressively more granular. A high-level process flowchart is helpful to identify sources of variation in the process and potential process measures (Fig. 1).

The suppliers, inputs, process, outputs, and customers (SIPOC) diagram (Fig. 2) for a specific process identifies suppliers and customers, followed by the *inputs* that are high-level sources of variation in the process that become the first iteration of critical Xs (critical

Suppliers	Inputs	Process	Outputs	Customers
Triage	Triage Exam "Start" in Imagecast	Radiology Triage	CT department notified of patient start in triage	CT
Triage	Patient brought into triage room for triage care		Patient is in the appropriate location for triage care to take place	Patient
Triage	Patient ID verified		Patient safely identified and ready for clinical care	Patient
Triage	Patient exam and prescription verified		Patient is confirmed to be prepared for the ordered exam	Patient
Triage	Patient receives pre-CT triage patient care		Patient has IV placed if applicable, screening, and contrast provided	Patient
Triage	CT department is notified of "patient ready" status		CT department is now aware of the time the patient can be scanned	CT

Fig 2. SIPOC diagram for the triage process. ID = identification; IV = intravenous; SIPOC = suppliers, inputs, process, outputs, and customers.