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Using Qualitative Measures to Improve Quality in Radiation Oncology

Amy S. Harrison, MS,[1] Yan Yu, MBA, PhD,[1] Adam P. Dicker, MD, PhD,[1] and Laura A. Doyle, MS[1]

Abstract

This article introduces the use of qualitative research techniques in the field of radiation oncology with respect to quality improvement initiatives. The qualitative techniques used in this research include field observations and in-depth, one-on-one interviews with radiation therapy technologists. The observations were conducted in a fast-paced academic institution. This high-pressure, high-throughput environment provided an interesting location for observation of behaviors, workflows, and areas of improvement. Qualitative research is a useful platform for formulating questions and addressing the environment on a larger scale. The information resulting from this research led to immediate changes that improved the efficiency and effectiveness of care provided to patients and identified future initiatives to improve patient safety and the timeliness of care provided. Overall, qualitative research proved to be an exceptional resource for identifying and evaluating a clinical department and demonstrated the usefulness of this method of research for future work.

Keywords

quality, safety, qualitative measures, radiation oncology

There have been multiple areas of research studying quality in radiation oncology. Quality is embedded in every core function within a radiation oncology department: quality of a linear accelerator, a treatment plan, patient management—the list is endless. Core research and publications to date revolve around the quality process and "how to" manuals to maintain consistency and quality with respect to different radiation delivery modalities.[1-3] Generally, these publications are written by groups of highly experienced specialty physicists and radiation oncologists working together in task groups and sanctioned by national societies such as the American Association of Physicists in Medicine and/or the American Society for Radiation Oncology. These task group reports cover a variety of topics ranging from education to routine quality assurance to specialty procedures.[4-6] Process maps, fault trees, and failure mode and effects analysis are a few quality improvement tools used to analyze and improve quality management in radiation oncology.[7,8] These authors have presented groundbreaking and novel approaches to the prevention and analysis of treatment errors.[9,10] These reports are expansive and will not be included in the scope of this research. The reader is referred to these professional organizations for a complete list and details of each task group report. Despite the number of guidance reports available, there are limited publications on the human aspects of quality, such as communication and teamwork.

Quality in radiation oncology is a difficult term to quantify because of the various technologies across the field, complex treatment regimes, and variability of care in the field as well as the mixed patient caseload. With such complexities, universal metrics of quality have yet to be defined in radiation oncology. Landmark quality papers such as the Institute of Medicine reports discuss the components of quality in health care defined by the ability to deliver safe, effective, efficient, equitable, timely, and patient-centered care.[11] To assess some of these components of quality care in radiation oncology, this study analyzes departmental workflows at the point of service for the treatment delivery process. The purpose of this study was to assess the use of qualitative analysis tools, including observational-based evaluation and qualitative interviews, as a technique to identify workflow and quality issues.

[1]Thomas Jefferson University Hospital, Philadelphia, PA

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Corresponding Author:
Amy S. Harrison, MS, Thomas Jefferson University Hospital, 111 South 11th Street, Rm G-321, Philadelphia, PA 19107.
Email: amy.harrison@jefferson.edu

Methods

Because the environment plays an important role in influencing quality and safety,[12] the treatment consoles of 2 linear accelerators were chosen for this research. A linear accelerator is the workhorse of external radiation therapy—a complex machine driven by qualified staff known as radiation therapists. The treatment console is the nexus of control for radiation delivery, patient imaging, and dose tracking/charting; it consists of multiple computers used by 1 or as many as 6 staff members at any time (Figure 1). This location was chosen because of the complexity, workload, communication, group cohesiveness, and work processes that characterize this hub. These 2 treatment consoles are located in the basement level of a radiation oncology department within an academic hospital setting; all staff mentioned are hospital employees.

The observational field experience created an opportunity for the researchers (2 medical physicists) to passively observe the clinical environment, obtain field notes, and later generate an interview guide used for one-on-one, in-depth, open-ended interviews with several radiation therapists. This was a formative evaluation, the purpose of which was to evaluate and improve the workflow, process, and environment of care focusing on the radiation therapy technologist (RTT) at the treatment unit.[13]

The timing for this project was ideal because of recent transitions in staffing, scheduling, and clinical procedures as well as disturbances from demolition and construction of 1 of the 4 treatment machines in the department. Construction forced the department to have extended treatment hours, causing RTTs to arrive at 6:00 AM, with treaments every 15 minutes from 7:00 AM to 6:00 PM. In an effort to provide timely, patient-centered care, one departmental focus was to optimize scheduling and workflow. This effort to optimize scheduling was complicated by increased clinic hours and increased patient volume per machine because of a scheduled machine replacement. Additional challenges came from the constant evolution of technology in patient care and included several new treatment technologies, the pursuit of meaningful use certification[14] of the departmental electronic medical record (EMR), and implementation of a departmental paperless environment that required significant effort and collaboration among individuals, considering the previous paper-based workflows.

The accumulation of these changes increased staff stress levels and dissatisfaction, as evidenced by employee satisfaction surveys. This dissatisfaction was cause for concern because of the fear that it could have an impact on patient safety. Divisional imbalance (eg, physician to nursing or physician to therapists) has an impact on communication and thus may lead to increased error rates in hospitals.[15] Additionally, multiple complaints from RTTs regarding the new scheduling, treating alone, 1-person warm-up, leadership, equipment not working, and poor training required attention and further investigation. This situation led to a focus on staff concerns relevant to quality; however, the qualitative research techniques that will be described may be used to evaluate many aspects of quality in radiation therapy.

The goal of this observational exercise was to review radiation therapist working conditions on an average treatment day and to discover the main concerns and issues that may go unnoticed by department leaders or may not be raised as concerns during traditional staff meetings or interviews. In an effort to understand the day-to-day pressures on the treatment therapists, a 10-hour observation (6:30 AM until 4:30 PM) was conducted at 2 treatment units. Because the observers were senior physicists in the department, the observation would be classified as an "observer-as-participant" relationship. This resulted in an overt observation, during which the physicist was involved in some of the activities, and there was a mutual awareness of the research process.[16]

During an observation, every detail may be important: physical setting, participant descriptions, communications (both verbal and nonverbal), and actions, among others. A brief excerpt of the field notes from the observation is provided in Table 1.

Collectively, 2 physicists spent 20 hours of time observing the linear accelerator console and environment as described. During these observations manual transcription was used to record as many details as possible about conversations, interactions, and observation between and among various staff members within the department: RTTs, nurses, physicians, physicists, transporters, residents, and dosimetrists. Manual transcription was used in lieu of electronic recording to comply with internal review board recommendations.

Results

The field notes from this observation were analyzed and coded by identifying and tallying occurrences of each theme. Although there are commercially available software programs to aid in this process, the traditional method of paper-based field notes and flagging similar themes with sticky notes can be implemented at no cost (Figure 2). Observer transcripts of staff conversations and interactions are broken into sections based on topic and usually are separated into large categories known as themes, with smaller divisions in each theme known as codes or nodes. The codes indicated similar patterns or subject matter for each observation and allowed the observation items to be categorized into 8 themes: patient interactions, work satisfaction, scheduling, equipment and technology, processes, communication, training, and food and drink. Some of these themes

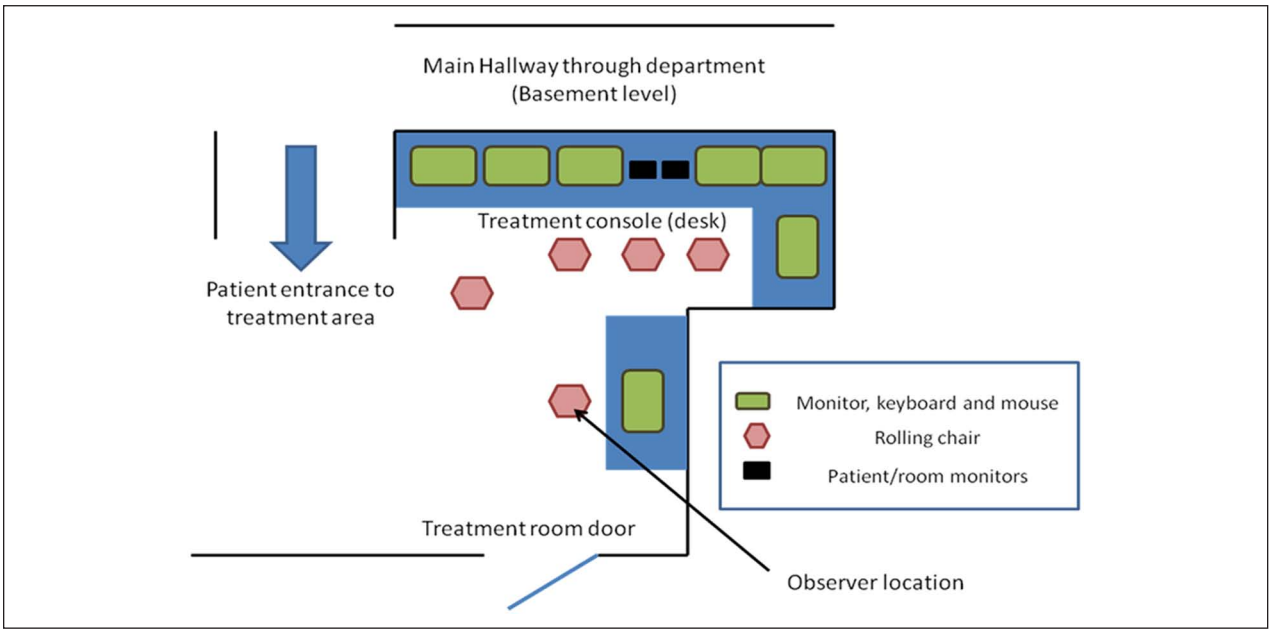

Figure 1. Depiction of the treatment console area and setting for direct observation.

Table 1. Excerpts From Field Notes Regarding Physical Environment.

The treatment area observed is an open work space. This area serves patients receiving radiation on a linear accelerator for cancer treatment. On the observation date, there were 22 and 23 patients scheduled on respective machines. The treatment console area supports 5 computer monitors on 1 counter, a cabinet above it holds patient charts, and 2 chairs across an open space and approximately 8 feet from another treatment console with a similar work space. Both work areas are cluttered with papers, binders, and clipboards on the desktop. Between each work space and treatment room is another computer on a smaller counter space. This smaller work area provided the location for both observers with a view of the console, hallway, and the entrance to the treatment room

Figure 2. Coding of field notes.

corresponded with staff dissatisfaction, an early interest identified in these observations and the subsequent focus of this work. The 3 themes with the highest frequency are discussed in this section in greater detail. Table 2 displays the breakdown of documented observations by category and frequency.

The top 3 categories included scheduling, communication, and work satisfaction. The scheduling category was broken into 6 codes: staff schedules, RTTs treating solo, patients arriving early/late, use of EMR scheduling system, understanding of treatment unit schedule, and adhering to treatment schedule. The topic of staff schedules had the greatest frequency of observation. Items ranged from lack of engineering presence during scheduled linear accelerator times and confusion over current schedules to satisfaction with current schedules. One excerpt from the field notes demonstrates 1 individual's satisfaction with the change in work schedules:

> RTT3 makes the statement about her 4-day workweek/3-day weekend: "It's like being a teenager again, I'm all smiles on the way home on Thursday nights."

Discussions about on-call duties ranged from compensation to competency and raised some important concerns

Table 2. Major Field Observation Categories Identified by Frequency of Occurrence.

Scheduling	26	Training	11
Communication	18	Patient interactions	10
Work satisfaction	19	Food and drink	10
Equipment and technology	17	Processes	10

about operations with minimal staffing during off hours. One important issue was a new policy for weekend treatment schedules that compensates the therapist with flex time rather than additional pay for weekend call. The therapists also expressed concerns that not all the weekend call staff "knows warm-up for SBRT/Hexapod" [stereotactic body radiotherapy specific; a complex device used for some treatments]. These observations were quite eye opening because they dealt with situations that had not been known by clinical leaders within the department. The sections of coded field notes relating to RTTs treating solo showed that therapists worked alone at the consoles for 1 hour 14 minutes in an 11-hour treatment day. In addition to concerns about staff-related schedules and operations, patients also influenced the therapist's daily treatment schedule by their actions. Observation showed that patients routinely arrived early for treatment—anywhere from 18 minutes to 70 minutes early for their appointment time. There are multiple reasons patients arrive early, including concerns over city traffic, other physician appointments, the hope of being treated early, and camaraderie with other patients. Patients enter the department an average of 42 minutes early, thus adding more pressure to the schedule of RTTs and causing them to try to accommodate the patients by treating them as soon as possible.

The nodes from the transcript pertaining to the EMR and scheduling demonstrated that the system is not being used effectively to communicate patient status, timing, and types of quality assurance needed among members of the department. Analysis of "understanding of treatment unit schedule" showed that multiple departments affect the workflow of the treatment unit by adding unscheduled tasks or delays into the RTT's day. The following observation describes the experience of delays in communication and multiple points of contact:

> 11:56 RTT2 states, "Patient way off, maybe it has something to do with her arms?" RTT1 responds, "Who's her doctor?" RTT3 answers, "Dr X, yeah it's her arms." RTT2 states, "We gotta do something—it's 1 off." RTTs take port films. Reviewed images with physicist, paged attending—no response; paged covering physician who was off site at a satellite hospital one block away; he states he couldn't do anything and suggested paging a resident. RTTs paged resident. Covering physician instructs therapists to take the patient off table and he'd review it on his return to department. Physicist text-paged primary physician; she responded that it was ok to repeat the CBCT [cone beam computed tomography] and treat. RTT requested more frequent imaging; MD stated she would change the prescription.
>
> 12:22 Second CBCT good. Patient starting treatment.

The last node analyzed, "keeping to treatment schedule," showed that despite starting 20 minutes late and all the disruptions, the treatment machines ran mostly on schedule all day, and 1 machine even finished early. Scheduling of both the patient and employee shifts emerged as an underlying issue of dissatisfaction and a potential area for improvement.

The "communication" category was easily broken into 4 codes: pleasant, patient, RTT to RTT, and RTT to other staff. Pleasant conversations included physics residents saying hello while clarifying that there was no need for a stereotactic body radiotherapy-specific quality assurance, greetings to everyone, joking between RTTs (1 RTT calling another one "rock solid" and all laughing), singing, and comments between RTTs about how they like when one doctor comes down in the morning to say hello when he/she notifies them that they can start treating. Patient communications included discussions about needing to see the nurse; patients asking "1000 things" from 1 RTT; patients coming to verbally notify RTTs that they were there, even though they were scanned in at the front desk; and patients coming to ask when they were going to be treated. RTT to RTT communications included discussions about treating patients, who was going to Dunkin' Donuts, the RTTs' schedules, pleasantries, and complaining about other divisions and each other. RTT communication to other staff revolved around machine repairs, patient setups, reasons for patient absence, missed treatment fields, answers to pages, and the varied responses from "doc-of-the-day" and the primary physician. This communication category gave a glimpse into the relationships and overall environment at the treatment consoles.

The third largest category was "work satisfaction," which had 3 main codes: process, schedule, and interaction. Processes included the following: patients cannot queue in until the front office opens, the warm-up person is not aware of what needs to be done, RTTs would prefer to use intensity modulated arc therapy instead of static intensity modulated radiation therapy, and not all RTTs have access to TeletrackingTX (an electronic communication with in-house patient transport).

Table 3. Interview Guide Questions.

1. In regard to scheduling, how would you describe a general day on the machines?
2. How do you feel (personally) when you run behind schedule?
3. What do you think about the proposed time slots for patients?
4. What would you suggest for improving patient throughput?
5. Can you describe your experience with a scheduling issue?
6. What is your understanding of the electronic patient schedule in the electronic medical record and verify system?
7. How do you feel about the level of training regarding this software?
8. If you need administrative assistance or more clarification about administrative issues (staff schedules, vacation, personnel conflicts, FMLA-extended leave) who do you go to?
9. What do you think of the new staff scheduling?
10. Is there anything else you would like to talk about?

Abbreviations: FMLA, Family Medical Leave Act.

> 11:08 RTT2 looks to correct the schedule for an inpatient. She uses Teletracking. RTT1 states RTT2 "is the only one of therapists on this machine that have access to this clinical tool and since she's going on vacation we're gonna be screwed." RTT1 says "Getting everyone access would be great." RTT2 says she loves using Teletracking. "It's like the bank—you don't need to talk to a teller anymore, you just use the ATM. No more people!"

The second code in work satisfaction was schedules. Although scheduling has been discussed previously, this was a recurring topic in the observations and warrants mentioning in this section pertaining to work satisfaction. It had 4 items, many overlapping with schedules in the other categories. The most important points centered on the new weekend treatment schedule, RTT schedules, flexible RTT schedules, and notice required for a day off. The final code in this category was interactions. Physician interactions were involved in 5 of the 9 records, and all 5 seemed to be negative. The most disconcerting was that the RTTs felt compelled to page a specific physician for a cone beam computed tomography shift that was within tolerance levels according to departmental policy but was approaching the threshold for physician notification. They had been reprimanded for not notifying this physician in the past when the shifts were of the same magnitude, even though they had followed departmental protocol correctly.

Qualitative research does not require a specific research question at the beginning of the project. The observation was useful for identifying specific topics that might be important to consider in-depth. This observational evaluation revealed 2 "Just Do It" system fixes. The first "Just Do It" fix was to address the nonuniformity of RTT access to the patient transport system. Within 24 hours, all therapists were given functional access and trained to use the system. The other "Just Do It" correction was a modification to the new "On-Call Policy." The new policy aims to improve patient safety by requiring full staffing levels for complex cases (eg, stereotactic body radiation therapy cases and patients treated with nonstandard accessories/equipment) that are treated on the weekend.

The observational period identified the areas of greatest concern and provided guidance and focus for the in-depth one-on-one interviews. The high frequency of items revolving around scheduling led this topic to be the focus of the interviews. Using the observation field notes and coding analysis, an interview guide was written to delve deeper into scheduling issues. The interview guide was designed to probe for more information about the treatment schedules and the therapist's feelings about scheduling. Although the observations yielded some insight, this was a passive exercise and did not elicit detailed information. Because of time constraints, the interview guide was limited to 10 main questions. Probing questions were used when necessary to gather more information from the interviewee. Four therapists were randomly selected to participate in the interview. This activity was completely voluntary, and the participant was assured of the anonymity of all discussions. The interviews were conducted within the department during operating hours. The majority of interviews were conducted in a neutral conference room. One was completed at the treatment unit with peers present. The interview questions are listed in Table 3.

When asked about running behind schedule, interview answers revealed similar emotions from the staff. The therapists stated that this made them feel "bad," "horrible," "guilty over sick patients having to wait," or "stressed." Results varied with respect to recommendations to solve this problem. Common scheduling issues included needing more flexibility and willingness to work longer hours to have that flexibility. One interviewee was quite clear about schedules being unrealistic:

> Well for one thing, it's unrealistic . . . there are not enough time slots for the number of patients. If there is one problem or you're a few minutes late getting

> a patient in or started—well, then everything is off schedule. There are major complaints from the patients. Right now we are one and a half—no, wait, we are two hours behind. And now we have the HDR (patient) we have to treat. And they have to be treated right away. And there's an open time slot for them now, but if they miss that time slot, like today, then you have to just fit them in.

The therapists indicated a desire for more autonomy with treatment schedules and more training on how to use treatment schedules more effectively. Some therapists stated that they knew the system extremely well, and others openly said, "I have no idea how to use it." With regard to training on the scheduling system, one therapist stated,

> But, you know, we trained ourselves. Or we figured it out. Or one person figured it out and then told the rest of us. You know, like word of mouth. We didn't have any training. It was just you figured out. But I feel like I know what I'm doing.

Therapists stated that they had discussed scheduling concerns several times with multiple supervisors and that they "hadn't been listened to." When asked for more detail, the therapist described the multiple attempts to discuss the subject:

> At staff meetings, one on one, with Supervisor 1, with Supervisor 2—multiple times. At therapist meetings. Some things are listened to, but not this issue. It's not better patient flow. It's a real issue.

These training and scheduling issues are compounded by a lack of knowledge about who supervises administrative operations. Each therapist interviewed had a different answer when asked who they go to for administrative assistance or clarification about administrative issues.

One of the topics that evolved from the interview process was the desire to learn. When asked about personal ability to navigate and interpret some aspects of a software program, one of the RTTs answered with a sense of frustration,

> I mean, basically, without being insulting to ourselves, it's like monkey see, monkey do. We are told what buttons to click and we are expected to remember it and click them on our own. I mean, there are some questions that I would like to ask, but I don't know who to turn to to ask them.

The findings from these observations and interviews indicate significant departmental problems such as poor training, unclear documentation of schedules and workflow, lack of respect for team members, underutilization of the EMR as an effective clinical tool, and disregard for standard operating procedures. When asked to describe his level of training for a specific program used on a daily basis as part of his basic job functions, one of the participants replied,

> Let's put it on a scale of 1-10, with 1 being not completely confident and 10 being there is nothing you don't know about it—you are 100% experienced and competent. I would say we are about a negative 3.

Similar findings were confirmed during observation at the treatment machine. Therapists raised concern over a prompt from the radiation delivery software that they were unsure about. They first discussed it among themselves and then turned to a physicist for answers regarding why they were receiving this new message without any knowledge on how to proceed. The interview process was lengthy but rewarding. It allowed for additional information from multiple perspectives that helped explain or clarify observational findings.

Discussion

This study using qualitative measures in radiation oncology has proven to be an invaluable tool for assessment during the reformatting of the department and departmental responsibilities. Observational and interview processes brought to light significant oversights in the perceptions of training and the need for training and an understanding of supervisory roles in the department. Although we have not sought to determine a causative link between quality of care and some of the research questions raised from this work, it is clear from observation that breakdown in communication and misunderstanding of processes contributes to a decrease in quality that inhibits the delivery of timely, efficient, and safe care.

Since this work, the department has improved in the areas identified through qualitative measures. Therapists receive monthly scheduled training on both continuing education topics and reviews of clinical procedures and practice. This change has already generated more than 20 hours of therapist-specific training in EMR procedures and another 20 hours of physics training for machine procedures and process training. The observations generated 2 immediate repairs to the patient care system. They also indicated to management that the therapists want more authority over their own patient schedules, are willing to learn the systems to schedule patients, and are willing to take responsibility for this task. The physics and information technology division also have agreed to come in over a weekend to rearrange the

therapists' computer work areas into a more ergonomic and efficient layout based on the therapists' feedback.

Qualitative measures are an underutilized field of research in radiation oncology departments, with a great magnitude of potential impact. In this brief study, cultural issues were identified regarding respect for one another and the work done in the department, which will need to be addressed through team-building exercises. During follow-up, a number of therapists expressed appreciation for the effort made to assess their needs, feelings, and work environment to help them perform better. This sentiment was expressed in the newly generated training sessions, during which one of the interviewed therapists said, "This is exactly what I wanted in training." The process of observation and interviewing showed the therapists a level of commitment from the department to address some therapy-specific issues. Qualitative analysis not only identified areas for improvement and increased efficiency and communication but provided the added benefit of building positive relations between divisions.

Declaration of Conflicting Interests

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