

# Insight into the Sharing of Medical Images

## Physician, Other Health Care Providers, and Staff Experience in a Variety of Medical Settings

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### Keywords

Medical record systems; radiology information PACS; compact disks\*; electronic health records; hospital information systems

### Summary

**Background:** Scant knowledge exists describing health care providers' and staffs' experiences sharing imaging studies. Additional research is needed to determine the extent to which imaging studies are shared in diverse health care settings, and the extent to which provider or practice characteristics are associated with barriers to viewing external imaging studies on portable media.

**Objective:** This analysis uses qualitative data to 1) examine how providers and their staff accessed outside medical imaging studies, 2) examine whether use or the desire to use imaging studies conducted at outside facilities varied by provider specialty or location (urban, suburban, and small town) and 3) delineate difficulties experienced by providers or staff as they attempted to view and use imaging studies available on portable media.

**Methods:** Semi-structured interviews were conducted with 85 health care providers and medical facility staff from urban, suburban, and small town medical practices in North Carolina and Virginia. The interviews were audio recorded, transcribed, then systematically analyzed using ATLAS.ti.

**Results:** Physicians at family and pediatric medicine practices rely primarily on written reports for medical studies other than X-rays; and thus do not report difficulties accessing outside imaging studies. Subspecialists in urban, suburban, and small towns view imaging studies through internal communication systems, internet portals, or portable media. Many subspecialists and their staff report experiencing difficulty and time delays in accessing and using imaging studies on portable media.

**Conclusion:** Subspecialists have distinct needs for viewing imaging studies that are not shared by typical primary care providers. As development and implementation of technical strategies to share medical records continue, this variation in need and use should be noted. The sharing and viewing of medical imaging studies on portable media is often inefficient and fails to meet the needs of many subspecialty physicians, and can lead to repeated imaging studies.

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## 1. Introduction

Imaging studies provide information crucial to the accurate diagnosis and effective treatment of multiple illnesses and injuries. The number of imaging studies conducted, many of which are expensive, has increased dramatically over the last two decades. For example, Medicare spending on medical imaging studies rose from 6.9 to 14 billion dollars from 2000 to 2006, with advanced imaging studies increasing at the greatest pace [1]. Multiple types of imaging studies expose patients to ionizing radiation, the amount varying widely by procedure [2]. Judicious use of imaging studies, particularly those exposing patients to ionizing radiation exposure, is therefore recommended [2, 3].

Imaging studies can potentially be shared with multiple health care providers, including those not associated at the facility at which the studies were ordered, through multiple formats. Electronic versions of imaging studies can be stored on mobile devices such as CD-ROMs and DVDs (CDs) and transported between practices [4]. The development and implementation of electronic medical records (EMRs) enables providers at the same practice to share medical information. Health information exchanges (HIEs) enable physicians and other health care providers to access medical notes, test results, and other medical information from other physicians and facilities [4]. Research has begun to document physician attitudes and experiences, as well as organizational policy toward and experiences with EMRs and HIEs [5-11]. However, imaging studies themselves are rarely included in EMRs or available through HIEs. Although the number is limited, HIEs that allow for exchange of imaging studies are being developed and implemented [12].

The few studies that have been conducted have noted that patients transferred from one facility to another often require new or repeat imaging studies. Repeat studies are often conducted because the initial studies were inadequate or changes in patient status needed to be assessed [13-15]. They are also conducted when patients are transferred without their imaging studies and when software incompatibilities and technical difficulties impede the use of the imaging studies [13-16]. Although these recent studies are informative, they limit their focus to patients who were transferred between emergency rooms or trauma centers [12-16] or who had undergone transarterial chemoembolization [17].

A recent survey of administrators of radiology practices, administrators of picture archiving and communication systems (PACS), and IT managers provide second-hand information about physician experiences with imaging studies. These administrators and managers indicate that physicians reported three primary problems viewing imaging studies on portable media: difficulty loading imaging studies; unfamiliarity with proprietary viewing software; and time burden to open and manipulate images [18]. However, the data were limited to imaging departments; other health care providers were not interviewed. Additional research is needed to delineate the experiences and practices of a range of providers and their staff who work in diverse settings as they attempt to obtain and access outside imaging studies and view the studies.

## 2. Objectives

This paper addresses the gaps in knowledge about current use and exchange of medical imaging studies among practices in urban, suburban, and small town settings in a region of the Southeast. "Outside facilities" refer to hospitals, practices, and imaging centers to which physicians, other health care providers, and their staff do not have electronic access through an internal system or electronic portal. Information about both provider and staff experiences is required to address this gap. Providers determine whether additional imaging studies should be ordered and make treatment decisions based on imaging study findings; their role in uploading of outside imaging studies may vary depending on their technological expertise and division of labor at their worksites. Staff's role in requesting, processing, and manipulating outside medical imaging studies may also vary by occupation and job description. Data from in-depth interviews conducted with providers and staff were used to

1. examine the media and venues through which physicians and their staff accessed outside medical imaging studies,

2. examine whether use or the desire to use imaging studies conducted at outside facilities varied by provider specialty or location (urban, suburban, or small town) and
3. delineate difficulties experienced by either providers or staff as they attempt to access and view imaging studies available on CDs.

### 3. Materials and methods

#### 3.1 Qualitative data

Semi-structured interviews were conducted with physicians, other health care providers, and medical facility staff to gain information about their range of experiences as they accessed imaging studies conducted at outside facilities. Semi-structured interviews were determined to be an appropriate method to collect data given the scarcity of research in this area. The use of semi-structured interviews, as opposed to multiple-choice surveys, yields rich data in participants' own words. Participants' responses are not constricted by pre-existing response categories; individuals are encouraged to provide extended verbal responses. This enables participants to provide information about topics that interviewers might not have realized were relevant prior to the interview and to provide responses that were unanticipated and would have been missed by questions with predetermined response categories [19-22].

#### 3.2 Study participants and recruitment

The purposive sampling method was used to solicit participation from individuals in diverse specialties and representing a range of geographic locations within the region. This sampling method allows for inclusion of participants who would be expected to have substantial variation in experiences [19, 23]. The heterogeneous sample enabled exploration of the breadth of experiences associated with image sharing in the region.

Participants were recruited from urban, suburban, and small town medical practices in North Carolina and Virginia during 2010 and 2011. Urban study participants were recruited from Wake Forest Baptist Health (WFBH), a medical center that provides inpatient and outpatient care and is associated with a medical school and an urban health care clinic, as well as from an urban Department of Public Health. For the purposes of this study, we define primary care providers as those who work in family or pediatric medicine practices and do not have subspecialties. We define subspecialty providers as those who a) work in family practice or pediatric practices and have a subspecialty, or b) work in another type of practice (e.g., internal medicine, general surgery, cardiothoracic surgery, orthopedic surgery, oncology; and radiology). WFBH providers include primary care providers, and subspecialty providers. Suburban and small town health care providers and their staff were recruited from primary care and subspecialty practices. Some practices were affiliated with WFBH; others were not. Staff had a range of titles and responsibilities to represent the multiple functions they performed in the medical image sharing process. Providers included physicians, nurse practitioners (NPs), and physician assistants (PAs).

#### 3.3 Interview Guide Development

The research team, which included radiologists, imaging informaticians, computer scientists, and social scientists, identified major topics to elicit the range of experiences of physicians, other health care providers, and staff in the context of sharing medical imaging studies. Particular focus was given to the sharing of medical images using portable media. Members of the research team with substantial experience in qualitative research refined two distinct interview guides, one to be used with health care providers, the other with their staff. Two practice interviews were transcribed and reviewed by the research team. Interview guides were modified following the review. ► Table 1 identifies the major topics addressed by the provider and staff interview guides. Topics addressed during interviews with staff varied substantially, depending upon their job responsibilities.

### 3.4 Data Collection and Analysis

Members of the research team invited potential participants at WFBH to participate. Senior administrators, managers, and providers were points of initial contact for nonWFBH practices. The contacts subsequently discussed the project with health care providers and staff at their facility to determine their willingness to participate. One experienced interviewer conducted all face-to-face interviews at the participants' worksites. Abbreviated interviews were conducted with participants whose jobs had limited relation to image sharing. All interviews were recorded. Participants were informed that participation was voluntary and that they could end the interview at any time. Written informed consent was obtained. Participants were not asked to provide personal health information. Confidentiality of the identity of the participants was maintained and access to data was restricted to research team members. This research study was deemed to pose no more than minimal risk to participants, to be HIPAA compliant, and was approved by Wake Forest Health Sciences Institutional Review Board (IRB).

Codes were developed to represent key concepts relevant to medical practice characteristics, respondent experiences, and the context in which image sharing occurs – see ► Table 2 [18]. The team members drew upon their combined knowledge to identify major concepts relevant to the study's goals. They subsequently reviewed the practice interview transcripts to refine and clarify the concept represented by each code. ATLAS-ti (version 6, Scientific Software Development GmbH, Berlin, Germany), a software program designed to facilitate analysis of qualitative data, was used in analyzing the content of the transcript of each participant's interview.

The interviews were transcribed verbatim. Sections of the transcripts associated with each concept were electronically tagged with the appropriate code. Any particular segment of text could be tagged with no, one, or multiple codes. One team member coded all transcripts. Each transcript was subsequently coded again by at least one other team member. Any discrepancies in coding were systematically resolved.

Sections of the transcripts tagged with the code "viewer problems" were closely examined. Viewer problems refer to any discussion by the participant of provider or staff efforts, problems, or challenges with viewing the CD images or using the viewer software to review outside images. Types of problems viewing CDs were recorded for each physician participant. Physician transcripts were systematically reviewed to determine a) whether the physician viewed imaging studies other than X-rays, b) whether he or she viewed imaging studies on CDs, and c) whether use of imaging studies on CD varied by the location or type of practice. Viewing practices of NPs and PAs were not reviewed due to ambiguity in their role viewing imaging studies in the practices. Quotations are annotated as provider (P) versus staff (S), the number assigned to each participant, and finally urban (U), suburban (S) or rural or small town (R).

## 4. Results

Forty-two health care providers (physicians, NPs and PAs) and 43 staff participated in this study. Participants were recruited from WFBH, an urban clinic, and 7 suburban and small town practices. Provider and staff characteristics are listed in ► Table 3. Fifty percent of providers worked at a hospital; the remaining 50% treated patients at group practices. Sixty percent of health care providers were subspecialty providers, with the majority of being non-Hispanic white men. Specialties and subspecialties represented by health care providers varied widely, and included family practice, pediatrics, internal medicine, radiology, orthopedics, general surgery, orthopedic surgery, cardiothoracic surgery, otolaryngology, oncology, and emergency medicine. Staff were recruited from the same nine organizations as providers, a public health department, and one additional small town practice. Sixteen staff worked in a metropolitan area, 15 in suburban settings, and 12 in small towns. Fifty-one percent worked at a hospital, with most being non-Hispanic white women.

### 4.1 Venues for accessing outside imaging studies

Physicians and other providers access imaging studies through multiple venues. They may order studies to be conducted at their own practice or an affiliated facility, usually gaining access to the

studies in electronic format. Many providers have access to imaging studies conducted at affiliated facilities through the internet. Imaging studies may be copied onto portable media, usually CDs, when internet exchanges are not established. Patients may transport CDs to their health care provider, or staff may contact the outside facility to request that the imaging data be transported on portable media. Imaging study reports are sent through many vehicles, including portable media or fax.

## 4.2 Practice characteristics and reported need to view imaging studies

The use of imaging studies varies substantially by specialty. X-rays are the only type of imaging studies viewed uniformly by primary care physicians. Family practitioner physicians primarily viewed the X-rays in electronic format, either on a CD or through an electronic network; use of film was also reported. Providers reported that they routinely ordered new X-ray exams at their own facility when they needed X-rays not readily available. Consequently, family medicine practitioners did not identify problems associated with viewing medical images. They depended on text reports for imaging studies other than X-rays. Even when imaging studies (other than X-rays) were available through an electronic portal or on a CD, family medicine physicians typically reported that they did not view the imaging data.

“We do have access to radiology images through [specific facility] and I don’t really use the images....I don’t pretend that I can read them” (P37S).

General internists who worked at a family practice depended on reports of the imaging studies other than X-rays.

“I’m not trained at looking at MRIs. I don’t read them. So I’m looking for the reports”(P33R).

Internal medicine physicians working in internal medicine practices often viewed the imaging studies themselves when available, in addition to reviewing the report. Subspecialty physicians routinely viewed medical imaging studies relevant to their practice; some found it useful to rely solely on reports at times. When asked about imaging studies brought by patient on CDs, one subspecialty physician stated,

[W]hen there is a lack of time, I just read the report.... And those people can read better than me.... And so I go by their report. But if I have time I like to read myself and get to another to compare (P28S).

Geographic location did not affect reported interest in viewing imaging studies other than X-rays. Primary care providers did not view imaging studies other than X-rays at any location. Urban and suburban subspecialty physicians routinely indicated that they found it valuable to view imaging studies other than X-rays and therefore had the opportunity to experience difficulties viewing outside studies on CDs. The limited number of small town subspecialty physicians in this study indicated that they often preferred to view imaging studies themselves, rather than relying solely on reports. However, when treating patients who had outside imaging studies, they often relied on written reports of imaging studies.

## 4.3 Difficulty viewing and obtaining imaging studies

### 4.3.1 Difficulty obtaining imaging studies

Accessing existing imaging studies was a common issue for subspecialists. Several specific problems were indicated. Patients sometimes failed to bring imaging studies contained on CDs with them to their appointments, even when they had been requested to do so by the medical office staff. Determining the type of imaging studies and location at which they had been conducted presented challenges.

Sometimes you don't even know what kinds of scans people have had. The disk [may] have some information [and] you can [view] a CT or an MRI scan. You might think, 'Did you get a PET scan', and the patient is like, 'I don't know,' so now you're having to chase back to the facility (P6U).

Obtaining imaging studies on CDs was often time consuming for staff and patients as they completed necessary paperwork, contacted facilities, or traveled to retrieve copies of medical imaging studies. It routinely took several days to weeks for physicians to receive CDs with relevant studies from outside facilities. Occasionally the requested imaging studies were never received. Physicians suggested that this time factor and lack of adequate knowledge regarding the existence or whereabouts of imaging studies led to delays in diagnosis and treatment in some cases and to duplication of imaging studies in others.

### 4.3.2 Difficulties viewing imaging studies on CDs

Reports of problems associated with viewing studies varied widely among those who used CDs. A few subspecialty providers who viewed imaging studies on CDs reported that they never or rarely had difficulty opening imaging studies. Many subspecialty providers reported limited problems viewing or uploading CDs.

"I've probably seen 90-95% success in opening [CDs]" (P3U).

A small number of subspecialty providers still had some difficulties with viewing imaging studies. One provider stood out, indicating that half of the CDs of imaging studies received

"don't work" (P25S).

However, providers and staff at the same practices sometimes reported substantially different levels of difficulty opening CDs.

When subspecialty providers reported difficulties viewing imaging studies, they indicated multiple problems prevented imaging studies on CDs from being viewed. A limited number of participants reported that the CDs received had been physically damaged. Physicians and staff reported receiving blank CDs that were supposed to contain imaging studies. The defect that prevented a particular CD from being opened sometimes remained indiscernible to providers or staff. Study participants reported that CDs occasionally lacked the relevant imaging study needed.

I've had an incident where they sent me a right study, but it was the wrong patient. I've had an incident of it being the right patient, but it'd be the wrong study" (S2U).

CDs may contain the correct type of imaging study about the correct patient, but exclude all but the most recent study, limiting access to potentially crucial information.

Opening imaging studies on CDs can be time consuming. Practitioners note that CDs typically have self-loading software, enabling the health care provider to retrieve the imaging study without additional software. The software itself can take time to load onto the computer or may be missing. One imaging librarian noted

"Usually when [we can't read the image at all, it] is because somebody forgot to put the viewer on there" (S6U).

The required software is sometimes located on a computer itself, leading to delays. Several individuals reported trying several different computers before being able to view an image.

Usually what we do is they'll give us a disk and ... we'll try multiple different computers in our departments to see if we can view the disk...[U]sually we can. Sometimes we can't (P4U).

Others reported that they could not open some studies due to software issues.

Once loaded, navigating through the system can be time consuming, due to diverse graphic interfaces. An urban subspecialty physician notes,

There are a few big imaging systems that we tend to get with frequency, but you sort of have to learn a little bit about a lot of different viewers to learn how to look at scans, how to put up difference sequences, different dates of imaging (P1U).

Additionally, software loaded on CDs can have functional limitations.

“[S]ome of [the software programs loaded on the CDs] ... can't do any measurements like I'm used to” (P8U).

PACS enable providers and staff to retrieve studies conducted at different times and locations and to examine the imaging studies more easily. The capacity to access imported images to a local PACS facilitates consultation with other practitioners, including radiologists. Once imported to PACS, physicians are able use the standard PACS functions, such as measurement tools, circumventing the need to learn how to navigate multiple types of viewing software. Inability to import imaging studies to PACS leads to inefficiencies. Multiple health care providers reported that there were occasions when they could view the imaging study on a CD, but were unable to transfer it to their PACS. A clinical coordinator noted:

When [the imaging system] won't download [sic] into our system... then you're kind of left with keeping track of that disk because when the procedure day comes and they want the images to review, they have to have the CDs because they can't pull it up on our system (S3U).

Inability to import imaging studies conducted at outside facilities to PACS therefore impedes the efficiency and potential effectiveness of the health care team.

## 5. Discussion

Using semi-structured interviews, this research probed significant challenges experienced by providers and staff in various medical practices and, more specifically, addresses the barriers to sharing of electronic medical imaging studies. The only type of imaging study viewed by family medicine physicians interviewed in our study was X-rays. This pattern was consistent among urban, suburban, and small town providers. As noted above, providers ordered new X-rays at their own facilities when existing studies were unavailable. Family medicine physicians did not report difficulty viewing imaging studies on portable media. Consistent with a study of emergency physicians in metropolitan New York, subspecialty physicians reported that they wanted or needed to view multiple types of outside imaging studies, at times in addition to written reports or consultation [24]. The urban, suburban, and small town subspecialty physicians interviewed in this study shared this attitude, although they were disproportionately represented in urban and suburban areas. This is to be expected given the distribution of primary care and subspecialty physicians in the region [25]. The few small town physicians interviewed for this study who worked at an internal medicine practice had access to imaging studies conducted at an affiliated facility. Some outside imaging studies were available to them on CD. However, they primarily relied on written reports for studies conducted at outside facilities despite their stated preference to be able to view imaging studies themselves.

Subspecialty physicians, and other health care providers and staff at their practices, have distinct needs in the context of EMRs and HIEs that are not shared by family physicians and their staff. Subspecialty physicians' viewing of imaging studies directly is not restricted to X-rays, and access to the imaging study itself is often considered crucial [16]. As development and implementation of technical strategies to share medical records continue, this variation in need and use should be accounted for. Access to imaging studies that may be considered essential to some physicians may be of low priority to others, whereas text reports of imaging studies were identified by most physicians as crucial.

Subspecialty physicians, other health providers, and their staff report multiple limitations when attempting to view medical images studies on CD. Lack of standardized viewer software on CDs lends to difficulty opening CDs; variation in viewer navigation systems results in time inefficiencies. Even when physicians and other health care providers have access to PACS that provided the capac-

ity to view imaging studies using standard tools, inability to import some imaging studies prevented them from taking advantage of the functions innate to PACS. These limitations are consistent with those reported by PACS and radiology administrators and IT managers [18] and emergency departments [14, 16] and system reviewers [26].

Reports of problems associated with accessing and viewing studies vary among providers and staff, even at the same practices. These discrepancies could reflect variability in skills or resource support by job category. However, uniform compliance with the existing Digital Imaging and Communications in Medicine (DICOM) Portable Data for Imaging and Integrating the Healthcare Enterprise (IHE) Portable Data for Imaging (PDI) standards would reduce the inefficiencies and lack of functionality that result from incompatible image viewing software on portable media, including the inability to import the studies from CDs to PACS. The DICOM standard was developed to facilitate transmission and receipt of digital medical images; the IHE initiative was developed to further improve the transfer of medical information [18]. Physicians and their staff continue to report system incompatibility. The capacity to bypass portable media altogether would eliminate the limitations associated with physically retrieving and transporting the media. Multiple complex challenges must be addressed as HIE typologies that include the capacity to exchange imaging studies are developed and implemented [27]. Although the number of existing HIEs that currently support the exchange of imaging studies is limited [12], the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act spurred additional research relevant to the development of HIEs that have the capacity to exchange imaging studies [28].

There are limitations to this study. The characteristics of the participants and their practices do not correspond to the population of health care providers and their practices in the region. This sampling method does not allow us to generalize the extent of image viewing limitations encountered to the population of health care providers and staff in North Carolina and Virginia, or other regions. Additionally, the sample included few small town or rural subspecialty physicians. The data therefore do not enable determination of whether access and use of CDs by small town subspecialty physicians in this study represent the full range of experiences with outside imaging studies among this subpopulation. However, the strength of the purposive sampling method ensured that health care providers and staff from practices with diverse specialties that ranged from urban to rural communities were interviewed. This enabled reporting on the range of use and difficulties accessing medical imaging studies among different practice settings and environments [19]. Although the research method did not allow us to quantify the prevalence of problems associated with accessing and using imaging studies among health care providers and their staff, it did enable us to identify the breadth of problems experienced.

## 6. Conclusion

Primary care and subspecialty providers interviewed in North Carolina and Virginia report divergent experiences with outside imaging studies. Primary care physicians rely on written reports of imaging studies other than X-rays, thereby obviating the need to view outside imaging studies on CDs. Subspecialty physicians in urban and suburban areas and small towns frequently view imaging studies through internet portals, but they are still dependent on imaging studies copied to portable media for outside studies. Physicians and their health care teams report that they are able to open most CDs that contain imaging studies. However, the process of opening and manipulating the imaging studies copied to portable media is often inefficient and fails to meet the needs of many physicians in specialty fields adequately who were interviewed for this study. Physicians report that these problems sometimes lead to delays in care or duplication of imaging studies. Repeat imaging studies often result in increased patient exposure to ionizing radiation and elevated costs [1, 2]. Increased efforts are needed to increase provider access to patient imaging studies and to address system incompatibilities. Development of HIEs should address the needs of users, and provide provider access to the imaging studies themselves, as well as any reports that may be available.



**Clinical Relevance Statement**

Primary care providers and subspecialty providers report distinct experiences as they integrate outside imaging studies into patient care. Primary care providers rely primarily on the written report and indicated little difficulty accessing the reports, while subspecialists reported multiple types of problems accessing and viewing imaging studies that sometimes lead to delays in care or duplication of imaging studies, and may result in increased patient exposure to ionizing radiation and increased healthcare costs. As development and implementation of technical strategies to share medical records continue, the variation in need and use should be addressed to improve patient care and health outcomes.

**Conflict of Interest**

The authors declare that they have no conflicts of interest in the research.

**Human Subjects Protection**

The study was approved by the Wake Forest Health Sciences Institutional Review Board.

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**Table 1** General Topics Addressed by Interview Guide for Providers and Staff

<b>Practitioners</b>	Use of medical images
	Use of imaging studies and their reports through internal systems and outside facilities
	Problems accessing and using imaging studies
	System design recommendations
	Preauthorization issues
	Exchange of medical records other than imaging studies
	Storage of medical imaging studies
<b>Staff</b>	Staff characteristics
	Copying imaging studies orders at medical facility
	Assistance provided to patients obtaining access to outside imaging studies
	Accessing imaging studies conducted at outside facilities
	Problems accessing imaging studies conducted at outside facilities

\*Topics addressed during interview varied by tasks assigned to staff member.

**Table 2** Concept Codes

<b>Characteristics of Participant and Practice</b>	Practice characteristics, including type, size, setting, geography
	Diseases treated common to practice or relevant to image sharing
<b>Factors Related to the Efforts to Physically Obtain CDs or Other Outside Images on Portable Media (e.g., film, flash drive, email)</b>	Provider burden associated with physically obtaining outside CDs or films
	Patient burden associated with physically obtaining/transporting outside CDs for films
<b>Factors Related to Viewing CD Images</b>	Viewer problems experienced by provider or staff
	Time/site at which provider access outside images
	Help with it – resources available when experiencing problems viewing CD
	Cost – cost (time, money, delays in care, repeat scans) of problems with viewing outside CDs
	Beyond scope – Issues or problems related to outside CD images which are beyond the scope of the project
<b>Factors Related to CD Data Storage Locally after CDs are Obtained</b>	Storage logistics – process by which outside images are stored locally for future use
	Storage security issues – issues related to maintaining security or confidentiality of outside CDs and images they contain
<b>Factors Related to Impact of Outside Images on Current Practice</b>	Use of CDs – how CDs currently used in practice
	Types of images used – type of images used in practice
	Impact on practice – importance of role of outside images in practice
	Rating – participant’s rating of current system or processes by which outside images are accessed for clinical care of patients
	Reports – use or access to reports related to outside imaging
	Other medical records – experience sharing other (not imaging related) medical records with outside hospitals
	Market – use of image and or image sharing as a market driver
<b>Perspective on a Fix</b>	Charge – participant’s estimate of what a reasonable charge might be to fix current problems related to accessing outside images
	Patient access – issues related to patient’s access or capacity to control access to medical images or reports related to their images
	Future system –how new and improved system might work optimally
	Pre-authorization – anything related to pre-authorization process

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**Table 3** Characteristics of Health Care Providers and Staff

		Total sample N=85	
		Providers N=42 (49%)	Staff N=43 (51%)
<b>Provider type</b>	Physician	34 (81%)	--
	PA or Nurse Practitioner	8 (19%)	--
<b>Staff position</b>	Front desk	--	19 (44%)
	Hospital records/ Image library	--	8 (19%)
	CMA, CNA, LPN	--	8 (19%)
	X-Ray technician	--	3 (7%)
	Nurse (RN)	--	5 (12%)
<b>Specialty of provider/ practice</b>	Primary care	17 (40%)	--
	Radiologists	4 (10%)	--
	Other subspecialist	21 (50%)	--
<b>Practice location</b>	Urban	18 (43%)	16 (37%)
	Suburban	18 (43%)	15 (35%)
	Small town	6 (14%)	12 (28%)
<b>Practice type</b>	Group practice	21 (50%)	15 (35%)
	Freestanding clinic	0	6 (14%)
	Hospital	21 (50%)	22 (51%)
<b>Gender</b>	Men	29 (69%)	5 (12%)
	Women	13 (31%)	38 (88%)
<b>Race &amp; Ethnicity</b>	White (non-Hispanic)	39 (93%)	39 (91%)
	White (Hispanic)	1 (2%)	1 (2%)
	African American	1 (2%)	3 (7%)
	Asian	1 (2%)	0

Percentages may not add to 100 due to rounding.

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