The need for improved telecommunication and collaborative practice among teleradiology end users, in a rural district of South Africa

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Highlights

- In this rural district of South Africa, there are significant strains in the interprofessional relationships between all end users as a result of miscommunication. This stems from failure to implement and revise standard teleradiology guidelines, which creates a gap in establishing well-defined responsibilities.
- End users of this teleradiology site lack support from the remote radiology service provider, who must provide guidance and educational support. This translates in the rural community receiving a suboptimal radiology service.
- There is limited interprofessional collaboration among the onsite end users who depend on each other to effectively fulfill their extended roles in this teleradiology setting.
- Primary communication in this setting is limited to telephone lines. Although the technical aspect of this communication is functional, the effectiveness of it is largely influenced by the quality of engagement between end users and the radiology service provider.

ABSTRACT

In a rural district of South Africa using teleradiology, challenges in communication are heightened because of end users being geographically dispersed from each other. End users, namely radiographers, radiologists, and referring clinicians are key players in the efficient functioning of teleradiology systems and must collaborate to deliver a radiological

service. This study aims to present how the interaction between these health professionals in a rural district of South Africa influences the teleradiology service delivered and provides recommendations on how interprofessional collaboration between them can be enhanced. A qualitative study with an exploratory, descriptive approach was adopted. Focus group interviews were conducted with the onsite end users, namely the radiographer and referring clinicians on different days. A separate interview was conducted with the radiologist at the remote reporting site. Qualitative content analysis was used to analyze the transcribed data. There are significant strains in the interprofessional relationships between all end users as a result of miscommunication. This stems from failure to implement and revise standard teleradiology guidelines, which creates a gap in establishing well-defined responsibilities. Second, end users at the teleradiology site lack support from the remote radiology service provider, who must provide guidance and educational support. This translates in the rural community receiving a suboptimal radiology service. Telecommunication is not limited to telephone lines but is largely influenced by the quality of engagement between end users and the use of additional support structures, such as standard guidelines and video conferencing, to facilitate effective communication.

Keywords: Teleradiology, tele-communication, interprofessional collaboration, radiographer, referring clinician, radiologist

Introduction

Interprofessional collaboration in health care is described as the engagement between health care professionals, who share a common interest and shared responsibility towards a patient.[1] The necessity of this collaboration in health care is emphasised by the World Health Organisation, who launched the International Classification of Functioning, Disability and Health (ICF), which provides a framework to effectively create a “Common language between all professionals”.[2] Snyman et al explains that when there is gaps in the mutual understanding of professionals regarding their defined and extended roles, effective service delivery to the patient becomes compromised.[3] Challenges in interprofessional collaboration in health care has been a long standing issue of contention, for this reason, a large shift in teaching approaches is being adopted, to educate undergraduate health professionals on how to adopt a bio-psychosocial – spiritual approach to patients and work effectively within a team, instead of teaching

curriculum in complete silos. [3] In the context of radiology, interprofessional collaboration between the referring clinician, radiographer and radiologist is mandatory according to the "Requesting of Medical Examinations Guidelines" which states that all requests made by the referring clinician should be in writing and justified.[4] The request must then be discussed with radiologist for authorisation, following which discussion should take place between the radiologist and radiographer to ensure the examination is optimised.[4-5] In the teleradiology setting, as described in Table 1, interprofessional collaboration also exists, however the request is discussed and approved with the radiographer on site and reported on by the remote radiologist, as illustrated in Figure 1.

Table 1: Summary Table

What is known	• Teleradiology was aimed at bridging the gap between urban and rural communities, in terms health care services and professional support for health care workers. • Success of teleradiology implementations are largely influenced by functioning of technical infrastructure and internet connectivity. • Teleradiology end users are expected to collaborate with each other in accordance with the medical imaging requesting guidelines of the Health Professionals Council of South Africa.
What this study has added to our knowledge	• There is significant break in communication between the end users involved in this rural teleradiology setting, resulting in compromised service delivery. • Examples of negative service delivery include patient delays and exposure to unnecessary radiation dose. • There is a need for a revised standard operating procedure manual as well as reorientation for all end users to ensure compliance. • Health care professionals in this rural district, using teleradiology systems are not receiving adequate professional support from urban reporting centres • Support structures such as video conferencing should be mandatory during teleradiology implementations, as telephone communication alone is not adequate.

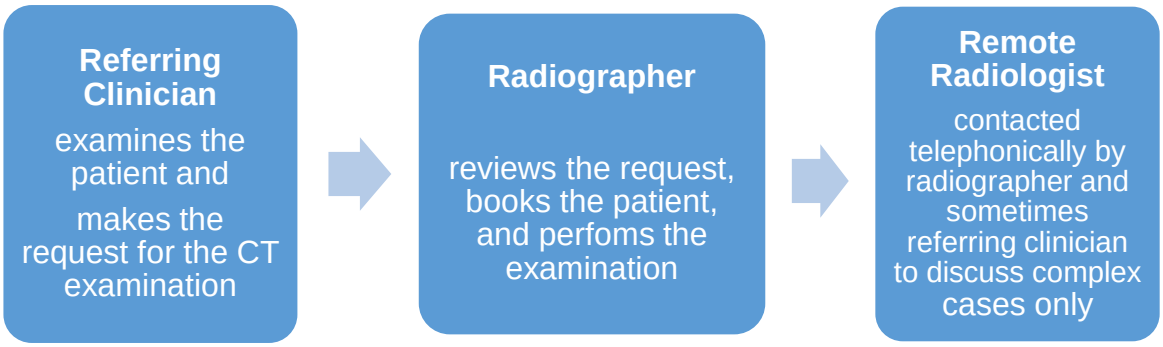

Figure 1. Booking procedure in teleradiology settings.

Barriers and successes regarding implementation of teleradiology has been a well documented area in eHealth research. However, this study highlights challenges unique to a rural district, flagged as one of the most socially vulnerable areas in South Africa, through the lens of the end users.[6] Teleradiology systems for this district was implemented in the year 2000, and is used to provide radiological reports for Computed Tomography (CT) examinations only. The site services six satellite hospitals within the district and uses telephone lines as the primary source of communication with the radiologist.[7] Other communication channels such as email are used for receiving reports if the retrieval application on teleradiology system is not functioning. Onsite radiographers and clinicians are located at the teleradiology site and referring clinicians who send their patients for CT examinations are situated at the satellite hospitals. A private radiology service provider located in another province is contracted to provide the radiology reports for to the teleradiology site. The radiographers at the teleradiology site are therefore responsible for its redistribution to the satellite hospitals. In this context, the radiology service provider only provides the radiological report, resulting in a shift of responsibilities for the onsite radiographer and clinicians, such injecting contrast media, authorising and planning the examination. To fulfil these extended roles, support and communication is needed from all three end users to be able to deliver an effective service to the rural communication by means of teleradiology systems.

Methods

A qualitative approach was adopted, with an exploratory descriptive research design. This was found to be appropriate as it helps gather in-depth information regarding utilisation of teleradiology and its impact on health care in a rural community. Exploratory,

descriptive designs have been commonly used in health research, with its main aim being to explore and describe the experiences of individuals regarding a particular area of interest.[8].

Data collection methods

Data were collected at the central teleradiology site as well as the remote radiologist reporting site. Teleradiology end users from this site as well as referring clinicians from satellite hospitals were invited to participate in the study. Written informed consent was obtained from the participants before commencing the interviews. Focus group interviews were conducted separately with each group of end users, namely the radiographer (N=6) and referring clinicians (N=12). Creswell explains that focus group interviews ideally occur with groups of between six to eight people. The disadvantage of having participants more than this figure is that the data collected becomes complex to analyse and data saturation may be reached quickly.[9] Creswell further explains the objective of qualitative research is not yield large quantity of data, but to extract rich in-depth information from the purposively selected participants. Having separate focus group interviews allowed for homogeneity in each group as well as the triangulation of data, ensuring trustworthiness. It also allowed the participants to describe their experiences in a free and unobtrusive manner, therefore portraying an authentic rendition of the current teleradiology practices occurring and the impact it is having on rural health care services. At the time of data collection there were three radiologists working at reporting site. However only one was available for a face to face interview. A semi- structured interview guide was used to collect data, comprising of similar open - ended questions for all groups of end users. All the focus group interviews were conducted by the researcher. Krueger and Casey states that the quality of the data collected is largely influenced by the interaction between the researcher and participants during the focus group interview.[10] The researcher's role as the interviewer was to ensure that participants don't dwell on irrelevant experiences, but rather lead the participants to the research question, which the researcher can delve deeper into, by means of probing questions.[10] Lastly, the researcher can attempt to clarify questions that participants struggle to answer, by providing examples of situations with which they may be familiar.[10] A research assistant was also present at two focus group interviews to make field notes, which was later correlated with the audio recordings. The interviews were audio recorded with the consent from the participants.

Data analysis

The audio recordings were transcribed by the researcher, to become immersed in the data and identify emerging patterns. The data analysis was conducted by the researcher and two peer reviewers to avoid researcher bias. Data was analyzed by means of content analysis, whereby data was analysed through a systematic classification process of coding and identifying themes.[11] In this study, the coding method described by Zhang and Wildemuth (2016) was adopted, which encompassed eight stringent steps, namely: 1) preparing the data, 2) defining the unit of analysis, 3) developing categories and a coding scheme, 4) testing the coding scheme on a sample of text, 5) coding all text, 6) assessing the coding consistency, 7) drawing conclusions from coded data, and 8) reporting on the methods and findings.[12] This process resulted in the identification of seven categories and three major themes.

Results

As described in Table 2, Interprofessional relationships between end users emerged to be an overlapping category among the end users, indicating that there was a pattern of similar experiences shared regarding interprofessional relationships. The categories were translated into three major themes: namely; factors that positively and negatively affect service delivery as well as strategies for improvement. Since strengths of teleradiology has been a well-documented area in literature, only the unique findings of interprofessional relations between teleradiology end users will be described

Table 2: Themes emanating from categories of all groups of end users

Group of end user	Categories	Themes
RADIOGRAPHER	Request for CT examinations	1. Factors that positively affect teleradiology service delivery 2) Factors that negatively affect teleradiology service delivery 3) Strategies to improve teleradiology service delivery
	Interprofessional relationships between teleradiology end users	
	Impact of teleradiology on service delivery	
REFERRING CLINICIAN	Impact of teleradiology on service delivery	
	Skills development for referring clinicians and radiographers	
	Inter-professional relationship between referring clinicians and their teleradiology end users	
RADIOLOGIST	Factors influencing teleradiology service delivery	

CT = computed tomography

Interprofessional relationships between teleradiology end users.

From the focus group interviews, feelings of negativity regarding the relationships the end users share with each other came out strongly and how these interactions negatively affect service delivery was shared.

Radiographers

Radiographers appeared to be affected the most, as their inter-professional relationships with both the referring clinicians and radiologists appeared strained. This was indicated in the radiographers' experiences when attempting to discuss the validity of the radiological request with the referring clinicians, which was often resulted in conflict of opinions and dismissal of the radiographer's professional opinion. The radiographers further elaborated that when attempting to seek radiologist's opinion, they were often not available to provide telephonic support to the radiographers. The radiographers explained that this negatively impacts on service delivery, as the management of the patient gets delayed and is subjected to unnecessary radiation dose due to new referring clinicians

lack of knowledge with regards to requesting radiological examination. Narrations of these views are described in Table 3.

Table 3: Narrations from radiographer focus group interview

Radiographer	"The when you say to doctor, this cannot happen, the doctor doesn't take your word for it, to say another professional maybe advising me not to do this, what you have to do is, call the radiologist, they don't respond sometimes they are busy, call later, those are the experiences. Now coming back to the impact, it would have you need to make a decision, now you cannot get a radiologist and the doctor is here, and you must decide if you are going to do this patient. In that space there is no one assuring the doctor that this should have not been happening. The impact of this patient, the patient obviously that time becomes a Guinee pig, we get a lot of interns, for them it's a matter of experiencing and so forth"
Radiographer	"Like with this morning, we didn't know who to call so we just did the scan" "We just scan, the doctor dictates"

Referring clinicians

Referring clinicians expressed challenges when communicating with the radiologist. They explained that when seeking authorization for certain radiological requests, as advised to do so by the radiographer, the radiologists did not want to further engage with them and encouraged them to use their own clinical acumen about the necessity of the radiological exam. This incited feelings of frustration and confusion amongst the end users who are guided by a standard operating procedure manual, which indicates that that urgent radiological requests should be discussed with the radiologists. They further described how this negatively impacts the management of the patient, as now the patient must wait for the authorization for the radiological examination and thus delays in treatment occur. Narrations of these views are described in Table 4.

Table 3: Narrations from referring clinician focus group interview

Referring clinician	"When you call, they get angry and they [Radiologist] say you are sitting with the patient there, what is your clinical judgment, why can't you do the scan, you don't have to call for all of them"
Referring Clinician	"Couple of times I called, and it was like I was just calling to hear their voice, they [radiologist] just said 'ya ok', so I ended up booking the patient".

Radiologists

In contrast to the referring clinicians' and radiographer experiences, the radiologists said they welcomed engagement with the referring clinicians, particularly when an angiogram or pediatric CT examination is requested. They also encouraged radiographers to consult with them on the planning of the examination. Narrations from the radiologist are described in Table 5

Table 5: Narrations from radiologist interview

Radiologist	"Consultations should definitely happen, because what happens is the referring physicians may not understand the implications of those CT examinations for those particular examinations and I think it's for us [Radiologist] to advice being the specialist".

Discussion

In the introduction of this paper, communication and inter-professional collaboration was highlighted as integral aspect of health care, however health professionals across many disciplines find the concept challenging to implement. In this study similar findings are shared, however the reasons for ineffective collaboration stem from different reasons.

The radiographers expressed feelings of losing their professional identity, whereby their opinions were not taken into consideration by the referring clinicians. This phenomenon has also been noted in other disciplines such as nursing. Salahni and Coulter explains that nurses and occupational therapists also have feelings of decreased autonomy and

heighted professional dominance by doctors.[13] Their findings revealed that the doctors were not aware that the nurses and occupational therapists harbored those feelings and explained that they did not intend to create that kind of environment in their setting.[13] Similar views were identified in this study, whereby the referring clinicians seem not to be aware of the radiographer's feelings and the radiologists, not aware of the other teleradiology end users' feelings. However, what is different in this context, appears to be a misinterpretation of the standard policies regarding consultations by all the end users involved, resulting in the contrasting views narrated by the two groups of end users. This can further be interpreted as a possible cause for tension among the teleradiology end users. Sustainability of health care projects, particularly in rural settings, has a lot to do with the availability of skilled professionals.[14] Campbell, McAllister and Eley describe intrinsic factors that influence health professionals to stay or leave rural settings, namely challenge, autonomy with specific reference to case management, and significance of work.[14] In this study the researcher extracted from the radiographer's views, that there was a sense of decreased autonomy with regards to CT requests.[14] Although it was mentioned that referring clinicians discuss the CT requests with the radiographers, it appears that the radiographer's opinion is still not taken into consideration thus leaving the radiographers with feelings of self-doubt and decreased motivation. This negatively impacts on service delivery as the radiographers are less likely to do more than what is expected of them.[15-16].

The same misinterpretation of the teleradiology policies can be attributed to the referring clinicians' attitude towards the radiologist, whereby the referring clinician is requested by the radiographer to consult with the radiologist for urgent cases, as seen in a traditional setting. However, when they follow these instructions, the radiologists appear reluctant to further engage with them. This is seen to deter the referring clinicians from future engagements with the radiologist, as they may appear incompetent. Similar findings is were noted in a study conducted by de Souza et al, who indicated that referring clinicians are reluctant to call the specialist as they feel unprepared regarding the questions that the specialist might ask them. In addition, they may harbor feelings of inadequacy if their short comings are exposed.[17] Another participant from the same study indicated that the not all specialists have the patience to understand the difficulties that they experience in the rural setting. It is therefore evident that ineffective communication, harbors feelings of insecurity from the referring clinicians, who would prefer not to engage with the radiologist, which increases the risk of examinations being done that may not be

warranted. Reiner underscores the importance of communication between the radiologist and other teleradiology end users and explains that matters regarding protocol selection, clinical, and imaging history all can directly or indirectly influence the overall quality of the report, and the standard of radiological service a patient receives.[18] Solheim, Storm and Whiney further explain that the risk of communication breakdown results in sub-optimal patient outcomes. In this context, this is seen in patients receiving radiological services that may not be warranted or appropriate for the clinical condition. [19]

The narrations from both the radiographers and referring clinicians allude to not receiving adequate support from the radiology service provider. This may be attributed to the fact that there are a limited number of radiologists with a high work volume at the reporting site, who are unable to maintain telephonic communication with the onsite end users. A study conducted by Balint et al (2014) indicated that telephonic interruptions while the radiologist is reporting results in decreased diagnostic accuracy. They further recommend that attempts should be made to limit phone calls in the reading room. This view may provide reasoning as to why radiologists are not fully engaging with the onsite end users. This however becomes a challenge, particularly in this teleradiology setting, that primarily uses telephone lines for communication with the radiologist.

Recommendations

Revising of the Teleradiology Standard Operating Procedure Manual

To address the challenges described by the end users, it is recommended that the standard operating procedure manual that guides requesting practices, be updated and reissued to all end users. A possible reorientation on the manual is also advised to ensure that the end users are familiar with their extended roles, which differs to a traditional radiology setting. For this reason, guidelines used for a general setting cannot be applied to the teleradiology setting.

Quarterly face-to- face meetings

From the narrations it appears that the end users are practicing in silos and not effectively collaborating. The end users themselves recommended that to address this issue, there needs to be improved channels of communication to ultimately improve the service they render as individuals. In the teleradiology setting, it is presumed that communication using

telephone lines and email communication will be effective at bridging the geographical gap. However, in this study, the referring clinicians and radiographers expressed the need to have face to face contact with the radiologists during quarterly periods, alluding to the fact that the current telephonic communication with the radiologist may not be adequate and lacking a patient centered approach. This face to face meeting would be necessary to resolve challenges and for educational purposes.

Video conference call

The radiologist suggested making use of technology such as skype or instant messaging to strengthen communication and keep in line with the technical nature of teleradiology and its intended purpose, which was to “bridge the gap”. This type of communication is supported in teleradiology by means of tele-conference calls, however in this setting there is no available infrastructure to support this type of interaction. For this reason, support structures for ongoing communication between the remote radiologist and onsite end users, must be a mandatory inclusion for all new teleradiology implementations and not an optional “add on”. Follow up on technical support for these structures must also be provided to ensure that it is used.

Conclusion

In rural district of South Africa, challenges in interprofessional collaboration are amplified in the teleradiology setting, due to the fact the individuals who expected to collaborate are separated from each other. As described in Table 5, there is significant break in communication, which can be attributed to poor quality engagements with the radiology service provider over the telephone line, which is the primary means of communication in this teleradiology setting. In addition to this non-compliance of the standard operating procedure manual leaves end users without well-defined responsibilities, which creates confusion and feelings of professional dominance and isolation among end users, particularly those at the onsite teleradiology. These feelings can often translate in the end user not going the extra mile as expected in a teleradiology setting, with limited resources, which could prove to be possibly hazardous to the patient, in terms of radiation safety and delays in patient management. In order to address challenges of break in communication in this context, interprofessional collaboration between the end users must be facilitated,

such that the teleradiology operation is not comprised of silos of professionals delivering individual services. This can be achieved by the remote radiology service providers understanding the extended supportive role they must play to the onsite end users, in addition to their reporting services. Secondly Infrastructure to support communication must be implemented and sustained. It can be concluded that the tele-communication is not limited to telephone lines but is largely influenced by the quality of engagement between end users and the use of additional support structures, to facilitate effective communication.

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