

Patient Reports as Stories of Clinical Work: Narrative and Work in Neuro Radiology

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Abstract

Radiology reports recount a patient condition but also represent and influence clinical work. This paper describes the connections between the radiology report and clinical work and considers the implications for computerisation. A story representation is described that allows consideration of the radiology report as an active unit of narrative rather than a passive collection of data. This paper draws upon the results of a qualitative study of a Neuro Radiology department.

Keywords: Story, Radiology Report, Clinical Work, Process

1. Introduction

In this paper we describe and discuss the radiology report. We consider the radiology report to be much more than a collection of clinical terms or a passive description of a patient condition. We describe the report as a story, as a unit of narrative representing the patient in a structured format relative to the work around them. The authors have previously explored the formal representation of the story for use in the electronic health record [1][2][3]. Here, the story concept is applied to existing reports to understand the close relationship between the structure of the report and the work of its production. We believe that efforts towards computerisation should not overlook the role of the existing report.

This paper draws from a qualitative investigation into the production and use of the neuro radiology report. A three-month ethnographic study was carried out in a neuro radiology department in a large urban hospital in the UK. Insights from the study will be given in this paper. The authors are unable to publish a report from the study, but do give an (anonymous) example report produced at the site. Reports from the study site are all extremely similar and this does not pose a significant problem. 166 reports have been analysed by hand and 25 of these, including the example, discussed with a radiologist. Work and perspectives have also been discussed with both radiologists and radiographers.

In the next section an example report is described, and in section 3 we give an extended description of work in neuro radiology. In section 4 we discuss the neuro radiology report as a story, and in section 5 how this story tells and influences the work we have described. The issues of a story based perspective for an electronic report are discussed in section 6.

2. Neuro Radiology Reports

Neuro radiology reports at the study site are concise, ‘matter of fact’ and consistent in structure. They are descriptions of a set of ‘x-ray’ images. The example report (figure 1) describes Magnetic Resonance Images (MRI) and Magnetic Resonance Angiograms (MRA) made of a patient’s brain. Two large aneurysms are found. It is a typical report; it begins by describing the imaging method and location, then describes the technique, then gives the findings, then a conclusion and ends with the

radiologist's and transcriber's initials (these initials have been changed). Of 166 reports examined relating to investigations into suspected aneurysm, all followed this structure, although not all reports contained every section. Eight reports did not describe the technique and fifty two did not give a conclusion. The reports not describing the technique were of cases where the images could not be properly made (e.g. the patient experiencing claustrophobia and unable to stay still for a full scan). The reports without conclusion were short reports that did not warrant a summary, the great majority where the radiologist reported the images to be 'normal'.

MRI BRAIN/MRA CIRCLE OF WILLIS TECHNIQUE: Axial GRASE brain, 3-D TOF volume images circle of Willis. FINDINGS: There are aneurysms arising from both intracavernous internal carotid arteries. On the left, the immediate pre-cavernous and intracavernous portions of the internal carotid artery are dysplastic with a fusiform aneurysm. This has a maximum dimension of approximately 1cm. On the right, there is a larger more saccular aneurysm with a maximum dimension of 2cm. This also arises from a dysplastic intracavernous internal carotid artery. The source data images from the angiography and axial GRASE images demonstrate these aneurysms nicely lying within the cavernous sinuses. In addition, there are changes of small vessel cerebrovascular disease in the brain with small lacunar infarcts involving the right gangliocapsular region. COMMENT: Bilateral intracavernous internal carotid aneurysms. This is fusiform on the left measuring approximately 1cm. On the right, the aneurysm is larger and more saccular in nature measuring 2cm in diameter. Small vessel cerebrovascular disease. FGH/JKL

Fig. 1: Example Neuro Radiology Report

The radiology report does not mirror the patient. The structure of the report does not match the structure (anatomy) of the patient. In this paper we will demonstrate the close relationship between report and work. A report represents a real patient but that representation is in a framework relating to the needs and routines of its authors and readers. In the patient the aneurysms are a serious, probably life threatening problem, but in the report they are part of an investigation. How else could the report claim the images “demonstrate these aneurysms *nicely* lying within the cavernous sinuses”?

3. Clinical Work in Neuro Radiology

We continue by describing how reports are produced. The work is first described with a simple, patient centric overview and then the perspectives of the radiographer and radiologist are discussed.

3.1 Clinical work: Overview

A referral note is sent to the neuro radiology department. The referral is evaluated and, if passed, an appointment made. The patient reports to reception. The secretary gives the patient forms they must complete and attaches the referral note to a folder that is passed to the radiographer. The patient waits until being called into the scan room by the radiographer. The patient is prepared and then must lie still on the scanner. The radiographer makes an initial scan and then the full scan. After the scanning is complete and the images checked, the patient may leave. The images are manipulated and printed. The images are attached to the folder and passed to the radiologist. The radiologist puts the images onto a light box, examines them and dictates the report. The report is transcribed and entered into the computer system. The report is sent to the requestor.

The overview is brief, missing out many details. It is an episode centred around the patient, starting with referral and ending with a report. With work presented in this way, the patient and the report are made to seem equivalent. We shall next describe work from the perspectives of the radiographer and radiologist, also giving an example of each. The perspectives show the centrality and equivalence of report and patient to be questionable. The overview is a gloss over a messy reality. However, although reports are created and used in this messy reality, they also serve to represent work, and do so in a similar way to the overview.

3.2 Radiographers work: Scanning

The radiographers largely work on scanning. They work in shifts, and usually in pairs or more. They scan the patients one after the other, and enter the patient details into the computer as they go. The scans take different lengths of time; there might be time to manipulate and print images directly after the scan, often they do this during the next scan. Many scans involve a nurse and radiologist to administer an injection to the patient. Many scans also require the radiologist to check the scans before the

patient is allowed to leave. The radiologist must be interrupted in whatever they are doing, and often leave the radiographers waiting. If a patient does not arrive the radiographer will have time to complete other work or have a break. The radiographer is concerned with the referral requests and the needs of the radiologists to fulfil this request. They select appropriate scanning techniques to meet those needs. They are concerned with the well being of the patient during the scan, but their main interaction with the patient is to tell them to “lie still”.

We now give a snapshot of work, taken from the study.

The next patient is on a trolley. Radiographer X, Radiographer Y and a nurse all help the patient onto the scanner. Radiographer X comes out to enter the patient details into the scanner. Radiographer Y returns a bit later. Radiographer X begins the scan and then reads out a previous report of the patient to Y. Radiographer X and Radiographer Y discuss medical terms. The scanner beeps to signify the initial scan complete. Radiographer X: “What’s all this? He’s got a blobby head” (referring to white marks). Radiographer Y “He was fiddling round with his hands.” Radiographer X starts the scanner. They work in silence. A secretary puts her head through the hatch behind them and says the last patient is still in the waiting room. Radiographer X phones the hospital porters. The scan finishes and Radiographer X goes into the scan room “Alright [name], how you doing? We’ll get a trolley okay?”

The description and example can be used to question the idealistic process of the overview. The radiographers do not work on one patient at a time, the example shows them scanning one and calling the porters to take away another. This second patient was actually ‘forgotten’, their patient episode was left incomplete. There was not a smooth process, there was an interruption by a secretary and the patient did not lie still, causing ‘blobby’ images. Work then, does not form an ideal process. Describing a patient as having a ‘blobby head’, the radiographer refers to the image as if it were the patient. The radiographer does not believe the ‘real’ patient to have this ‘blobby head’, it is explained as hand movement. We can see the start of a performance of a medical body. It is relevant that patient details are entered away

from the patient. The real patient leaves after being scanned, but the performance continues with reporting.

3.3 Radiologists Work: Reporting

The radiologist does not have a strict routine to their day. They usually have commitments at several hospitals. They have formal and informal meetings with neuro surgeons and sometimes patients. They will make angiograms. They read academic journals and follow specific research interests. They must schedule some specific times for reporting, but mainly reporting is fitted around their other commitments or done in the quieter evening times. The radiologist should collect the folders of images from the radiographers, but often these are delivered to the radiologist because the basket the radiographer keeps them in overflows. Each set of images is reported in turn and by priority. The referral notes are sometimes read before and sometimes after viewing the images, depending upon the radiologist. Each image is viewed individually before being placed on the light box. The images are arranged chronologically and often anatomically. An obviously 'normal scan' will be quick and unproblematic to report. More often the images will be arranged, re-arranged and closely examined. The radiologist might refer to a journal or a reference book. The radiologist may discuss troublesome, or interesting cases with other radiologists and neuro surgeons. The dictation of the report involves much rewinding, reviewing and changing before the report is complete. Interruptions may lead to discussion about the case, or may lead to distractions. The radiologist is usually able to leave the report part way done and go and do something else. When they return they will review the report so far and carry on. A report is always finished before the next one is started. A note or letter may also be taped after a report. The next folder is taken off the pile and a new report begun on the same tape.

A snapshot of radiologists' work taken from the study now follows.

*Radiologist A returns to his office talking to Radiologist B about golf.
Radiologist A takes a set of x-ray films out of a folder and arranges them on
the lightbox. Radiologist B reads a referral letter. Radiologist A: "Its
impossible to tell...." Radiologist B: (reads) "Eye muscles are swollen."
Radiologist A: "Who says that? Its impossible to tell." A continues:*

“They’re saying... Surely not... Let me see the report.” Radiologist B reads it out. Radiologist A: “I think it’s impossible to say from....” Radiologist B: “I agree.” Radiologist A calls to Radiologist C who is walking by and asks him to deal with a patient he has no time for. A radiographer brings more folders of films: “Here”.

The description and example can be used to question the idealistic process of the overview. There is no smooth flow from referral to diagnosis, in the example the radiologist is shown to have trouble with a particular referral and is interrupted by the delivery of more folders. Work is not simply centred around a patient. Radiologists are also shown to be working together, and although they discuss a patient, they discuss images of the real patient from which ‘it is impossible to tell’ and talk about the patient in terms of the referral. The conversation between the radiologists covers golf as well as images and a referral.

This section has given an overview of work and two perspectives. The overview presents an idealistic process centred around the patient, but the perspectives disrupt this process. Scanning and reporting individually do not flow smoothly and the two are disjoint and interruptive of each other. Work does not begin with a patient arriving or end with a report, but overlaps. The images, referrals and reports together with the work of the secretaries, nurses, radiologists and radiographers perform a version of the patient that is related to, but the same as the real patient. We will look at the report in this performance and consider its relationship to work. We will find that the report is a story connected to the messy realities of work, but also a story of work. The report presents work in a very similar format to the overview. The overview is idealistic but serves to make sense of neuro radiology by centring the patient. The report as a performance of the body also centres the patient. We will argue however that it is a mistake to see report and patient as directly equivalent but rather that the report must still be understood in terms of the performance.

4. The Neuro Radiology Report as Story

Studies of healthcare sometimes use the idea of a story. For example Gubrium [4] uses stories to explore diversities in understanding and opinion in a nursing home. Whereas the story concept might be used to understand conflicts in other areas of

medicine, we use it in neuro radiology to understand how two disjoint routines are brought together into a patient centric process. Hunter [5] compares “doctors stories” to Sherlock Holmes’ reconstruction of the crime. Taking the report as a story we look at how it reconstructs work.

Berg and Bowker describe how patient records possess a central niche in the actor network of care: “[The patient record] is where many of the nurses’ and physicians’ tasks begin and end, and are coordinated, where specific spaces and times ... unfold.” [6 p514]. The neuro radiology report, holds this niche in the patient centric overview but not necessarily in the two perspectives. The report is not the same as the patient records referred to, an individual report is dictated, transcribed and checked and is then complete; it can be remade but not edited. Inscriptions do not accumulate in the report, but it does still relate to and represent work of radiologists, radiographers and often neuro surgeons, nurses and others. Reports themselves do accumulate, patients are often on return visits. In the patient centric overview reports could be said to be at the beginning and end of tasks. At the time of scanning previous reports are usually present and always a referral note. The production of a new report marks the end of the reporting of a set of images. However, the perspectives emphasise that reports (and referrals and images) are all similar and routine. The report is neither the beginning or end of any work here but a mundane part of it. The overview suggests an equivalence of patient and report and that they are central, the perspectives show the patient to be marginalized (lying still for the scan, and absent for reporting) and the report to be about the patient but relating more in structure and content to work.

The records Berg and Bowker [6] discuss, in which a number of reports and entries accumulate are different stories to the individual report. The longer form is the ‘longitudinal story’, the individual report we shall call a ‘snapshot’. Hunter [5] and Kay and Purves [1][2] have discussed the idea of a longitudinal story. Berg and Bowker discuss how collections of reports construct a patient history and anatomical geography. Here we concentrate on the snapshot. In the next section a story model is used to step through the report and relate it to its context.

5. The Neuro Radiology report as story of clinical work

Elsewhere [3] we have discussed Labov's story model [7]. It is a six-phase structure that corresponds to the neuro radiology report well (although it has been found unsuitable for some longitudinal stories [8]). The six phases are the 'abstract', 'orientation', 'complicating action', 'evaluation', 'resolution' and 'coda'. Not all phases appear in all stories. For the purposes of this paper, the model provides a convenient way for the authors to break down the report and closely read through it. All the information necessary for understanding the use of the model in this paper is given.

Abstract:	[none]
Orientation:	MRI BRAIN/MRA CIRCLE OF WILLIS TECHNIQUE: Axial GRASE brain, 3-D TOF volume images circle of Willis.
Complicating Action (with evaluation):	FINDINGS: There are aneurysms arising from both intracavernous internal carotid arteries. On the left, the immediate pre-cavernous and intracavernous portions of the internal carotid artery are dysplastic with a fusiform aneurysm. This has a maximum dimension of approximately 1cm. On the right, there is a larger more saccular aneurysm with a maximum dimension of 2cm. This also arises from a dysplastic intracavernous internal carotid artery. The source data images from the angiography and axial GRASE images demonstrate these aneurysms nicely lying within the cavernous sinuses. In addition, there are changes of small vessel cerebrovascular disease in the brain with small lacunar infarcts involving the right gangliocapsular region.
Resolution (with evaluation):	COMMENT: Bilateral intracavernous internal carotid aneurysms. This is fusiform on the left measuring approximately 1cm. On the right, the aneurysm is larger and more saccular in nature measuring 2cm in diameter.
Coda:	Small vessel cerebrovascular disease. FGH/JKL

Fig. 2: Story Phases of the Example Neuro Radiology Report

Abstract

The story model (fig.2) begins with an abstract. The abstract describes what the story is about. The radiology reports of our sample have no abstract, or rather the abstract is implicit. We believe the neuro radiology report does not need an abstract because of its frequency and consistency of subject and structure; the reader will already know what the report will be about before they read it.

Orientation

The first phase of the report is the orientation. The orientation of a story describes features such as events, characters, setting and time. The report orients the reader to

the area of the patient scanned and the methods used to do so. The opening words juxtapose references to technology and body (“MRI brain”) signalling that the object of discussion is not the patient’s brain but a technological performance of it (highlighting particular phenomena according to the investigation, in this case blood vessels). The technique listed in reports is a very brief summary of what could actually fill several pages. The technique in the report gives just enough information to the reader. There is hardly a mention of the patient in this section, despite scanning being the only time when the real patient is actually present. This phase describes the images, or more accurately, the way in which the images were made. This section is not a passive description but assures competence of the investigation and sets the scene for the following sections by specifying what is visualised and how.

Complicating Action (Containing Evaluation)

Next in the story model are the complicating action and evaluation. The complicating action describes what happens. The evaluation is not usually a distinct phase but permeates through the others. It tells why a story is interesting and significant. The findings of the report are statements (and speculations) about the images. The radiologist does not simply describe the image but describes what they see as relevant. The example report is from an investigation into suspected aneurysm, and the first part of the report concentrates on the two aneurysms found, and then mentions an additional finding of cerebrovascular disease. Not mentioned are the areas that are free from aneurysms, the problems that the radiologist looks for but doesn’t find. Reports by trainee radiologists are noticeably longer than normal. The trainee may not know what not to report, but also must make effort to reassure the reader that all checks have been made. The radiologist also takes into account information that is not in the image such as age. Although the reporting functions to diagnose the patient, it actively points to treatments. The reference to the aneurysms “nicely” lying in a particular location is doing exactly that. During the study, a radiologist spoke to the first author about a report that had been carefully phrased so as to discourage a neuro surgeon from operating. Another report was shown to hold a hidden complaint about a surgeon not returning images, and another to have comments that related to the authoring radiologist’s bid for research funding.

Resolution (Containing Evaluation)

The next phase of the story is the resolution. The resolution of a story describes what finally happened. This section of the report tries to give factual information. It is built upon the alignment of work, technology, clinician and patient in the preceding sections of the report. This conclusion is a simple example, giving a summary of the findings. Some conclusions directly answer questions on the referral, and some contain additional comments relevant to the ongoing investigations. Not all reports have a conclusion. When the conclusion is present, as a restatement of findings it is not about the patient as much as about the intended reader.

Coda

Finally there is a coda. The coda of a story serves as a bridge back to the present. Here the coda is the radiologist's and transcriber's initials. The initials are not about image or patient, they are about radiologist, transcriber and the process of reporting.

Each section of the report has been described in terms of work. The report is about a patient but describes a medical body founded upon the work of scanning and reporting and relevant to the ongoing investigation or treatment. Earlier in this paper, work in neuro radiology was described using an idealistic overview and examples of messy reality. The report represents work much like the overview, but traces of the messy reality are apparent too (and have been mentioned). The overview began with a referral being made and a patient arriving. This information is not in the report, but is the kind of information that might be in an abstract. The overview then had the scanning of the patient, and the report represents this in the orientation. There is then a smooth link to the analysis and reporting of images in the complicating action. The resolution, we argue, points forward to the referrer and future action. The coda does not relate to any point of the overview but shows the teller of the story. This teller is the radiologist and the story is more weighted to them than the radiographers. The complicating action, the main part of the story, describes the radiologist's work. The report is not exactly the same as the overview but similar. It is patient centric showing a smooth flow from patient scanning to diagnosis.

The report has been described as a snapshot story, used in and representative of work. The research forms part of work towards development of a radiology workbench, and in the next section we will briefly consider the consequences of the findings.

6. Reports and Computerisation

Radiology reports at the study site were computerised only to the extent that they were typed and stored in a database. Further computerisation is certainly possible, but rather than apply existing techniques to the report, the authors have sought to understand what the report is in the first place. This study has shown the report to be more than a collection of patient data, but a story about the patient structured in terms of the work around it. The report has an important role in neuro radiology and we argue that the perspective held in computerisation must cover the routines of its production and use.

This research forms part of work towards a radiology workbench¹. Further computerisation of reports might simply mean automatic transcription, or perhaps something that changes the report, such as structured entry and storage or even integration with the image. The findings of this paper show that it is not adequate to simply store information about a patient, it is a false assumption that the report is a collection of individually meaningful statements free from context. The study does not tell us how a computerised report could or should look but does support the idea that it should be able to tell a story and that any underlying structuring should be relevant to the work of production. The close relationship between report (and referrals and images) and work means that development of the radiology workbench is not just a technical but a sociotechnical issue.

7. Conclusion

The neuro radiology report is not passive information but a story. We have discussed the report and its production and have described the report as a story. We have highlighted this story's connection to clinical work, and believe this connection is valuable to understand in the movement towards further computerisation.

References

1. Kay S, Purves I.
Medical Records and Other Stories: a Narratological Framework, *Meth Infom Med* 1996;
35:72-88.
2. Kay S, Purves I.

¹ EPSRC project (GR/M549/9).

- Medical Records and the "Story Stuff": A Narrativistic Model. in T. Greenhalgh, B Hurwitz (eds.) Narrative Based Medicine: Dialogue and Discourse in Clinical Practice, London: BMJ Books 1998; pp. 185-201.
3. Rooksby J, Kay S.
The Communicative Function of Radiology Reports, Proceedings of Medical Informatics Europe 2000. pp1045-51.
 4. Gubrium J.
Perspective and Story In Nursing Home Ethnography. in J.N. Henderson, M.D. Vesperi (eds.) The Culture of Long Term Care: Nursing Home Ethnography, Westport CT: Bergin and Garvey 1995; pp. 23-36
 5. Hunter KM.
Doctors Stories: The Narrative Structure of Medical Knowledge. Princeton NJ: Princeton University Press 1991.
 6. Berg M, Bowker G.
The Multiple Bodies of the Medical Record: Towards a Sociology of an Artefact', The Sociological Quarterly 1997; 38,3:513-27.
 7. Labov W.
Language in the inner city. Studies in the Black English vernacular, University of Pennsylvania Press, Philadelphia 1972.
 8. Opie A.
Teams as author: Narrative and Knowledge creation in case discussions in multidisciplinary health teams, Soc Res Online 1997 Vol.2 No.3. <http://www.socresonline.org.uk/2/3/5.html>

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