Qualitative Research for Patient Safety Using ICTs: Methodological Considerations in the Technological Age

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Abstract. Considerable effort and resources have been dedicated to improving the quality and safety of patient care through health information systems, but there is still significant scope for improvement. One contributing factor to the lack of progress in patient safety improvement especially where technology has been deployed relates to an over-reliance on purely objective, quantitative, positivist research paradigms as the basis for generating and validating evidence of improvement. This paper argues the need for greater recognition and accommodation of evidence of improvement generated through more subjective, qualitative and pragmatic research paradigms to aid patient safety especially where technology is deployed. This paper discusses how acknowledging the role and value of more subjective ontologies and pragmatist epistemologies can support improvement science research. This paper illustrates some challenges and benefits from adopting qualitative research methods in patient safety improvement projects, particularly focusing challenges in the technological era. While adopting methods that can more readily capture, analyse and interpret direct user experiences, attitudes, insights and behaviours in their contextual settings, patient safety can be enhanced 'on the ground' and errors reduced and/or mitigated, challenges of using these methods with the younger "technologically-centred" healthcare professionals and patients needs to recognised.

Keywords. Grounded theory, qualitative research, improvement science, generation Y, technology

Introduction

Primum non nocere – "First, do no harm" should be the governing principle of medical practice. However, patient safety is compromised all too often in the delivery of healthcare. It has been two decades since the Institute of Medicine report (USA) [1] and the Quality in Australia Healthcare Study [2] alerted us to the disturbing fact that healthcare delivery is associated with errors and adverse events. In the past decades, researchers, health administrators and frontline clinicians have stepped up efforts to improve patient safety. Many strategies have been implemented, from root cause

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analysis to national standards for clinical care but these have met with limited success. Today's healthcare system is still a long way from being safe and reliable.

One of the reasons for the slow progress of patient safety improvement initiatives can be attributed to the over-reliance of an objective, positivist research paradigm where scientific data analysis and double-blinded controlled trials are held in high esteem in order to provide an evidence base for action. More recent studies have emerged which show that qualitative research methods could possibly play a much needed role in improvement science for patient safety, especially when considering the use of information communication technologies (ICTs) [3].

There are benefits and pitfalls for each of these research paradigms. By using quantitative research methodology, the finding is considered as universally adoptable and to some extend, "believable" by clinicians. This is closely related in methodology to drug and device trials. This approach, however, lacks the sensitivity of understanding context and human behaviours. On the other hand, qualitative research methodology often takes into consideration of human and contextual sensitivity, but might not affect change. Change, which is often been seen synonymous with improvement, is what clinicians would want to measure as the outcome of research.

This paper presents a discussion about the research philosophy and research methodology which have been applied in a number of the authors' patient safety improvement projects [4, 5]. This paper then discusses and addresses the challenges that were encountered in applying this research methodology within a clinical science environment, with a discussion of challenges faced using these techniques within a "technologically-centred" healthcare professional and patients.

1. Research philosophy

Clinicians often view double-blinded controlled trials as the gold standard to support clinical practice [6]. This is seen as important to advance medical understanding and treatment by reducing confounding factors and bias. A traditional clinical research approach tends to adopt an objective ontology and a positivist epistemology.

Improvement in quality and safety of patient care however, is almost always directly influenced by the context of care, the work environment and knowledge and skill of the participants [3]. As such, the translation of 'objective' research data from one institution to the other is impossible given the inability to fully control the environment, human emotions and behaviours. More importantly, advances in technology mean that technology utilisation and familiarity of research subjects on technology are different between different institutions. These are not easily controllable variables.

As a result, the need to consider data collected through other methods, in particular, qualitative research methods has been recognised in recent literature [3, 6, 7, 8]. In patient safety improvement work, qualitative research methods are increasingly being used due to the complexity of phenomena being studied [7, 9]. The qualitative research approach allows the in-depth understanding of interactions between healthcare professionals and environments [10]. Qualitative research methods might serve different roles, such as the identification of salient features to improve health care delivery, the identification of barriers and activators for change and the development of theory and understanding of the phenomenon being observed [10]. It is likely that the

basic principles of improvement might be discussed in different institutions, but it is unlikely that the strategies to improve patient safety could be fully transported from one institution to the other.

The guiding research philosophy in patient safety improvement using qualitative research method is therefore worthy of further discussion. Social science research often adopts a subjective ontology and interpretivist epistemology. The interpretivist approach argues that the truth is a social construct [11]. The truth and knowledge is interpreted by humans, their beliefs, their emotions and their values [11]. Researchers conduct studies to understand the world rather than to change the world [12]. When patient safety is considered, however, the purpose of the research is often to improve the practice in order to reduce harm. This is therefore in conflict with many of the principles of interpretivist epistemology.

As such, the authors suggest pragmatism as the suitable epistemology for improvement science research in patient safety. Pragmatism is defined as the approach to understand what works in the world, taking into account context and human behaviours [13]. Pragmatism is often used as the epistemology to guide mixed method research [13, 14]. Pragmatism encompasses socially produced knowledge [14]. Knowing and knowledge is based on prior knowledge and knowing begins from a practical stand point rather than a theoretical stand point [13]. Improvement science research aims to emphasises "whatever works": therefore it is suggested that pragmatism epistemology is most suitable.

2. Data collection techniques

Different data collection techniques can be used to gather data for developing strategies to improve patient safety, especially with the use of ICTs. Data collection techniques commonly used include observations, semi-structured interviews and focus group interviews. Other data collection tools and techniques that might be helpful include ethnographic studies, post-cards and participatory design workshops. Observations and semi-structured interviews appear to be most commonly used techniques especially when there is a limited time frame and resources for the conduct of a project.

2.1. Participant/Sample selection

The participant selection process is dependent on the context of each field site. In small clinical areas with approximately 50 staff, invitation for all staff members to participate in the research might be appropriate. In our experience, most clinicians will participate in the observation sessions and 50-75% of staff will agree to be interviewed if they are engaged in the process and there is buy-in.

In large clinical areas, it is often appropriate to apply purposeful sampling for interviews [11]. It is suggested that all senior clinicians as well as a selection of junior clinicians should be invited taking into account their seniority, experience, participation in clinical activities and their standing amongst their peers. 30-50 participants is often adequate for data analysis.

Based on our experience, 20 fully documented observation sessions will provide adequate information for analysis and interpretation of a single observed phenomenon.

2.2. Observations

Conducting observations is important for improvement science involving clinicians. Observations are often not required and not appropriate for projects involving patients. Observations should be considered as the first data collection technique in order to gain an in-depth understanding of the clinical context, the environment and the nature of clinical issues being studied. In our experience, these observation sessions not only serve as a familiarisation process for the researchers but also provide opportunities for clinical staff to gain some insights about the research being conducted.

It has been well documented in the literature that there are differences between what people say they do, what they perceive they do and what they actually do [15]. Conducting observations is therefore an important part of data collection in order to understand organisational issues and team interactions as well as uncovering the actual clinical practice within each specific clinical setting [9].

Advances in technology do raise the question regarding observations and the role of observation as a data collection technique. The use of smart phones with photo taking and recording capability provide a "communal" way of collecting data through video-observation or photo-observation. How does these technique evolve and how could these techniques help in observations require further exploration in the future.

2.3. Semi-structured interviews

Semi-structured interviews are seen as important data collection techniques to obtain the views of end users (patients or clinicians). In the experience of the authors, the interview duration of around 30 minutes is most productive. Interview duration longer than that often results in a loss of concentration from participants. Semi-structured interviews allow the researcher to gain adequate information regarding the research questions. This technique also allows the use of further questioning to clarify statements made and to explore the clinical experiences of healthcare profession [11]. Rich contextual data can be gathered and analysed using this technique.

As a guide, at least five main sections should be considered when constructing a question frame for use in clinical safety improvement projects. The research should aim to understand the clinical process, information or context required to assist in the process, education and training requirements, tools and strategies to improve the clinical process and the use of ICTs for improvement. These sections are:

1. Clinician's perceptions of the clinical process, including their own role within that process and the perceived functions that the process serves.
2. Information content and environment required for the ideal clinical process.
3. Education and training that clinicians have received, the usefulness of this and how the improvement process can allow for the translation of knowledge to practice.
4. Clinician's understanding of what factors affect the clinical process and strategies that might help.
5. The potential role and main features of ICTs to improve the clinical process.

While traditionally, interviews should be conducted at a time of minimal distraction, the common use of smart phone as part of clinical communication means that it is impossible for healthcare professionals to be completed undistracted from work to participate in interviews. Text messages and phone calls often interrupt

interviews. More importantly, as the authors collect data for various projects using this method over the years, a trend has emerged among younger generation of healthcare professionals. While interviews are supposed to allow interviewees to discuss and consider a topic, it appears that the answers to questions are often very short and to the point from younger healthcare professionals. The interviews are more often a interactive discussion with the interviewee rather than traditional interviews with a lot of prompting needed. This is likely due to the culture of "technologically-assisted" communication through tweeter and text messages at which interactive and communal discussion is a norm. As such, semi-structure interview techniques might need to evolve over time to take into account these social trends.

3. Data analysis process

Qualitative data is unstructured and consists of massive volumes of data ranging from interview transcripts to field notes. The data analysis process aims to provide some structure to the unstructured data and reduce the masses of text to a meaningful pattern and framework to communicate the data without losing the rich contextual insights and understanding of qualitative data [11]. Different techniques and methods have used for conducting analysis of qualitative data [16]. Analysis of qualitative data is an iterative process. This is especially important when data from different clinical areas and different groups of clinicians collected by different researchers are combined together for analysis. Different perspectives from the descriptive data emerge during the iterative analytical processes [16]. The changes in pattern of younger "technologically-centred" interviewees require further thoughts. Due to the more interactive nature of interviews, iterative analysis by the interviewers becomes very important in the data analysis process.

One common approach draws on principles of Grounded theory to guide analysis of data obtained from observations and interviews for improvement science. Grounded theory was proposed as the data analysis method that allows for the generation of significant insights and theory from qualitative data [17]. Grounded theory analysis has been used in medical research [14, 16]. In the quality and safety domain, grounded theory research has been used to generate insights, understanding and theories of the phenomena observed [18].

Grounded theory principles can be applied in research in improvement science with the aim of developing strategies and recommendation for improvement. As the data analysis process involves multiple iterations, recurrent themes emerge. As the data analysis progresses, new themes occur less frequently. Theoretical saturation [11] normally guides the depth of data analysis and number of iteration cycles. Data analysis should include open coding, axial coding and selecting coding. Constant comparison and memoing should accompany open-axial and selective coding to provide meaningful interpretation to the data [17]. The integration of field notes during interviews become important with less descriptive answers obtained in the younger group of interviewees.

Various strategies have been proposed to improve the rigour of qualitative research, including prolonged engagement, triangulation, member checking, audit trial, reflexivity, thick description and peer debriefing [19]. Triangulation has been suggested as the tried and tested means of offering completeness and rigour for qualitative research [19]. This process is especially important with the

"technologically-centred" generation. The use of text messages and various chat programs often lead to a different set of terms and languages used. To integrate interviews and observations from interviewees of different groups, multiple types of triangulation of data analysis are needed to allows a better analysis of holistic data, approaching the concept of crystallisation and triangulation state of mind [19]. During the triangulation process, the comparison and integration of analysis of data from different sources tends to complement each other and therefore provides more in-depth and thorough view.

4. Challenges faced in qualitative research.

There are numerous challenges associated with using qualitative research methods in improvement science research for patient safety. Some of these challenges relate to data collection techniques while others relate to the pre-conceived notions associated with the objective, positivist research paradigm within clinical practice. This process is made more complicated in the technological era.

It is often difficult to get buy-in from clinicians and healthcare administrators. Senior clinicians and healthcare administrators are reliant on numbers and graphs to make decisions and find qualitative research abstract and difficult to understand.

It might be difficult to obtain required data from clinicians for analysis. This is especially a challenge with the younger "technologically-centred" healthcare professionals with short and more interactive style of communication. Clinicians may find it difficult to articulate what they actually do. Conducting observations can help to overcome this challenge and is an important element to data collection. Clinician researchers are often biased in their observations of the phenomenon. The inclusion of non-clinician observers will also provide a more systemic view of the clinical process and improvement strategies.

It is often very time consuming to analyse qualitative data word by word and line by line. A more practical way is a process described by Boeije [20] whereby comparisons are made between interviews and/or particular settings. In these circumstances, combination of data obtained from different groups of clinicians with different communicative styles needs to be carefully integrated. It is often very difficult to communicate qualitative data to a clinical audience. While it is important to consider rich contextual insights, it should also be noted that the goal of improvement science research is to provide a list of recommendations of what needs to be done to improve clinical practice. As such, it is essential to provide clear recommendations of strategies to improve clinical practice.

These challenges, however reflect the effect of using qualitative methodology in improvement science research at which the recommendations and strategies derived from the research often argues for flexible standardisation [21]. Flexible standardisation in ICT design and implementation acknowledges evidence required for improvement derived by different methods but also consider socio-technical issues in the process.

5. Conclusion

Qualitative research has a significant role in healthcare research, especially in improvement science involving the development and implementation of ICTs for safer patient care. This paper has argued that the guiding research philosophy should be subjective and pragmatist. This paper has emphasised the need for observations and interviews to gain an in-depth understanding of strategies to improve patient care. The data can then be analysed drawing on grounded theory principles. While all these techniques have been well described in the past, it is important to note that younger "technologically-centred" group of healthcare professionals poses new challenges in regarding to data collection and analysis using qualitative research techniques.

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