

# READERS' TOOLBOX

## Understanding Research Methods

### Qualitative Research Methods in Medical Education

Adam P. Sawatsky, M.D., M.S., John T. Ratelle, M.D.,  
Thomas J. Beckman, M.D.

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#### Common Methodologies Used in Qualitative Research

##### Discourse Analysis

Analyzes language to enable an understanding of its role in constructing the social world



##### Ethnography

Aims to understand the meanings and behaviors associated with the membership of groups, teams, etc. through the collection of observational and interview data

##### Grounded Theory

Develops, through collection and analysis of data, a well-integrated set of concepts that provide a theoretical explanation of a social phenomenon



##### Phenomenology

Focuses on exploring how individuals make sense of the world and that aims to provide insightful accounts into the subjective experience of these individuals

##### Thematic Analysis

Identifies and categorizes themes within and across data sets to describe a phenomenon of interest



#### SUMMARY

Qualitative research was originally developed within the social sciences. Medical education is a field that comprises multiple disciplines, including the social sciences, and utilizes qualitative research to gain a broader understanding of key phenomena within the field. Many clinician educators are unfamiliar with qualitative research. This article provides a primer for clinician educators who want to appraise or conduct qualitative research in medical education. This article discusses a definition and the philosophical underpinnings for qualitative research. Using the Standards for Reporting Qualitative Research as a guide, this article provides a step-wise approach for conducting and evaluating qualitative research in medical education. This review will enable the reader to understand when to utilize qualitative research in medical education and how to interpret reports using qualitative approaches.

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Qualitative research provides approaches to explore and characterize the education of future anesthesiologists. For example, the practice of anesthesiology is increasingly team-based; core members of the anesthesia care team include physicians, trainees, nurse anesthetists, anesthesiologist assistants, and other healthcare team members.<sup>1</sup> Understanding how to work within and how to teach learners about anesthesia care teams requires the ability to conceptualize the complexity of individual psychology and social interactions that occur within teams. Qualitative research is well suited to investigate complex issues like team-based care. For example, one qualitative study observed the interactions between members of the anesthesia care team during simulated stressful situations and conducted interviews of team members; they described limited understanding of each team member's role and perceptions about appropriate roles and responsibilities, which provided insight for interprofessional team training.<sup>2</sup> Another qualitative study explored the hierarchy within the anesthesia care team, highlighting residents' reluctance to challenge the established hierarchy and outlining the strategies they use to cope with fear and intimidation.<sup>3</sup> Key issues in medical education and anesthesiology, particularly when exploring human experience and social interactions, may be best studied using qualitative research methodologies and methods.

Medical education is a complex field, and medical education research and practice fittingly draws from many

Image: J. P. Rathmell and Terri Navarette.

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### Box 1. What to Look for in Research Using This Method

When appraising qualitative research in medical education, do the authors:

1. Clearly state the study purpose and research question?
2. Describe the conceptual framework that inform the study and guide analysis?
3. Identify their qualitative methodology and research paradigm?
4. Demonstrate adequate reflexivity, conveying to the reader their values, assumptions and way of thinking, being explicit about the effects these ways of thinking have on the research process?
5. Choose data collection methods that are congruent with the research purpose and qualitative methodology?
6. Select an appropriate sampling strategy, choosing participants whose perspectives or experiences are relevant to the study question?
7. Define their method for determining saturation, how they decided to stop data collection?
8. Outline their process for data processing, including the management and coding of study data?
9. Conduct data analysis consistent with their chosen methodology?
10. Consider techniques to enhance trustworthiness of their study findings?
11. Synthesize and interpret their data with sufficient detail and supporting quotations to explain the phenomenon of study?

disciplines (e.g., medicine, psychology, sociology, education) and synthesizes multiple perspectives to explain how people learn and how medicine should be taught.<sup>4,5</sup> The concept of a field was well described by Cristancho and Varpio<sup>5</sup> in their tips for early career medical educators: “A *discipline* is usually guided by shared paradigms, assumptions, rules and methods to present their knowledge claims—i.e., people from the same discipline speak the same language. A *field* brings people from multiple disciplines together.” Qualitative research draws from the perspectives of multiple disciplines and has provided methodologies to explore the complex research questions inherent to medical education.

Current medical training is heavily influenced by the practice of evidence-based medicine.<sup>6</sup> Trainees are taught the “hierarchy of evidence” for evaluating studies of clinical interventions.<sup>7</sup> This hierarchy prioritizes knowledge gained through systematic reviews and meta-analyses, randomized controlled trials, and observational studies, but it does not include qualitative research methodologies. This means that because of their medical training and exposure to quantitative medical literature, clinician educators may be more familiar with quantitative research and feel more comfortable engaging in studies utilizing quantitative methodologies. However, many clinician educators are not familiar with the language and application of qualitative research and feel less comfortable engaging in studies using qualitative methodologies.

Because medical education is a diverse and complex field, qualitative research is a common approach in medical education research. Clinician educators who wish to understand the medical education literature need to be familiar

with qualitative research. Clinician educators involved in research may also find themselves asking questions best answered by qualitative methodologies. Our goal is to provide a broad, practical overview of qualitative research in medical education. Our objectives are to:

- 1) Define qualitative research.
- 2) Compare and contrast qualitative and quantitative research.
- 3) Provide a framework for conducting and appraising qualitative research in medical education.

Qualitative research in medical education has a distinct vocabulary with terminology not commonly used in other biomedical research fields. Therefore, we have provided a glossary and definitions of the common terms that are used throughout this article (table 1).

### What Is Qualitative Research?

Of the many attempts to provide a comprehensive definition of qualitative research, our favorite definition comes from Denzin and Lincoln:

“Qualitative research is a situated activity that locates the observer in the world. Qualitative research consists of a set of interpretive, material practices that make the world visible. These practices...turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them.”<sup>12</sup>

This definition reveals the following points: first, qualitative research is a “situated activity,” meaning that the research and observations are made in the real world, in this case a real life clinical or educational situation. Second, qualitative research “turns the world into a series of representations” by representing the observations, in this case of a clinical or educational situation, with qualitative data, usually taking the form of words, pictures, documents, and other symbols. Last, qualitative researchers seek to “make sense” of the meanings that research participants bring to different phenomena to allow for a greater understanding of those phenomena. Through qualitative research, observers comprehend participants’ beliefs and values and the way these beliefs and values are shaped by the context in which they are studied.

### Qualitative versus Quantitative Research

Because most clinician educators are familiar with quantitative methods, we will start by comparing qualitative and

**Table 1.** Glossary of Common Terms Used in Qualitative Research

Term	Definition
Code	A word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data. <sup>8</sup>
Conceptual framework	Theories that represent a way of thinking about the phenomenon being studied and guide the interpretation of data and situate the study within the larger body of literature on a specific topic. <sup>9</sup>
Constructivism	An epistemology asserting that the reality is constructed by our social, historical and individual contexts. <sup>10</sup>
Epistemology	A belief about the nature of knowledge.
Member check	The process of presenting research findings to study participants to provide opportunities to ensure that the analysis is representative of their own experience. <sup>10</sup>
Methodology	A way of organizing research practice that guide data collection and analysis.
Positivism	A theoretical framework that is guided by the search for objective truth. <sup>10</sup>
Purposive sampling	The choice of participants whose perspectives or experiences are relevant to the study question. <sup>11</sup>
Reflexivity	A technique to enhance researchers' recognition of their own influence on their research, such as how their sexes, ethnic backgrounds, positions, and roles may influence study participants' involvement and/or the choices that researchers make about conceptual frameworks, data collection, and analysis. <sup>10</sup>
Saturation	A research technique used to determine sample size. The research team, during data collection and analysis, must determine at some point that newly collected data does not provide additional insights into the data analysis process. <sup>10</sup>
Triangulation	The process of comparing findings from different methods or perspectives to enhance trustworthiness of the study results. <sup>10</sup>

**Table 2.** Comparisons of Quantitative and Qualitative Research in Medical Education

	Quantitative	Qualitative
Epistemology	Objectivism	Constructivism
Theories of knowledge	Positivism, postpositivism	Postmodernism, interactionism, critical theory, <i>etc.</i>
Objectives	Correlations, cause and effect, deductive, theory testing	Understanding of individual and context, inductive, theory building
Questions	What? Why (cause)? How (mechanism)?	Why (explanation)? How (process)?
Methodologies	Experimental or quasi-experimental	Grounded theory, ethnography, phenomenology
Methods	RCTs, surveys, statistical analysis	Observations, interviews, focus groups, narratives, <i>etc.</i>
Researcher	Detached, unbiased, "blinding"	Situated, influences research analysis, "reflexivity"

RCT, randomized clinical trial.

quantitative methods to gain a better understanding of qualitative research (table 2). To illustrate the difference between qualitative and quantitative research in medical education, we pose the question: "What makes noon conference lectures effective for resident learning?" A qualitative approach might explore the learner perspective on learning in noon conference lectures during residency and conduct an exploratory thematic analysis to better understand what the learner thinks is effective.<sup>13</sup> A qualitative approach is useful to answer this question, especially if the phenomenon of interest is incompletely understood. If we wanted to compare types or attributes of conferences to assess the most effective methods of teaching in a noon conference setting, then a quantitative approach might be more appropriate, though a qualitative approach could be helpful as well. We could use qualitative data to inform the design of a survey<sup>14</sup> or even inform the design of a randomized control trial to compare two types of learning during noon conference.<sup>15</sup> Therefore, when discussing qualitative and quantitative research, the issue is not which research approach is stronger, because it is understood that each approach yields different types of knowledge when answering the research question.

## Similarities

The first step of any research project, qualitative or quantitative, is to determine and refine the study question; this includes conducting a thorough literature review, crafting a problem statement, establishing a conceptual framework for the study, and declaring a statement of intent.<sup>16</sup> A common pitfall in medical education research is to start by identifying the desired methods (*e.g.*, "I want to do a focus group study with medical students.") without having a clearly refined research question, which is like putting the cart before the horse. In other words, the research question should guide the methodology and methods for both qualitative and quantitative research.

Acknowledging the conceptual framework for a study is equally important for both qualitative and quantitative research. In a systematic review of medical education research, only 55% of studies provided a conceptual framework, limiting the interpretation and meaning of the results.<sup>17</sup> Conceptual frameworks are often theories that represent a way of thinking about the phenomenon being studied. Conceptual frameworks guide the interpretation of data and situate the study within the larger body of literature on

a specific topic.<sup>9</sup> Because qualitative research was developed within the social sciences, many qualitative research studies in medical education are framed by theories from social sciences. Theories from social science disciplines have the ability to “open up new ways of seeing the world and, in turn, new questions to ask, new assumptions to unearth, and new possibilities for change.”<sup>18</sup> Qualitative research in medical education has benefitted from these new perspectives to help understand fundamental and complex problems within medical education such as culture, power, identity, and meaning.

## Differences

The fundamental difference between qualitative and quantitative methodologies centers on epistemology (*i.e.*, differing views on truth and knowledge). Cleland<sup>19</sup> describes the differences between qualitative and quantitative philosophies of scientific inquiry: “quantitative and qualitative approaches make different assumptions about the world, about how science should be conducted and about what constitutes legitimate problems, solutions and criteria of ‘proof.’”

Quantitative research comes from *objectivism*, an epistemology asserting that there is an absolute truth that can be discovered; this way of thinking about knowledge leads researchers to conduct experimental study designs aimed to test hypotheses about cause and effect.<sup>10</sup> Qualitative research, on the other hand, comes from *constructivism*, an epistemology asserting that reality is constructed by our social, historical, and individual contexts, and leads researchers to utilize more naturalistic or exploratory study designs to provide explanations about phenomenon in the context that they are being studied.<sup>10</sup> This leads researchers to ask fundamentally different questions about a given phenomenon; quantitative research often asks questions of “What?” and “Why?” to understand causation, whereas qualitative research often asks the questions “Why?” and “How?” to understand explanations. Cook *et al.*<sup>20</sup> provide a framework for classifying the purpose of medical education research to reflect the steps in the scientific method—description (“What was done?”), justification (“Did it work?”), and clarification (“Why or how did it work?”). Qualitative research nicely fits into the categories of “description” and “clarification” by describing observations in natural settings and developing models or theories to help explain “how” and “why” educational methods work.<sup>20</sup>

Another difference between quantitative and qualitative research is the role of the researcher in the research process. Experimental studies have explicitly stated methods for creating an “unbiased” study in which the researcher is detached (*i.e.*, “blinded”) from the analysis process so that their biases do not shape the outcome of the research.<sup>21</sup> The term “bias” comes from the positivist paradigm underpinning quantitative research. Assessing and addressing “bias” in qualitative research is incongruous.<sup>22</sup> Qualitative research, based largely on a constructivist paradigm, acknowledges the role of the researcher as a “coconstructor” of knowledge and utilizes the concept of “reflexivity.” Because researchers act as coconstructors of

knowledge, they must be explicit about the perspectives they bring to the research process. A reflexive researcher is one who challenges their own values, assumptions, and way of thinking and who is explicit about the effects these ways of thinking have on the research process.<sup>23</sup> For example, when we conducted a study on self-directed learning in residency training, we were overt regarding our roles in the residency program as core faculty, our belief in the importance of self-directed learning, and our assumptions that residents actually engaged in self-directed learning.<sup>24,25</sup> We also needed to challenge these assumptions and open ourselves to alternative questions, methods of data collection, and interpretations of the data, to ultimately ensure that we created a research team with varied perspectives. Therefore, qualitative researchers do not strive for “unbiased” research but to understand their own roles in the coconstruction of knowledge. When assessing reflexivity, it is important for the authors to define their roles, explain how those roles may affect the collection and analysis of data, and how the researchers accounted for that effect and, if needed, challenged any assumptions during the research process. Because of the role of the researcher in qualitative research, it is vital to have a member of the research team with qualitative research experience.

## A Word on Mixed Methods

In mixed methods research, the researcher collects and analyzes both qualitative and quantitative data rigorously and integrates both forms of data in the results of the study.<sup>26</sup> Medical education research often involves complex questions that may be best addressed through both quantitative and qualitative approaches. Combining methods can complement the strengths and limitations of each method and provide data from multiple sources to create a more detailed understanding of the phenomenon of interest. Examples of uses of mixed methods that would be applicable to medical education research include: collecting qualitative and quantitative data for more complete program evaluation, collecting qualitative data to inform the research design or instrument development of a quantitative study, or collecting qualitative data to explain the meaning behind the results of a quantitative study.<sup>26</sup> The keys to conducting mixed methods studies are to clearly articulate your research questions, explain your rationale for use of each approach, build an appropriate research team, and carefully follow guidelines for methodologic rigor for each approach.<sup>27</sup>

## Toward Asking More “Why” Questions

We presented similarities and differences between qualitative and quantitative research to introduce the clinician educator to qualitative research but not to suggest the relative value of one these research methods over the other. Whether conducting qualitative or quantitative research in medical education, researchers should move toward asking more “why” questions to gain deeper understanding of the key phenomena and theories in medical education to move the field of



medical education forward.<sup>28</sup> By understanding the theories and assumptions behind qualitative and quantitative research, clinicians can decide how to use these approaches to answer important questions in medical education.

## Conducting and Appraising Qualitative Research

There are substantial differences between qualitative and quantitative research with respect to the assessment of rigor; here we provide a framework for reading, understanding, and assessing the quality of qualitative research. O'Brien *et al.*<sup>29</sup> created a useful 21-item guide for reporting qualitative research in medical education, based upon a systematic review of reporting standards for qualitative research—the Standards for Reporting Qualitative Research. It should be noted, however, that just performing and reporting each step in these standards do not ensure research quality.

Using the Standards for Reporting Qualitative Research as a backdrop, we will highlight basic steps for clinician educators wanting to engage with qualitative research. If you use this framework to conduct qualitative research in medical education, then you should address these steps; if you are evaluating qualitative research in medical education, then you can assess whether the study investigators addressed these steps. Table 3 underscores each step and provides examples from our research in resident self-directed learning.<sup>25</sup>

1. **Refine the study question.** As with any research project, investigators should clearly define the topic of research, describe what is already known about the phenomenon that is being studied, identify gaps in the literature, and clearly state how the study will fill that gap. Considering theoretical underpinnings of qualitative research in medical education often means searching for sources outside of the biomedical literature and utilizing theories from education, sociology, psychology, or other disciplines. This is also a critical time to engage people from other disciplines to identify theories or sources of information that can help define the problem and theoretical frameworks for data collection and analysis. When evaluating the introduction of a qualitative study, the researchers should demonstrate a clear understanding of the phenomenon being studied, the previous research on the phenomenon, and conceptual frameworks that contextualize the study. Last, the problem statement and purpose of the study should be clearly stated.
2. **Identify the qualitative methodology and research paradigm.** The qualitative methodology should be chosen based on the stated purpose of the research. The qualitative methodology represents the overarching philosophy guiding the collection and analysis of data and is distinct from the research methods (*i.e.*, how the data will be collected). There are a number of qualitative methodologies; we have included a list of some of the most common methodologies in table 4. Choosing a qualitative methodology involves examining the existing literature, involving colleagues with qualitative research expertise,

and considering the goals of each approach.<sup>32</sup> For example, explaining the processes, relationships, and theoretical understanding of a phenomenon would point the researcher to *grounded theory* as an appropriate approach to conducting research. Alternatively, describing the lived experiences of participants may point the researcher to a *phenomenological* approach. Ultimately, qualitative research should explicitly state the qualitative methodology along with the supporting rationale. Qualitative research is challenging, and you should consult or collaborate with a qualitative research expert as you shape your research question and choose an appropriate methodology.<sup>32</sup>

3. **Choose data collection methods.** The choice of data collection methods is driven by the research question, methodology, and practical considerations. Sources of data for qualitative studies would include open-ended survey questions, interviews, focus groups, observations, and documents. Among the most important aspects of choosing the data collection method is alignment with the chosen methodology and study purpose.<sup>33</sup> For interviews and focus groups, there are specific methods for designing the instruments.<sup>34,35</sup> Remarkably, these instruments can change throughout the course of the study, because data analysis often informs future data collection in an iterative fashion.
4. **Select a sampling strategy.** After identifying the types of data to be collected, the next step is deciding how to sample the data sources to obtain a representative sample. Most qualitative methodologies utilize purposive sampling, which is choosing participants whose perspectives or experiences are relevant to the study question.<sup>11</sup> Although random sampling and convenience sampling may be simpler and less costly for the researcher than purposeful sampling, these approaches often do not provide sufficient information to answer the study question.<sup>36</sup> For example, in grounded theory, theoretical sampling means that the choice of subsequent participants is purposeful to aid in the building and refinement of developing theory. The criteria for selecting participants should be stated clearly. One key difference between qualitative and quantitative research is sample size: in qualitative research, sample size is usually determined during the data collection process, whereas in quantitative research, the sample size is determined *a priori*. *Saturation* is verified when the analysis of newly collected data no longer provides additional insights into the data analysis process.<sup>10</sup>
5. **Plan and outline a strategy for data processing.** Data processing refers to how the researcher organizes, manages, and dissects the study data. Although data processing serves data analysis, it is not the analysis itself. Data processing includes practical aspects of data management, like transcribing interviews, collecting field notes, and organizing data for analysis. The next step is coding the data, which begins with organizing the raw data into chunks to allow for the identification of themes and patterns. A *code* is a “word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or

**Table 3.** Components of Qualitative Research: Examples from a Single Research Study

Research Component	Example
Refine the study question	Given the desire for faculty guidance of the SDL process during residency training, the purpose of the study was to explore residents' perceptions of the role that faculty members play in the promotion and support of resident SDL, to better characterize the SDL process in the clinical learning environment.
Identify the methodology	We previously developed a comprehensive, theoretical model of SDL among internal medicine residents, including the domains of person, process, and context; this theoretical model informed our constructivist grounded theory approach to explore faculty support for SDL among internal medicine residents and further characterize the relationship between context and process.
Choose data-collection methods	To facilitate discussion among residents regarding contextual elements and SDL, we used focus groups to collect data. Focus groups fit within a constructivist paradigm and are well suited for exploring the circumstances through which participants construct meaning, making this an appropriate tool for exploring the context surrounding resident experiences with SDL.
Select a sampling strategy	We purposively sampled internal medicine residents but were limited in our ability to perform theoretical sampling. Theoretical saturation was determined through group consensus, and data collection stopped after seven focus groups.
Plan and outline a strategy for data processing	After the first two focus groups were open-coded, we discussed the dominant themes and the relationships between themes to create a book of axial codes. We applied the axial codes to all transcripts using a qualitative software program that aids in the organization of qualitative research data.
Conduct the data analysis	We analyzed data as it was being collected and processed data through open-coding, axial coding, and writing analytic memos. We continued to analyze the data through group discussion, engaging in constant comparison between themes, and examination of relationships between themes, theoretical models of SDL, and new data as it was collected. Through consensus-building discussions, we developed models to explain the relationships between the emerging themes.
Consider the trustworthiness of your study findings	All the coders were core faculty in the residency program, and to provide additional perspective, we reviewed the coding with the focus group moderator. To establish the trustworthiness of our findings, we invited all participants to two member-check sessions, presented results of the analysis to study participants, and provided time for comments. This process did not identify any need for further analysis or data revision.
Synthesize and interpret data	We identified three explanatory models for categorizing themes describing faculty support for SDL: faculty guidance for the process of SDL, SDL <i>versus</i> other-directed learning, and faculty archetypes for supporting SDL. One example of a faculty archetype for supporting SDL was "collaborative SDL," in which the faculty member and the learner work together to answer a question, allowing the faculty member to explicitly model their approach for SDL.

Note: Please see reference 25: Sawatsky AP, Ratelle JT, Bonnes SL, Egginton JS, Beckman TJ. Faculty support for self-directed learning in internal medicine residency: A qualitative study using grounded theory. *Acad Med* 2018; 93:943–51.  
SDL, self-directed learning.

**Table 4.** Common Methodologies Used in Qualitative Research

Methodology	Definition
Discourse analysis	A methodology that analyses language to enable an understanding of its role in constructing the social world <sup>10</sup>
Ethnography	A methodology that aims to understand the meanings and behaviors associated with the membership of groups, teams, <i>etc.</i> , through the collection of observational and interview data <sup>10</sup>
Grounded theory	A methodology designed to develop, through collection and analysis of data, a well integrated set of concepts that provide a theoretical explanation of a social phenomenon <sup>20</sup>
Phenomenology	A methodology that focuses on exploring how individuals make sense of the world and that aims to provide insightful accounts into the subjective experience of these individuals <sup>10</sup>
Thematic analysis	A methodology that focuses on the identification of themes and categorization of themes within and across data sets to describe a phenomenon of interest <sup>31</sup>

evocative attribute for a portion of language-based or visual data.<sup>38</sup> There is an artificial breakdown between data processing and analysis, because these steps may be conducted simultaneously; many consider *coding* as different from—yet a necessary step to facilitating—the analysis of data.<sup>8</sup> Qualitative software can support this process, by making it easier to organize, access, search, and code your data. However, it is noteworthy that these programs do not do the work for you, they are merely tools for supporting data processing and analysis.

**6. Conduct the data analysis.** When analyzing the data, there are several factors to consider. First, the process of data analysis begins with the initial data collection, which often informs future data collection. Researchers should be intentional when reading, reviewing, and analyzing data as it is collected, so that they can shape and enrich subsequent data collection (*e.g.*, modify the interview questions). Second, data analysis is often conducted by a research team that should have the appropriate expertise and perspectives to bring to the analysis process. Therefore, when evaluating

## Box 2. Where to Find More Information on This Topic

For more information on qualitative research in medical education:

1. Qualitative Research and Evaluation Methods: Integrating Theory and Practice, by Michael Q. Patton (SAGE Publications, Inc., 2014)
2. Qualitative Inquiry and Research Design: Choosing Among Five Approaches, by John W. Cresswell (SAGE Publications, Inc. 2017)
3. Researching Medical Education, by Jennifer Cleland and Steven J. Durning (Wiley-Blackwell, 2015)
4. Qualitative Research in Medical Education, by Patricia McNally, in Oxford Textbook of Medical Education, edited by Kieren Walsh (Oxford University Press, 2013)
5. The Journal of Graduate Medical Education "Qualitative Rip Out Series" (Available at: <http://www.jgme.org/page/ripouts>)
6. The Standards for Reporting Qualitative Research (O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: a synthesis of recommendations. Acad Med. 2014;89(9):1245-51.)
7. The Wilson Centre Qualitative Atelier (For more information: <http://thewilsoncentre.ca/atelier/>)

a qualitative study, you should consider the team's composition and their reflexivity with respect to their potential biases and influences on their study subjects. Third, the overall goal is to move from the raw data to abstractions of the data that answer the research question. For example, in grounded theory, the research moves from the raw data, to the identification of themes, to categorization of themes, to identifying relationships between themes, and ultimately to the development of theoretical explanations of the phenomenon.<sup>30</sup> Consequently, the primary researcher or research team should be intimately involved with the data analysis, interrogating the data, writing analytic memos, and ultimately make meaning out of the data. There are differing opinions about the use of "counting" of codes or themes in qualitative research. In general, counting of themes is used during the analysis process to recognize patterns and themes; often these are not reported as numbers and percentages as in quantitative research, but may be represented by words like *few*, *some*, or *many*.<sup>37</sup>

7. **Recognize techniques to enhance trustworthiness of your study findings.** Ensuring consistency between the data and the results of data analysis, along with ensuring that the data and results accurately represent the perspectives and contexts related to the data source, are crucial to ensuring *trustworthiness* of study findings. Methods for enhancing trustworthiness include *triangulation*, which is comparing findings from different methods or perspectives, and *member-checking*, which is presenting research findings to study participants to provide opportunities to ensure that the analysis is representative.<sup>10</sup>
8. **Synthesize and interpret your data.** Synthesis of qualitative research is determined by the depth of the analysis and involves moving beyond description of the data to explaining the findings and situating the results within the larger body of literature on the phenomenon of interest. The reporting of data synthesis should match the research methodology. For instance, if the study is using grounded theory, does the study advance the theoretical understanding of the phenomenon being studied? It is also important to acknowledge that clarity and organization are paramount.<sup>10</sup> Qualitative data are rich and extensive;

therefore, researchers must organize and tell a compelling story from the data.<sup>38</sup> This process includes the selection of representative data (e.g., quotations from interviews) to substantiate claims made by the research team.

## Conclusions

Qualitative research is commonly used in medical education but may be unfamiliar to many clinician educators. In this article, we provided a definition of qualitative research, explored the similarities and differences between qualitative and quantitative research, and outlined a framework for conducting or appraising qualitative research in medical education. Even with advanced training, it can be difficult for clinician educators to understand and conduct qualitative research. Leaders in medical education research have proposed the following advice to clinician educators wanting to engage in qualitative medical education research: (1) clinician educators should find collaborators with knowledge of theories from other disciplines (e.g., sociology, cognitive psychology) and experience in qualitative research to utilize their complementary knowledge and experience to conduct research—in this way, clinician educators can identify important research questions; collaborators can inform research methodology and theoretical perspectives; and (2) clinician educators should engage with a diverse range disciplines to generate new questions and perspectives on research.<sup>4</sup>

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## Competing Interests

The authors declare no competing interests.

## Correspondence

Address correspondence to Dr. Sawatsky: Mayo Clinic, Gonda 17, 200 First Street SW, Rochester, Minnesota 55905. [sawatsky.adam@mayo.edu](mailto:sawatsky.adam@mayo.edu). Information on purchasing reprints may be found at [www.anesthesiology.org](http://www.anesthesiology.org)

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## ANESTHESIOLOGY REFLECTIONS FROM THE WOOD LIBRARY-MUSEUM

# Chloroform, Ether, or Nitrous Oxide at Night? Light for Liberty from F. T. Grimes, M.D., D.D.S.

**The Last Come Down!**

**ONLY TWENTY DOLLARS FOR A FULL SET OF TEETH!**

I propose for the next eight months to make entire upper or lower sets of Artificial Teeth on the Hard Rubber or Vulcanite Base for the small sum of twenty dollars—operations which were formerly charged forty to fifty dollars for. I have reduced the price for eight months for the purpose of inducing all who may desire Artificial Teeth inserted to call within the time above mentioned. You will see from the following clause copied from the Goodyear Vulcanite Company's license under which all dentists now have to operate, that this is the lowest price that Artificial Teeth can be inserted for by any Dentist:

*Fourth.* That this license shall not be assigned or transferred by the party of the second part, nor shall it be used, either directly or indirectly, as a basis for any other claim to work, or permit any person or persons to do any work, for a term less than Twenty Dollars.

*Fifth.* That this license shall not be assigned or transferred by the party of the second part, nor shall it be used, either directly or indirectly, as a basis for any other claim to work, or permit any person or persons to do any work, for a term less than Twenty Dollars.

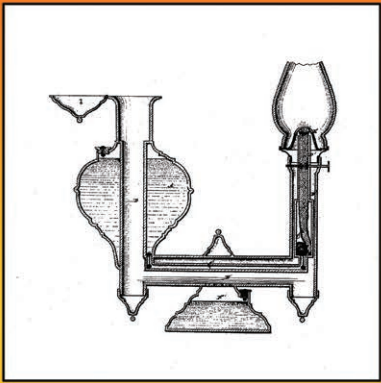
Every Dentist has to pay to the Vulcanite Company and for other license this year from ninety to a hundred and fifty dollars, where they formerly only paid ten dollars, with a probability of a further advance for license, in which case Vulcanite or Rubber work will be advanced to former prices, fifty to sixty dollars for an upper or lower set of Teeth.

Teeth should be extracted from three to five months before inserting Teeth. Temporary sets can be inserted three or four weeks after extracting.

I am prepared to perform all other operations in Dental Surgery in a most durable manner, such as cleaning, filling, removing tartar and stains from the teeth, correcting irregularities, &c.

Chloroform, Ether, the Anaesthetic Spray and Nitrous Oxide administered for the extraction of teeth without pain. Operations warranted. Terms, Cash.

Office and Residence opposite the Methodist Church, Liberty, Mo. F. T. GRIMES, M. D., D. D. S., Surgeon Dentist.



Chloroform, Ether, the Anaesthetic Spray and Nitrous Oxide administered for the extraction of teeth without pain. Operations warranted. Terms, Cash.

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Filed by its inventor, Dr. Franklin T. Grimes of Liberty in Clay County, Missouri, United States Patent 110648 was granted in January of 1871 for his “Improvement in lamps.” The patent diagram (*upper right*) features an oil reservoir and a wicked lamp. As a dental advertising broadside (*left*) spells out, “Chloroform, Ether...and Nitrous Oxide” (*lower right*) could now be administered more readily during the evenings, courtesy of lamps patented by Dr. Grimes. Yes, even explosive ether was administered around Grimes patented lamps. (Copyright © the American Society of Anesthesiologists’ Wood Library-Museum of Anesthesiology.)

*George S. Bause, M.D., M.P.H., Honorary Curator and Laureate of the History of Anesthesia, Wood Library-Museum of Anesthesiology, Schaumburg, Illinois, and Clinical Associate Professor, Case Western Reserve University, Cleveland, Ohio. [UJYC@aol.com](mailto:UJYC@aol.com).*