

## QUALITATIVE RESEARCH IN PHARMACY EDUCATION

### A Review of the Quality Indicators of Rigor in Qualitative Research

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Attributes of rigor and quality and suggested best practices for qualitative research design as they relate to the steps of designing, conducting, and reporting qualitative research in health professions educational scholarship are presented. A research question must be clear and focused and supported by a strong conceptual framework, both of which contribute to the selection of appropriate research methods that enhance trustworthiness and minimize researcher bias inherent in qualitative methodologies. Qualitative data collection and analyses are often modified through an iterative approach to answering the research question. Researcher reflexivity, essentially a researcher's insight into their own biases and rationale for decision-making as the study progresses, is critical to rigor. This article reviews common standards of rigor, quality scholarship criteria, and best practices for qualitative research from design through dissemination.

**Keywords:** qualitative research design, standards of rigor, quality, best practices

#### INTRODUCTION

Within the past 20 years, qualitative research in health professions education has increased significantly, both in practice and publication. Today, one can pick up most any issue of a wide variety of health professions education journals and find at least one article that includes some type of qualitative research, whether a full study or the inclusion of a qualitative component within a quantitative or mixed methods study. Simultaneously, there have been recurrent calls for enhancing rigor and quality in qualitative research.

As members of the academic community, we share responsibility for ensuring rigor in qualitative research, whether as researchers who design and implement, manuscript reviewers who critique, colleagues who discuss and learn from each other, or scholarly teachers who draw upon results to enhance and innovate education. Therefore, the purpose of this article is to summarize standards of rigor and suggested best practices for designing, conducting, and reporting high-quality qualitative research. To begin, Denzin and Lincoln's definition of qualitative research, a long-standing cornerstone in the field, provides a useful foundation for summarizing quality standards and best practices:

Qualitative research involves the studied use and collection of a variety of empirical materials – case study; personal experience; introspection; life story; interview; artifacts; cultural texts and productions; observational,

historical, interactional, and visual texts – that describe the routine and problematic moments and meanings in individual lives. Accordingly, qualitative researchers deploy a wide range of interconnected interpretative practices, hoping always to get a better understanding of the subject matter at hand. It is understood, however, that each practice makes the world visible in a different way. Hence there is frequently a commitment to using more than one interpretative practice in any study.<sup>1</sup>

In recent years, multiple publications have synthesized quality criteria and recommendations for use by researchers and peer reviewers alike, often in the form of checklists.<sup>2-6</sup> Some authors have raised concerns about the use of such checklists and adherence to strict, universal criteria because they do not afford sufficient flexibility to accommodate the diverse approaches and multiple interpretive practices often represented in qualitative studies.<sup>7-11</sup> They argue that a strict focus on using checklists of specific technical criteria may stifle the diversity and multiplicity of practices that are so much a part of achieving quality and rigor within the qualitative paradigm. As an alternative, some of these authors have published best practice guidelines for use by researchers and peer reviewers to achieve and assess methodological rigor and research quality.<sup>12,13</sup>

Some journals within the field of health professions education have also established best practice guidance, as opposed to strict criteria or a checklist, for qualitative research. These have been disseminated as guiding questions or evaluation categories. In 2015, *Academic Medicine*

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produced an expanded second edition of a researcher/author manual that includes specific criteria with extensive explanations and examples.<sup>14</sup> Still others have disseminated best practice guidelines through a series of methodological articles within journal publications.<sup>2</sup>

In this article, attributes of rigor and quality and suggested best practices are presented as they relate to the steps of designing, conducting, and reporting qualitative research in a step-wise approach.

## **BEST PRACTICES: STEP-WISE APPROACH**

### **Step 1: Identifying a Research Topic**

Identifying and developing a research topic is comprised of two major tasks: formulating a research question, and developing a conceptual framework to support the study. Formulating a research question is often stimulated by real-life observations, experiences, or events in the researcher's local setting that reflect a perplexing problem begging for systematic inquiry. The research question begins as a problem statement or set of propositions that describe the relationship among certain concepts, behaviors, or experiences. Agee<sup>15</sup> and others<sup>16,17</sup> note that initial questions are usually too broad in focus and too vague regarding the specific context of the study to be answerable and researchable. Creswell reminds us that initial qualitative research questions guide inquiry, but they often change as the author's understanding of the issue develops throughout the study.<sup>16</sup> Developing and refining a primary research question focused on both the phenomena of interest and the context in which it is situated is essential to research rigor and quality.

Glassick, Huber, and Maeroff identified six criteria applicable to assessing the quality of scholarship.<sup>18,19</sup> Now commonly referred to as the *Glassick Criteria* (Table 1), these critical attributes outline the essential elements of any scholarly approach and serve as a general research framework for developing research questions and designing studies. The first two criteria, clear purpose and adequate preparation, are directly related to formulating effective research questions and a strong conceptual framework.

Generating and refining a qualitative research question requires thorough, systematic, and iterative review of the literature, and the use of those results to establish a clear

context and foundation for the question and study design. Using an iterative approach, relevant concepts, principles, theories or models, and prior evidence are identified to establish what is known, and more importantly, what is not known. The iterative process contributes to forming a better research question, the criteria for which can be abbreviated by the acronym FINER, ie, feasible, interesting, novel, ethical, and relevant, that is answerable and researchable, in terms of research focus, context specificity, and the availability of time, logistics, and resources to carry out the study. Developing a FINER research question is critical to study rigor and quality and should not be rushed, as all other aspects of research design depend on the focus and clarity of the research question(s) guiding the study.<sup>15</sup> Agee provides clear and worthwhile additional guidance for developing qualitative research questions.<sup>15</sup>

Reflexivity, the idea that a researcher's preconceptions and biases can influence decisions and actions throughout qualitative research activities, is a critical aspect of rigor even at the earliest stages of the study. A researcher's background, beliefs, and experiences may affect any aspect of the research from choosing which specific question to investigate through determining how to present the results. Therefore, even at this early stage, the potential effect of researcher bias and any ethical considerations should be acknowledged and addressed. That is, how will the question's influence on study design affect participants' lives, position the researcher in relationship with others, or require specific methods for addressing potential areas of research bias and ethical considerations?

A conceptual framework is then actively constructed to provide a logical and convincing argument for the research. The framework defines and justifies the research question, the methodology selected to answer that question, and the perspectives from which interpretation of results and conclusions will be made.<sup>5,6,20</sup> Developing a well-integrated conceptual framework is essential to establishing a research topic based upon a thorough and integrated review of relevant literature (addressing Glassick criteria #1 and #2: clear purpose and adequate preparation). Key concepts, principles, assumptions, best practices, and theories are identified, defined, and integrated in ways that clearly demonstrate the problem statement and corresponding research question are

Table 1. Glassick's Criteria for Assessing the Quality of Scholarship of a Research Study<sup>18</sup>

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1. Clear purpose – goal or research question and supporting rationale
  2. Adequate preparation – thorough, integrated review of relevant literature and prior work
  3. Appropriate methods – research approach and methods align to answer research question
  4. Significant results – obtain results that advance knowledge and/or practice in the targeted field
  5. Effective presentation – presented in a way that others can emulate and/or build upon the work
  6. Reflective critique – regular, systematic approach to question and learn from and during research process
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answerable, researchable, and important to advancing thinking and practice.

Ringsted, Hodges, and Sherpbier describe three essential parts to an effective conceptual framework: theories and/or concepts and principles relevant to the phenomenon of interest; what is known and unknown from prior work, observations, and examples; and the researcher's observations, ideas, and suppositions regarding the research problem statement and question.<sup>21</sup> Lingard describes four types of *unknowns* to pursue during literature review: what no one knows; what is not yet well understood; what controversy or conflicting results, understandings, or perspectives exist; and what are unproven assumptions.<sup>22</sup> In qualitative research, these unknowns are critical to achieving a well-developed conceptual framework and a corresponding rigorous study design.

Recent contributions from Ravitch and colleagues present best practices in developing frameworks for conceptual and methodological coherence within a study design, regardless of the research approach.<sup>23,24</sup> Their recommendations and arguments are highly relevant to qualitative research. Figure 1 reflects the primary components of a conceptual framework adapted from Ravitch and Carl<sup>23</sup> and how all components contribute to decisions regarding research design, implementation, and applications of results to future thinking, study, and practice. Notice that each element of the framework interacts with and influences other elements in a dynamic and interactive process from the beginning to the end of a research project. The intersecting bidirectional arrows

represent direct relationships between elements as they relate to specific aspects of a qualitative research study.

Maxwell also provides useful guidance for developing an effective conceptual framework specific to the qualitative research paradigm.<sup>17</sup> The 2015 second edition of the *Review Criteria for Research Manuscripts*<sup>14</sup> and work by Ravitch and colleagues<sup>23,24</sup> provide specific guidance for applying the conceptual framework to each stage of the research process to enhance rigor and quality. Quality criteria for assessing a study's problem statement, conceptual framework, and research question include the following: introduction builds a logical case and provides context for the problem statement; problem statement is clear and well-articulated; conceptual framework is explicit and justified; research purpose and/or question is clearly stated; and constructs being investigated are clearly identified and presented.<sup>14,24,25</sup> As best practice guidelines, these criteria facilitate quality and rigor while providing sufficient flexibility in how each is achieved and demonstrated.

While a conceptual framework is important to rigor in qualitative research, Huberman and Miles caution qualitative researchers about developing and using a framework to the extent that it influences qualitative design deductively because this would violate the very principles of induction that define the qualitative research paradigm.<sup>25</sup> Our profession's recent emphasis on a holistic admissions process for pharmacy students provides a reasonable example of inductive and deductive reasoning and their respective applications in qualitative and quantitative research studies. Principles of inductive reasoning are applied when a qualitative research study examines a representative group of competent pharmacy professionals to generate a theory about essential cognitive and affective skills for patient-centered care. Deductive reasoning could then be applied to design a hypothesis-driven prospective study that compares the outcomes of two cohorts of students, one group admitted using traditional criteria and one admitted based on a holistic admissions process revised to value the affective skills of applicants. Essentially, the qualitative researcher must carefully generate a conceptual framework that guides the research question and study design without allowing the conceptual framework to become so rigid as to dictate a testable hypothesis, which is the founding principle of deductive reasoning.<sup>26</sup>

## Step 2: Qualitative Study Design

The development of a strong conceptual framework facilitates selection of appropriate study methods to minimize the bias inherent in qualitative studies and help readers to trust the research and the researcher (see

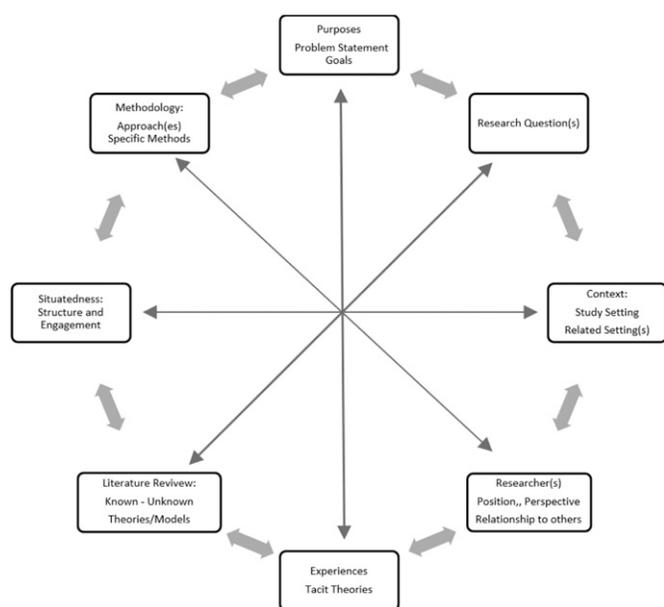


Figure 1. Adaptation of Ravitch and Carl's Components of a Conceptual Framework<sup>23</sup>

Glassick criteria #3 in Table 1). Although researchers can employ great flexibility in the selection of study methods, inclusion of best practice methods for assuring the rigor and trustworthiness of results is critical to study design. Lincoln and Guba outline four criteria for establishing the overall trustworthiness of qualitative research results: credibility, the researcher ensures and imparts to the reader supporting evidence that the results accurately represent what was studied; transferability, the researcher provides detailed contextual information such that readers can determine whether the results are applicable to their or other situations; dependability, the researcher describes the study process in sufficient detail that the work could be repeated; confirmability, the researcher ensures and communicates to the reader that the results are based on and reflective of the information gathered from the participants and not the interpretations or bias of the researcher.<sup>27</sup>

Specific best practice methods used in the sampling and data collection processes to increase the rigor and trustworthiness of qualitative research include: clear rationale for sampling design decisions, determination of data saturation, ethics in research design, member checking, prolonged engagement with and persistent observation of study participants, and triangulation of data sources.<sup>28</sup>

Qualitative research is focused on making sense of lived, observed phenomenon in a specific context with specifically selected individuals, rather than attempting to generalize from sample to population. Therefore, *sampling design* in qualitative research is not random but defined purposively to include the most appropriate participants in the most appropriate context for answering the research question. Qualitative researchers recognize that certain participants are more likely to be “rich” with data or insight than others, and therefore, more relevant and useful in achieving the research purpose and answering the question at hand. The conceptual framework contributes directly to determining sample definitions, size, and recruitment of participants. A typical best practice is purposive sampling methods, and when appropriate, convenience sampling may be justified.<sup>29</sup>

*Purposive sampling* reflects intentional selection of research participants to optimize data sources for answering the research question. For example, the research question may be best answered by persons who have particular experience (critical case sampling) or certain expertise (key informant sampling). Similarly, additional participants may be referred for participation by active participants (snowball sampling) or may be selected to represent either similar or opposing viewpoints (confirming or disconfirming samples). Again, the process of developing and using a strong conceptual framework to

guide and justify methodological decisions, in this case defining and establishing the study sample, is critical to rigor and quality.<sup>30</sup> *Convenience sampling*, using the most accessible research participants, is the least rigorous approach to defining a study sample and may result in low accuracy, poor representativeness, low credibility, and lack of transferability of study results.

Qualitative studies typically reflect designs in which data collection and analysis are done concurrently, with results of ongoing analysis informing continuing data collection. Determination of a final sample size is largely based on having sufficient opportunity to collect relevant data until new information is no longer emerging from data collection, new coding is not feasible, and/or no new themes are emerging; that is, reaching *data saturation*, a common standard of rigor for data collection in qualitative studies. Thus, accurately predicting a sample size during the planning phases of qualitative research can be challenging.<sup>30</sup> Care should be taken that sufficient quantity (think *thick* description) and quality (think *rich* description) of data have been collected prior to concluding that data saturation has been achieved. A poor decision regarding sample size is a direct consequence of sampling strategy and quality of data generated, which leaves the researcher unable to fully answer the research question in sufficient depth.<sup>30</sup>

Though *data saturation* is probably the most common terminology used to describe the achievement of sufficient sample size, it does not apply to all study designs. For example, one could argue that in some approaches to qualitative research, data collection could continue infinitely if the event continues infinitely. In education, we often anecdotally observe variations in the personality and structure of a class of students, and as generations of students continue to evolve with time, so too would the data generated from observing each successive class. In such situations, data saturation might never be achieved. Conversely, the number of participants available for inclusion in a sample may be small and some risk of not reaching data saturation may be unavoidable. Thus, the idea of fully achieving data saturation may be unrealistic when applied to some populations or research questions. In other instances, attrition and factors related to time and resources may contribute to not reaching data saturation within the limits of the study. By being transparent in the process and reporting of results when saturation may not have been possible, the resulting data may still contribute to the field and to further inquiry. Replication of the study using other samples and conducting additional types of follow-up studies are other options for better understanding the research phenomenon at hand.<sup>31</sup>

In addition to defining the sample and selecting participants, other considerations related to sampling bias may impact the quantity and quality of data generated and therefore the quality of the study result. These include: methods of recruiting, procedures for informed consent, timing of the interviews in relation to experience or emotion, procedures for ensuring participant anonymity/confidentiality, interview setting, and methods of recording/transcribing the data. Any of these factors could potentially change the nature of the relationship between the researcher and the study participants and influence the trustworthiness of data collected or the study result. Thus, ongoing application of previously mentioned researcher reflexivity is critical to the rigor of the study and quality of sampling.<sup>29,30</sup>

Common qualitative data collection methods used in health professions education include interview, direct observation methods, and textual/document analysis. Given the unique and often highly sensitive nature of data being collected by the researcher, trustworthiness is an essential component of the researcher-participant relationship. *Ethical conduct* refers to how moral principles and values are part of the research process. Participants' perceptions of ethical conduct are fundamental to a relationship likely to generate high quality data. During each step of the research process, care must be taken to protect the confidentiality of participants and shield them from harm relating to issues of respect and dignity. Researchers must be respectful of the participants' contributions and quotes, and results must be reported truthfully and honestly.<sup>8</sup>

Interview methods range from highly structured to increase dependability or completely open-ended to allow for interviewers to clarify a participant's response for increased credibility and confirmability. Regardless, interview protocols and structure are often modified or refined, based on concurrent data collection and analysis processes to support or refute preliminary interpretations and refine focus and continuing inquiry. Researcher reflexivity, or acknowledgement of researcher bias, is absolutely critical to the credibility and trustworthiness of data collection and analysis in such study designs.<sup>32</sup>

Interviews should be recorded and transcribed verbatim prior to coding and analysis.<sup>28</sup> *Member checking*, a common standard of rigor, is a practice to increase study credibility and confirmability that involves asking a research subject to verify the transcription of an interview.<sup>1,16,28</sup> The research subject is asked to verify the completeness and accuracy of an interview transcript to ensure the transcript truthfully reflects the meaning and intent of the subject's contribution.

*Prolonged engagement* involves the researcher gaining familiarity and understanding of the culture and

context surrounding the persons or situations being studied. This strategy supports reflexivity, allowing the researcher to determine how they themselves may be a source of bias during the data collection process by altering the nature of how individuals behave or interact with others in the presence of the researcher. Facial expressions, spoken language, body language, style of dress, age, race, gender, social status, culture, and the researcher's relationship with the participants may potentially influence either participants' responses or how the researcher interprets those responses.<sup>33</sup> "Fitting in" by demonstrating an appreciation and understanding of the cultural norms of the population being studied potentially allows the researcher to obtain more open and honest responses from participants. However, if the research participants or topic are too familiar or personal, this may also influence data collection or analysis and interpretation of the results.<sup>33</sup> The possible applications of this section to faculty research with student participants in the context of pharmacy education are obvious, and researcher reflexivity is critical to rigor.

Some researchers using observational methods adopt a strategy of direct field observation, while others play partial or full participant roles in the activity being observed. In both observation scenarios, it is impossible to separate the researcher from the environment, and researcher reflexivity is essential. The pros and cons of observation approach, relative to the research question and study purpose, should be evaluated by the researcher, and the justification for the observational strategy selected should be made clear.<sup>34</sup> Regardless of the researcher's degree of visibility to the study participants, *persistent observation* of the targeted sample is critical to the confirmability standard and to achieving data saturation. That is, study conclusions must be clearly grounded in persistent phenomena witnessed during the study, rather than on a fluke event.<sup>28</sup>

Researchers acknowledge that observational methodologies are limited by the reality that the researcher carries a bias in determining what is observed, what is recorded, how it is recorded, and how it is transcribed for analysis. A study's conceptual framework is critical to achieving rigor and quality and provides guidance in developing predetermined notions or plans for what to observe, how to record, and how to minimize the influence of potential bias.<sup>34</sup> Researcher notes should be recorded as soon as possible after the observation event to optimize accuracy. The more detailed and complete the notes, the more accurate and useful they can be in data analysis or in auditing processes for enhancing rigor in the interpretation phase of the study.<sup>34</sup>

*Triangulation* is among the common standards of rigor applied within the qualitative research paradigm.

Data triangulation is used to identify convergence of data obtained through multiple data sources and methods (eg, observation field notes and interview transcripts) to avoid or minimize error or bias and optimize accuracy in data collection and analysis processes.<sup>33,35,36</sup>

Again, researcher practice in reflexivity throughout research processes is integral to rigor in study design and implementation. Researchers must demonstrate attention to appropriate methods and reflective critique, which are represented in both core elements of the conceptual framework (Figure 1) and Glassick criteria (Table 1). In so doing, the researcher will be well-prepared to justify sampling design and data collection decisions to manuscript reviewers and, ultimately, readers.

### Step 3: Data Analysis

In many qualitative studies, data collection runs concurrently with data analysis. Specific standards of rigor are commonly used to ensure trustworthiness and integrity within the data analysis process, including use of computer software, peer review, audit trail, triangulation, and negative case analysis.

Management and analyses of qualitative data from written text, observational field notes, and interview transcripts may be accomplished using manual methods or the assistance of computer software applications for coding and analysis. When managing very large data sets or complex study designs, computer software can be very helpful to assist researchers in coding, sorting, organizing, and weighting data elements. Software applications can facilitate ease in calculating semi-quantitative descriptive statistics, such as counts of specific events, that can be used as evidence that the researcher's analysis is based on a representative majority of data collected (*inclusivism*) rather than focusing on selected rarities (*anecdotalism*). Using software to code data can also make it easier to identify deviant cases, detect coding errors, and estimate interrater reliability among multiple coders.<sup>37</sup> While such software helps to manage data, the actual analyses and interpretation still reside with the researcher.

Peer review, another common standard of rigor, is a process by which researchers invite an independent third-party researcher to analyze a detailed audit trail maintained by the study author. The audit trail methodically describes the step-by-step processes and decision-making throughout the study. Review of this audit trail occurs prior to manuscript development and enhances study confirmability.<sup>1,16</sup> The peer reviewer offers a critique of the study methods and validation of the conclusions drawn by the author as a thorough check on researcher bias.

Triangulation also plays a role in data analysis, as the term can also be used to describe how multiple sources of data can be used to confirm or refute interpretation,

assertions, themes, and study conclusions. If a theme or theory can be arrived at and validated using multiple sources of data, the result of the study has greater credibility and confirmability.<sup>16,33,36</sup> Should any competing or controversial theories emerge during data collection or analysis, it is vital to the credibility and trustworthiness of the study that the author disclose and explore those negative cases. *Negative case analysis* refers to actively seeking out and scrutinizing data that do not fit or support the researcher's interpretation of the data.<sup>16</sup>

The use of best practices applying to data collection and data analysis facilitates the full examination of data relative to the study purpose and research question and helps to prevent premature closure of the study. Rather than stopping at the initial identification of literal, first-level assertion statements and themes, authors must progress to interpreting how results relate to, revise, or expand the conceptual framework, or offer an improved theory or model for explaining the study phenomenon of interest. Closing the loop on data collection is critical and is achieved when thorough and valid analysis can be linked back to the conceptual framework, as addressed in the next section.

### Step 4: Drawing Valid Conclusions

Lingard and Kennedy<sup>38</sup> succinctly state that the purpose of qualitative research is to deepen one's understanding of specific perspectives, observations, experiences, or events evidenced through the behaviors or products of individuals and groups as they are situated in specific contexts or circumstances. Conclusions generated from study results should enhance the conceptual framework, or contribute to a new theory or model development, and are most often situated within the discussion and conclusion sections of a manuscript.

The discussion section should include interpretation of the results and recommendations for practice. Interpretations should go beyond first-level results or literal description of observed behaviors, patterns, and themes from analysis. The author's challenge is to provide a complete and thorough examination and explanation of how specific results relate to each other, contribute to answering the research question, and achieve the primary purpose of the research endeavor. The discussion should "close the loop" by integrating study results and analysis with the original conceptual framework. The discussion section should also provide a parsimonious narrative or graphical explanation and interpretation of study results that enhances understanding of the targeted phenomena.

The conclusion section should provide an overall picture or synopsis of the study, including its important and unique contributions to the field from the perspective

of both conceptual and practical significance. The conclusion should also include personal and theoretical perspectives and future directions for research. Together, the discussion and conclusion should include responses to the larger questions of the study’s contributions, such as: So what? Why do these results matter? What next?

The strength of conclusions is dependent upon the extent to which standards of rigor and best practices were demonstrated in design, data collection, data analysis, and interpretation, as described in previous sections of this article.<sup>4,12,17,23,24</sup> Quality and rigor expectations for drawing valid conclusions and generating new theories are reflected in the following essential features of rigor and quality, which include: “Close the loop” to clearly link research questions, study design, data collection and analysis, and interpretation of results. Reflect effective integration of the study results with the conceptual framework and explain results in ways that relate, support, elaborate, and/or challenge conclusions of prior scholarship. Descriptions of new or enhanced frameworks or models are clear and effectively grounded in the study results and conclusions. Practical or theoretical implications are effectively discussed, including guidance for future studies. Limitations and issues of

reflexivity and ethics are clearly and explicitly described, including references to actions taken to address these areas.<sup>3,4,12,14</sup>

**Step 5: Reporting Research Results**

Key to quality reporting of qualitative research results are clarity, organization, completeness, accuracy, and conciseness in communicating the results to the reader of the research manuscript. O’Brien and others<sup>4</sup> proposed a standardized framework specifically for reporting qualitative studies known as the Standards for Reporting Qualitative Research (SRQR, Table 2). This framework provides detailed explanations of what should be reported in each of 21 sections of a qualitative research manuscript. While the SRQR does not explicitly mention a conceptual framework, the descriptions and table footnote clarification for the introduction and problem statement reflect the essential elements and focus of a conceptual framework. Ultimately, readers of published work determine levels of credibility, trustworthiness, and the like. A manuscript reviewer, the first reader of a study report, has the responsibility and privilege of providing critique and guidance to authors regarding achievement of quality criteria,

Table 2. An Adaptation of the 21 Elements of O’Brien and Colleagues’ Standards for Reporting Qualitative Research (SRQR)<sup>4</sup>

Manuscript Section	Research Design and Methods				
	Title, Abstract, and Introduction	Methods	Results	Discussion	Other
Section Elements	Title	Qualitative approach and research paradigm	Synthesis and interpretation	Integration with prior work, implications, transferability, and contributions to the field	Conflicts of Interest
	Abstract	Researcher characteristics and reflexivity			
	Problem formulation	Context Sampling strategy	Links to empirical data (quotes, etc.)		Funding
	Purpose or Research question	Ethical issues pertaining to human subjects Data collection methods Data collection instruments/ technologies Units of study Data processing Data analysis Techniques to enhance trustworthiness		Limitations	

execution and reporting of standards of rigor, and the extent to which meaningful contributions to thinking and practice in the field are presented.<sup>13,39</sup>

Authors must avoid language heavy with connotations or adjectives that insert the researcher's opinion into the database or manuscript.<sup>14,40</sup> The researcher should be as neutral and objective as possible in interpreting data and in presenting results. Thick and rich descriptions, where robust descriptive language is used to provide sufficient contextual information, enable the reader to determine *credibility, transferability, dependability, and confirmability*.

The process of demonstrating the credibility of research is rooted in honest and transparent reporting of how biases and other possible confounders were identified and addressed throughout study processes. Such reporting, first described within the study's conceptual framework, should be revisited in reporting the work. Confounders may include the researcher's training and previous experiences, personal connections to the background theory, access to the study population, and funding sources. These elements and processes are best represented in Glassick's criteria for *effective presentation* and *reflective critique* (Table 1, criteria 5 and 6). Transferability is communicated, in part, through description of sampling factors such as: geographical location of the study, number and characteristics of participants, and the timeframe of data collection and analysis.<sup>40</sup> Such descriptions also contribute to the credibility of the results and readers' determination of transfer to their and other contexts. To ensure dependability, the research method must be reported in detail such that the reader can determine proper research practices have been followed and that future researchers can repeat the study.<sup>40</sup> The confirmability of the results is influenced by reducing or at a minimum explaining any researcher influence on the result by applying and meeting standards of rigor such as member checking, triangulation, and peer review.<sup>29,33</sup>

## CONCLUSION

In qualitative studies, the researcher is often the primary instrument for data collection. Any researcher biases not adequately addressed or errors in judgement can affect the quality of data and subsequent research results.<sup>33</sup> Thus, due to the creative interpretative and contextually bound nature of qualitative studies, the application of standards of rigor and adherence to systematic processes well-documented in an audit trail are essential. The application of rigor and quality criteria extend beyond the researcher and are also important to effective peer review processes within a study and for scholarly dissemination. The goal of rigor in qualitative research can be described as ensuring that the research design, method, and conclusions are explicit, public, replicable, open to critique, and free of bias.<sup>41</sup> Rigor

in the research process and results are achieved when each element of study methodology is systematic and transparent through complete, methodical, and accurate reporting.<sup>33</sup> Beginning the study with a well-developed conceptual framework and active use of both researcher reflexivity and rigorous peer review during study implementation can drive both study rigor and quality.

As the number of published qualitative studies in health professions educational research increases, it is important for our community of health care educators to keep in mind the unique aspects of rigor in qualitative studies presented here. Qualitative researchers should select and apply any of the above referenced study methods and research practices, as appropriate to the research question, to achieve rigor and quality. As in any research paradigm, the goal of quality and rigor in qualitative research is to minimize the risk of bias and maximize the accuracy and credibility of research results. Rigor is best achieved through thoughtful and deliberate planning, diligent and ongoing application of researcher reflexivity, and honest communication between the researcher and the audience regarding the study and its results.

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