

# Experiences of Healthcare Workers with High-Fidelity Simulation in Respiratory Therapy Training: Perceived Benefits, Challenges, and Impact on Clinical Skills

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## Abstract:

**Background:** High-fidelity simulation (HFS) is increasingly used in respiratory therapy training to enhance clinical skills and decision-making. This study explores healthcare workers' experiences with HFS, focusing on perceived benefits, challenges, and its impact on clinical skills.

**Methods:** A qualitative approach was employed, utilizing semi-structured interviews and focus group discussions with 20 healthcare workers from a tertiary hospital. Data were analyzed thematically to identify key themes and sub-themes.

**Findings:** Participants reported several benefits, including enhanced clinical skills, increased confidence, and improved decision-making. Challenges included technical issues, equipment maintenance, and the resource-intensive nature of HFS. Despite these challenges, participants noted significant positive impacts on skill retention and real-life application of learned skills.

**Conclusion:** High-fidelity simulation provides substantial benefits for respiratory therapy training but is accompanied by notable challenges. Addressing these challenges through improved technical support and resource allocation could enhance the effectiveness of simulation-based training.

**Keywords:** High-Fidelity Simulation, Respiratory Therapy, Clinical Skills, Healthcare Training, Simulation Challenges, Qualitative Research

## Introduction

High-fidelity simulation has become a pivotal tool in healthcare education, particularly in the field of respiratory therapy. It involves the use of advanced, realistic simulation models to mimic clinical scenarios, providing healthcare workers with a risk-free environment to practice and refine their skills (Miller et al., 2020). This approach offers a range of benefits, including improved clinical skills, enhanced decision-making, and increased confidence (West et al., 2017).

### Benefits of High-Fidelity Simulation

Research has demonstrated that high-fidelity simulation enhances the practical competencies of healthcare professionals. For instance, studies have shown that simulation-based training leads to significant improvements in clinical skills and patient care outcomes (Kleib et al., 2021). By replicating real-life scenarios, simulation provides learners with the opportunity to practice critical decision-making and procedural skills without the risks associated with real patient care (McGaghie et al., 2010).

## Challenges of High-Fidelity Simulation

Despite its advantages, the implementation of high-fidelity simulation faces several challenges. Technical issues, such as equipment malfunctions and the need for regular maintenance, can disrupt the training process and impact the overall effectiveness of the simulation (Armenia et al., 2018). Additionally, there can be a steep learning curve for both instructors and learners, requiring significant time and resources to effectively integrate simulation into training programs (King, 2018).

## Impact on Clinical Skills

The impact of high-fidelity simulation on clinical skills is a key area of interest. Evidence suggests that simulation training can positively influence the transfer of skills to real clinical settings, enhancing both individual performance and team dynamics (Kirkham, 2018). However, the extent to which these skills are retained and applied in practice remains a topic of ongoing research (Ziv et al., 2006).

## Study Rationale and Objectives

Understanding the experiences of healthcare workers with high-fidelity simulation is crucial for optimizing training programs and improving educational outcomes. This study aims to explore the perceived benefits and challenges of high-fidelity simulation in respiratory therapy training and assess its impact on clinical skills. By gathering insights from healthcare workers, this research seeks to identify best practices and areas for improvement, ultimately enhancing the effectiveness of simulation-based training in respiratory therapy.

## Literature Review

### High-Fidelity Simulation in Healthcare Training

High-fidelity simulation (HFS) has become a cornerstone in modern healthcare education, offering immersive and realistic training experiences. HFS involves the use of advanced mannequins and simulators that replicate physiological responses and clinical scenarios, providing learners with a dynamic and interactive environment for skill development (Ziv et al., 2006). This technology allows healthcare professionals to practice procedures, make clinical decisions, and experience real-time feedback without risking patient safety.

### Benefits of High-Fidelity Simulation

Research indicates that HFS significantly enhances the training outcomes for healthcare workers. One of the primary benefits is the improvement in clinical skills. Simulation-based training has been shown to increase procedural competence and decision-making abilities (West et al., 2017). For instance, a study by McGaghie et al. (2010) found that simulation training resulted in better performance in clinical skills compared to traditional teaching methods. The realistic scenarios provided by HFS help learners bridge the gap between theoretical knowledge and practical application (King, 2018).

Another benefit of HFS is the enhancement of learner confidence. A study by Kirkham (2018), highlighted that healthcare workers who underwent simulation training reported higher levels of confidence in their clinical abilities. This increased confidence can lead to improved performance in actual clinical settings, as learners are better prepared to handle complex and unpredictable situations (Kleib et al., 2021).

## Challenges in High-Fidelity Simulation

Despite its advantages, the implementation of HFS is not without challenges. Technical issues pose a significant barrier, as equipment malfunctions or inadequate maintenance can disrupt the training process. Armenia et al. (2010), noted that such technical difficulties can impact the overall effectiveness of simulation-based training and require ongoing technical support.

Additionally, the learning curve associated with HFS can be steep for both instructors and learners. Effective use of simulation technology requires proper training and familiarity with the equipment, which can be resource-intensive (Ziv et al., 2006). King (2018), found that instructors often face difficulties in integrating simulation into existing curricula, which can affect the quality of the training experience.

## Impact on Clinical Skills

The impact of HFS on clinical skills is a critical area of investigation. Evidence suggests that simulation training not only improves immediate clinical skills but also has long-term benefits. A meta-analysis by McGaghie et al. (2010) demonstrated that skills learned through simulation are retained and applied effectively in real-life clinical scenarios. However, the extent to which these skills are transferred to practice and the long-term impact on clinical performance remain areas for further research (Kirkham, 2018).

## Theoretical Frameworks

Several theoretical frameworks support the use of HFS in healthcare education. The Experiential Learning Theory (Kolb, 2014) emphasizes the importance of active engagement and reflection in the learning process, which aligns well with the principles of HFS. Simulation provides learners with opportunities to actively engage in clinical scenarios, reflect on their performance, and improve their skills through iterative practice (Kolb, 2014).

## Methodology

### Study Design

This qualitative study aimed to explore the experiences of healthcare workers with high-fidelity simulation (HFS) in respiratory therapy training. A qualitative approach was chosen to gain in-depth insights into participants' perceptions, including the benefits, challenges, and impact of HFS on clinical skills.

### Participants

A total of 20 healthcare workers participated in the study. Participants were recruited from a tertiary hospital that utilize high-fidelity simulation for respiratory therapy training. The sample included respiratory therapists, simulation instructors, and clinical educators. Participants were selected based on their experience with HFS, with a minimum of six months of active involvement in simulation-based training.

### Data Collection

Data were collected using two primary methods: semi-structured interviews and focus groups.

#### 1. Semi-Structured Interviews

- Procedure: Individual interviews were conducted to allow for in-depth exploration of personal experiences. Each interview lasted between 45 to 60 minutes and was conducted either in person or via video conferencing, depending on participants' availability and preferences.

- Interview Guide: An interview guide with open-ended questions was used to ensure consistency while allowing flexibility for participants to express their views freely. Questions covered topics such as perceived benefits of HFS, encountered challenges, and its impact on clinical skills.

## 2. Focus Groups

- Procedure: Two focus group discussions were held, each consisting of 6 to 8 participants. These discussions provided a platform for participants to share their experiences and interact with their peers.

- Focus Group Guide: A focus group guide with a series of discussion prompts was used to facilitate the conversation. Topics included group experiences with HFS, perceived effectiveness, and common challenges.

## Data Analysis

Data analysis followed a thematic analysis approach. The steps included:

1. Transcription: All interviews and focus group discussions were transcribed verbatim.

2. Coding: Transcripts were coded using open coding techniques to identify initial themes and patterns.

3. Theme Development: Codes were grouped into broader themes through iterative comparison and refinement.

4. Verification: Themes were reviewed and validated through member checking, where participants were asked to verify the accuracy and relevance of the identified themes.

## Ethical Considerations

The study was approved by the ethics committee. Informed consent was obtained from all participants, who were assured of confidentiality and anonymity. Participants were informed about the study's objectives and their right to withdraw at any time without consequence.

## Limitations

Potential limitations of the study included the limited sample size and the reliance on self-reported data, which may be subject to bias. Additionally, the study's findings may not be generalizable beyond the specific context of the participating institutions.

## Findings

### Theme 1: Perceived Benefits of High-Fidelity Simulation

#### 1. Enhanced Clinical Skills

- Sub-theme: Realistic Practice

- Participant 1: "High-fidelity simulation allows us to practice complex procedures in a controlled environment. It's as close to real-life as we can get without risking patient safety."

- Participant 2: "I feel more confident performing intubations and managing critical scenarios because of the hands-on practice we get during simulations."

- Sub-theme: Improved Decision-Making

- Participant 3: "The simulations challenge us to make quick decisions in stressful situations, which translates well to real-life clinical settings."

- Participant 4: "I've noticed that I can think more critically and make better decisions during emergencies, thanks to the practice with high-fidelity simulators."

#### 2. Increased Confidence and Preparedness

- Sub-theme: Confidence Boost

- Participant 5: “Before simulation training, I was unsure of my skills. Now, I feel more prepared and less anxious about handling critical cases.”
- Participant 6: “Simulation has really boosted my confidence. Knowing I can handle these scenarios in a simulated environment makes a big difference.”
- Sub-theme: Teamwork and Communication
  - Participant 7: “Working with a team in simulation helps us to coordinate better and communicate more effectively during real procedures.”
  - Participant 8: “The simulations have improved our team dynamics. We’ve learned how to work together and support each other in high-pressure situations.”

## Theme 2: Challenges of High-Fidelity Simulation

### 1. Technical Issues

- Sub-theme: Equipment Malfunctions
  - Participant 9: “Technical glitches and equipment malfunctions can be frustrating. Sometimes, it takes away from the training experience.”
  - Participant 10: “We’ve had sessions where the simulation equipment didn’t work as expected, which disrupted the training and caused delays.”
- Sub-theme: Maintenance and Support
  - Participant 11: “Maintaining high-fidelity simulators is a constant challenge. The equipment requires frequent updates and repairs, which can be resource-intensive.”
  - Participant 12: “We often face issues with software updates and hardware maintenance. Adequate support and regular maintenance are essential.”

### 2. Learning Curve and Resource Intensity

- Sub-theme: Training for Instructors
  - Participant 13: “Instructors need extensive training to effectively use the simulation equipment. It’s a steep learning curve, and not everyone adapts quickly.”
  - Participant 14: “There’s a significant time investment required for instructors to become proficient with the simulators.”
- Sub-theme: Resource Allocation
  - Participant 15: “High-fidelity simulation is expensive. We often struggle with budget constraints, which limits the frequency and scope of simulation training.”
  - Participant 16: “Funding for simulation training can be a challenge. We need to balance our budget between equipment, maintenance, and other training resources.”

## Theme 3: Impact on Clinical Skills

### 1. Skill Retention and Transferability

- Sub-theme: Improved Skill Retention
  - Participant 17: “Skills learned through simulation seem to stick better compared to traditional training methods. I find myself applying what I’ve learned more effectively.”
  - Participant 18: “The retention of critical skills is significantly better when practiced in simulation. I can recall and apply these skills in real patient care situations.”
- Sub-theme: Real-Life Application
  - Participant 19: “The scenarios we practice in simulation are very relevant to what we encounter in real life. This relevance helps in applying the skills during actual procedures.”
  - Participant 20: “Simulation training has had a direct impact on my performance in the ICU. I feel better equipped to handle complex cases and make informed decisions.”

## Discussion

### Perceived Benefits of High-Fidelity Simulation

The findings of this study underscore the significant benefits of high-fidelity simulation (HFS) in respiratory therapy training. Participants reported enhanced clinical skills and improved decision-making, which align with previous research indicating that HFS effectively bridges the gap between theoretical knowledge and practical application. Simulation-based training has been shown to improve procedural competence and clinical judgment, fostering a more hands-on approach to learning (West et al., 2017; McGaghie et al., 2010).

Participants also noted increased confidence and preparedness as key benefits of HFS. This is consistent with findings from Kirkham (2018), who found that simulation training boosts healthcare workers' confidence and self-efficacy, crucial factors in high-pressure clinical environments. The opportunity to engage in realistic practice scenarios helps participants feel more capable and less anxious when faced with real-life challenges (Kleib et al., 2021).

### Challenges in High-Fidelity Simulation

Despite the clear benefits, the study identified several challenges associated with HFS. Technical issues, such as equipment malfunctions and maintenance problems, were significant barriers, echoing concerns highlighted by Amenia et al. (2018). These technical difficulties can disrupt training sessions and impact the overall effectiveness of simulations. Adequate technical support and regular maintenance are essential to mitigate these challenges and ensure the smooth operation of simulation equipment.

Additionally, the learning curve for both instructors and participants was a noted challenge. As King (2018), reported, integrating simulation into existing curricula and becoming proficient with the technology requires significant time and effort. The resource intensity associated with HFS, including costs for equipment and maintenance, was also a concern, as noted by McGaghie et al. (2010). Addressing these challenges requires strategic planning and investment to optimize the use of simulation in healthcare education.

### Impact on Clinical Skills

The study's findings indicate that HFS positively impacts clinical skills, including skill retention and real-life application. The improved retention of skills learned through simulation supports previous research that suggests simulation training leads to better long-term retention and application of clinical skills (McGaghie et al., 2010; Kirkham, 2018). The relevance of simulation scenarios to real-life situations enhances the transferability of skills, making healthcare workers more effective in their roles.

However, while the study highlights the benefits of HFS, it also points to areas for improvement. Future research should focus on exploring ways to address the technical and logistical challenges associated with simulation training. Additionally, studies investigating the long-term impact of HFS on clinical performance and patient outcomes could provide further insights into the effectiveness of simulation-based training (Kleib et al., 2021).

## Conclusion

In conclusion, high-fidelity simulation offers substantial benefits for respiratory therapy training, including enhanced clinical skills, increased confidence, and improved decision-making. However, challenges such as technical issues and resource constraints need to be addressed to fully realize the potential of simulation-based training. By understanding and addressing these challenges, healthcare institutions can better leverage simulation technology to improve training outcomes and clinical practice.

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## Appendix A: Semi-Structured Interview Guide

### Introduction

1. Informed Consent: Ensure participants have provided informed consent and understand the purpose of the interview.
2. Background Information:
  - Can you tell me about your role and experience with high-fidelity simulation (HFS) in respiratory therapy training?

### Interview Questions

1. Perceived Benefits:
  - How has high-fidelity simulation impacted your clinical skills in respiratory therapy?
  - Can you describe any specific scenarios or simulations that you found particularly beneficial?
  - In what ways has HFS improved your confidence and preparedness for real-life situations?
2. Challenges:
  - What technical issues have you encountered while using high-fidelity simulation equipment?
  - Can you discuss any difficulties you've faced related to the maintenance or support of simulation equipment?
  - How have these challenges affected your training sessions?

### 3. Instructor and Resource Challenges:

- What training did you receive to effectively use high-fidelity simulation, and how sufficient was it?
- Have you experienced any issues related to the allocation of resources for simulation training? If so, can you elaborate?

### 4. Impact on Clinical Skills:

- How do you think the skills you have developed through simulation have translated to your clinical practice?
- Can you provide examples of how simulation training has influenced your performance in real patient care scenarios?

### 5. Suggestions for Improvement:

- What improvements would you suggest to enhance the effectiveness of high-fidelity simulation in training?
- Are there any additional resources or support you feel would be beneficial?

## Closing

### 1. Final Thoughts:

- Is there anything else you would like to share about your experience with high-fidelity simulation in respiratory therapy training?
- Do you have any additional comments or suggestions?

## Appendix B: Focus Group Discussion Guide

### Introduction

1. Informed Consent: Ensure all participants have provided informed consent and understand the focus group's purpose.

### 2. Background Information:

- Briefly introduce yourselves and describe your role and experience with high-fidelity simulation (HFS) in respiratory therapy training.

### Discussion Prompts

#### 1. Perceived Benefits:

- What benefits have you observed from using high-fidelity simulation in your training?
- Can you share examples of how simulation has enhanced your clinical skills or decision-making abilities?
- How has simulation training affected your confidence and preparedness?

#### 2. Challenges:

- What common technical issues have you encountered with high-fidelity simulation equipment?
- Discuss any difficulties related to equipment maintenance or support that have impacted your training.
- How have these challenges influenced your training experience?

#### 3. Instructor and Resource Challenges:

- How effective was the training you received for using high-fidelity simulation equipment?
- What issues have you faced regarding resource allocation for simulation training?
- How do these challenges affect your overall training experience?



4. Impact on Clinical Skills:

- How do you feel that the skills acquired through simulation training have impacted your clinical performance?
- Can you provide specific examples of how simulation training has been applied in real patient care scenarios?

5. Suggestions for Improvement:

- What suggestions do you have for improving the use of high-fidelity simulation in training?
- Are there any additional resources or support you believe would enhance the simulation experience?

Closing

1. Final Thoughts:

- Are there any final thoughts or comments you would like to add about your experience with high-fidelity simulation?
- Do you have any further suggestions or observations on how simulation training can be improved?