Policy Development for the Use of Virtual Reality in Pediatric Burn Patients

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Introduction

- ► Burns: the 5th most common non-fatal childhood injury (World Health Organization, 2018)

- ► 24% of burn injuries occur in children (< age 15) (World Health Organization, 2018)

- ► > 300 children (< age 19) seek medical treatment for a burn injury daily (The Centers for Disease Control and Prevention, 2019)

- ► Children (< age 5) were 2.4 times more likely than the general population to suffer a burn (World Health Organization, 2018)

Introduction

► Burn Pain: described as excruciating and often undertreated (Chan et al., 2007; Khadra et al., 2018)

► Virtual Reality
  — Allows immersion/interaction with an artificial environment (Das et al., 2005; Khadra et al., 2018)
  — Provides distraction from pain experienced by burn patients (Das et al., 2005; Khadra et al., 2018)
  — Currently used with pediatric patients undergoing venous cannulation (Walther-Larsen et al., 2019)
  — A potentially powerful treatment option for children during burn wound care (Khadra et al., 2018)

Problem Statement

- ► Problem: lack of virtual reality policy
- ► Current Practice: pharmacotherapies and simple distraction techniques for pain
- ► Problem Focus: healthcare policy
- ► Problem Identification: through a literature review on the impact of utilizing virtual reality for children during burn wound care
- ► Problem Parameters: pediatric burn patients and staff providing their care

Purpose and Objectives

► Purpose: to create and evaluate a policy for the use of virtual reality for pediatric patients undergoing burn wound care to decrease pain associated with such procedures

► Objectives
  1. Create an evidence-based policy for virtual reality use with pediatric burn patients during wound care by 5/28/21
  2. Assemble a multidisciplinary team to review the policy using an evaluation tool by 7/9/21
  3. Revise the policy based on feedback from the evaluation tool by 7/18/21

Background

► Burns
  — Painful, lasting physical and psychological consequences (Chan et al., 2007; Das et al., 2005)
  — Significant impact on immediate and long-term quality of life (Chan et al., 2007; Das et al., 2005)
► Burn Wound Care
  — Repetitive painful stimuli (Das et al., 2005; Khadra et al., 2018)
  — Leads to anxiety and physical and emotional trauma (Das et al., 2005; Khadra et al., 2018)
  — Leads to increased incidence of persistent pain (Retrouvey & Shahrokhi, 2015)

Background

► Virtual Reality
  — More effective level of distraction by focusing on something else (Das et al., 2005; Khadra et al., 2018)
  — Positive effect on pain management for pediatric patients (Chan et al., 2007; Das et al., 2005; Hoffman et al., 2019; Khadra et al., 2018; Kipping et al., 2012)

Background

- ► Grossman Burn Center at Bakersfield Memorial Hospital
  - — Established in 2017
  - — Approximately 30 pediatric patients/year admitted for burn wound care
  - — Virtual reality equipment present, but no policy to guide use

Concepts

- Pain
  - Localized or generalized unpleasant bodily sensation (Merriam-Webster, n.d.-b)
  - Causes mild to severe physical discomfort and emotional distress (Merriam-Webster, n.d.-b)
  - Sensation induced by noxious stimulus (Merriam-Webster, n.d.-b)
  - Associated with actual or potential tissue damage (Merriam-Webster, n.d.-b)
  - Aversive sensory and emotional experience (The International Association for the Study of Pain, 2019)
  - Caused by actual or potential tissue injury (The International Association for the Study of Pain, 2019)

Concepts

► Virtual Reality
  — Simulated environment (Merriam-Webster, n.d.-c)
  — Created by a computer (Merriam-Webster, n.d.-c)
  — Experienced via sensory stimuli (Merriam-Webster, n.d.-c)
  — User's actions partially determine what happens (Merriam-Webster, n.d.-c)
  — Can be explored in some manner (Virtual Reality Society, 2017)

► Burn
  — Tissue damage from heat, chemical exposure, or electrical contact (Mayo Clinic, 2020)

Concepts

► Wound Care

— Technique that enhances the healing of skin (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, n.d.)

— Specific to injuries sustained from a burn injury (for this project)

► Policy

— Definitive course or method of action selected to guide decisions (Merriam-Webster, n.d.-d)

— Decisions, plans, and actions to achieve specific goals (World Health Organization, 2020)

Framework

► ACE Star Model
  — Transferring knowledge into nursing and healthcare practice in order to improve quality

Framework

1. Evidence search
2. Evidence synthesis
3. Evidence translation into a policy
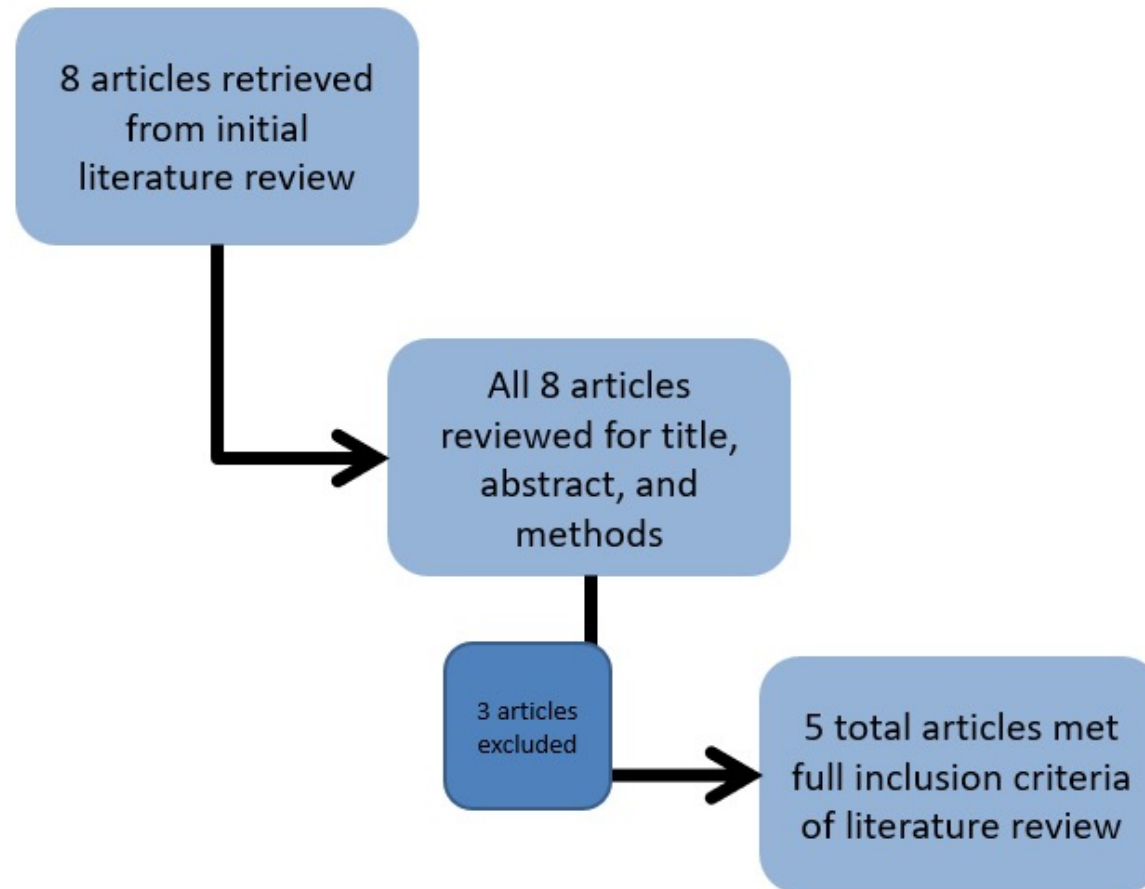4. Evaluation of policy by participants
5. Policy revisions

Synthesis of the Evidence: Evidence Search

► PICOT Question: Does the use of virtual reality (I) for pediatric patients (P) with burn injury admitted to the hospital reduce pain (O) during routine burn wound care (T)?

► Search Terms: "burns," "virtual reality," "pain management," "inpatient"

► Databases: PubMed, CINAHL

► Inclusion Criteria: RCTs, English language

► Subjects: pediatric patients

► Journals Parameters: no type or date restrictions

Synthesis of the Evidence: Evidence Search

► Search Results
— Including "inpatient" = 4 articles
— Excluding "inpatient" = 8 articles
—Titles, abstracts, and methods reviewed
—3 articles excluded (outpatient settings, adult participants, non-burn wound care procedures)
—5 articles met criteria

Synthesis of the Evidence: Evidence Search

8 articles retrieved from initial literature review

All 8 articles reviewed for title, abstract, and methods

3 articles excluded

5 total articles met full inclusion criteria of literature review

Synthesis of the Evidence

► Level of Evidence
  — Strong but limited
  — 3 RCTs (level II), 2 descriptive studies (level VI)

► Themes
  — Decreased pain associated with burn wound care during virtual reality (Chan et al., 2007; Das et al., 2005; Hoffman et al., 2019; Khadra et al., 2018; Kipping et al., 2012)
  — Patient, caregiver, and nurse satisfaction with virtual reality during burn wound care (Das et al., 2005; Hoffman et al., 2019; Khadra et al., 2018)

Synthesis of the Evidence

► Study Design
- — 2 RCTs: within-subjects (Das et al., 2005; Hoffman et al., 2019)
- — 1 RCT: between-subjects (Kipping et al., 2012)

► Purposes
- — Virtual reality during burn wound care in decreasing pain (Das et al., 2005; Hoffman et al., 2019; Khadra et al., 2018; Kipping et al., 2012)
- — Feasibility and effectiveness of virtual reality in reducing pain during burn wound care (Chan et al., 2007)
- — Feasibility and usability of virtual reality during burn wound care (Khadra et al., 2018)
- — Virtual reality during burn wound care in decreasing procedure time (Kipping et al., 2012)

Synthesis of the Evidence

► Exclusion Criteria

  — Head, face, or eye burns (Chan et al., 2007; Hoffman et al., 2019)

  — Cognitive impairment (Chan et al., 2007; Khadra et al., 2018; Kipping et al., 2012)

  — History of epilepsy (Chan et al., 2007; Khadra et al., 2018)

  — Intubation (Hoffman et al., 2019)

  — Ramsay Sedation Scale score of 6 or > (Khadra et al., 2018)

► Participant Ages

  — Specifically reported (Das et al., 2005; Hoffman et al., 2019)

  — Means reported (Chan et al., 2007; Khadra et al., 2018; Kipping et al., 2012)

Synthesis of the Evidence

► Data Collection Tools (Pain Scales)
- ─ FACES Scale (Chan et al., 2007; Das et al., 2005)
- ─ Graphic rating scale (Hoffman et al., 2019)
- ─ Visual analog scale (Kipping et al., 2012)
- ─ FLACC Behavioral Pain Scale (Khadra et al., 2018)

► Virtual Reality Equipment
- ─ Goggles (Chan et al., 2007; Das et al., 2005; Hoffman et al., 2019; Kipping et al., 2012)
- ─ Wide, curved screen for projection (Khadra et al., 2018)
- ─ Mouse or joystick (Chan et al., 2007; Das et al., 2005; Kipping et al., 2012; Khadra et al., 2018)
- ─ Simulated "cold environment" (Chan et al., 2007; Hoffman et al., 2019)

Synthesis of the Evidence

► Additional Data Collection
   — Procedure time (Kipping et al., 2012)
   — Anxiety levels (Khadra et al., 2018)
   — Level of sedation (Khadra et al., 2018)
   — Realism of virtual reality experience (Hoffman et al., 2019)
   — Satisfaction with pain management (Hoffman et al., 2019)

► Results/Conclusions
   — Decreased burn wound care pain with virtual reality

Synthesis of the Evidence

► Strengths
— Consistent outcomes across all studies
— Primarily RCTs

► Weaknesses
— Small sample sizes
— Single site studies

Synthesis of the Evidence

- Gaps
  - Best type of virtual reality equipment and simulations
  - Ideal duration of virtual reality use
  - Best inclusion and exclusion criteria for virtual reality

- Future Research
  - Large sample sizes
  - Multisite studies

Methods

► **Project Design**
— Healthcare policy project
— Translated the evidence into a policy to guide the use of virtual reality for pediatric burn patients undergoing burn wound care

► **Setting**
— Grossman Burn Center at Bakersfield Memorial Hospital
—Patients of all ages
—Only burn unit within the community
—7 inpatient beds, 1 hydrotherapy room, 2 hyperbaric chambers
—15 registered nurses, 4 burn surgeons, 2 physician assistants, 1 child life specialist
—Policy template and approval process in place

Methods

- **Participants**
  - Burn unit employees
    - 15 registered nurses
    - 1 nurse manager
    - 1 child life specialist

Methods

- **Intervention**
  - Per the PI
    - Created an evidence-based policy
    - Met with participants and provided packets (introduction sheet, policy draft, survey items, demographic questions)
    - Allowed 1 week for data collection
      - Voluntary participation
      - Packets returned anonymously
    - Made changes to the policy based on data analysis
    - Submitted the proposed policy to the institution

Methods

- **Data Collection** (Health-Related Policy Analysis Tool: HrPAT)
  - Provides a framework for the development, analysis, and evaluation of policies (Casey et al., 2019)
  - Domains: context, process, content, stakeholder consultation, implementation, evaluation
  - Likert Scale: 1 (absent) to 7 (high quality)
  - Project Usage: 12 applicable items (inclusive of each domain) to evaluate the usability of the proposed policy

Methods

- **Data Collection** (Demographics)
  - Multiple choice selections for ranges
    - Number of years in current profession
    - Age

Methods

► **Data Collection** (Process)
  — Completed packets gathered by the PI on the due date
  — Packet information entered into an Excel spreadsheet
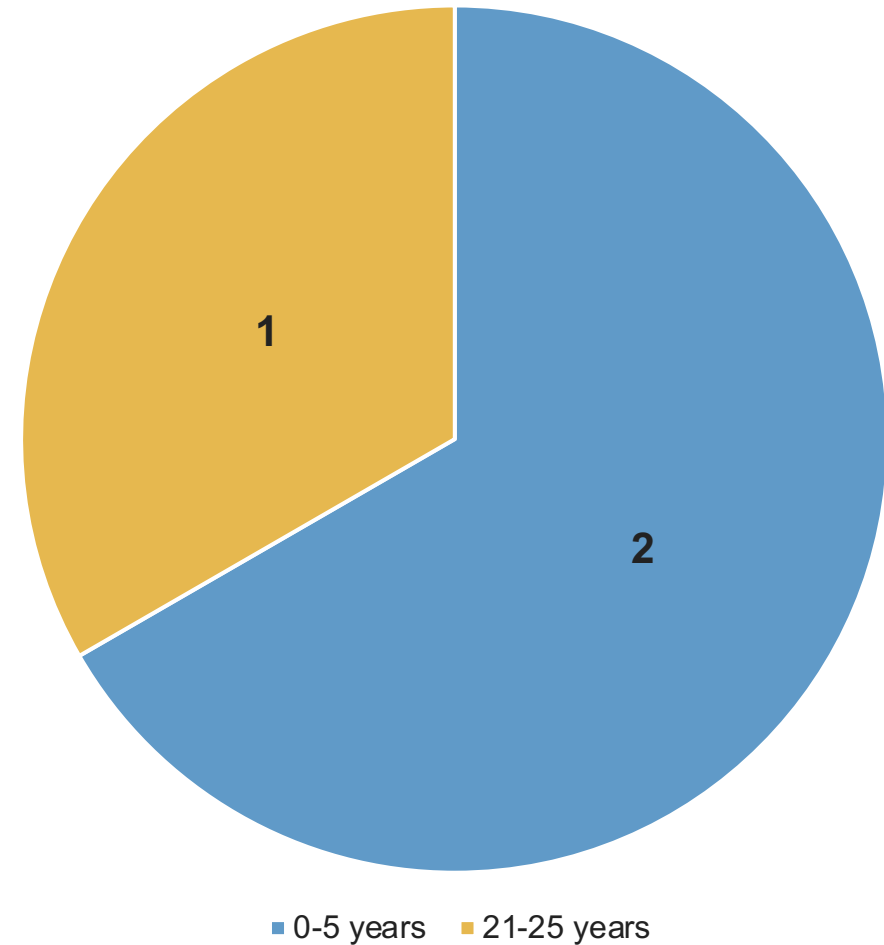 — Secure storage of Excel spreadsheet

Analysis

- HrPAT
  - Averaged individual scores for a mean line score
  - Calculated the domain score percentages (via the authors' formula)
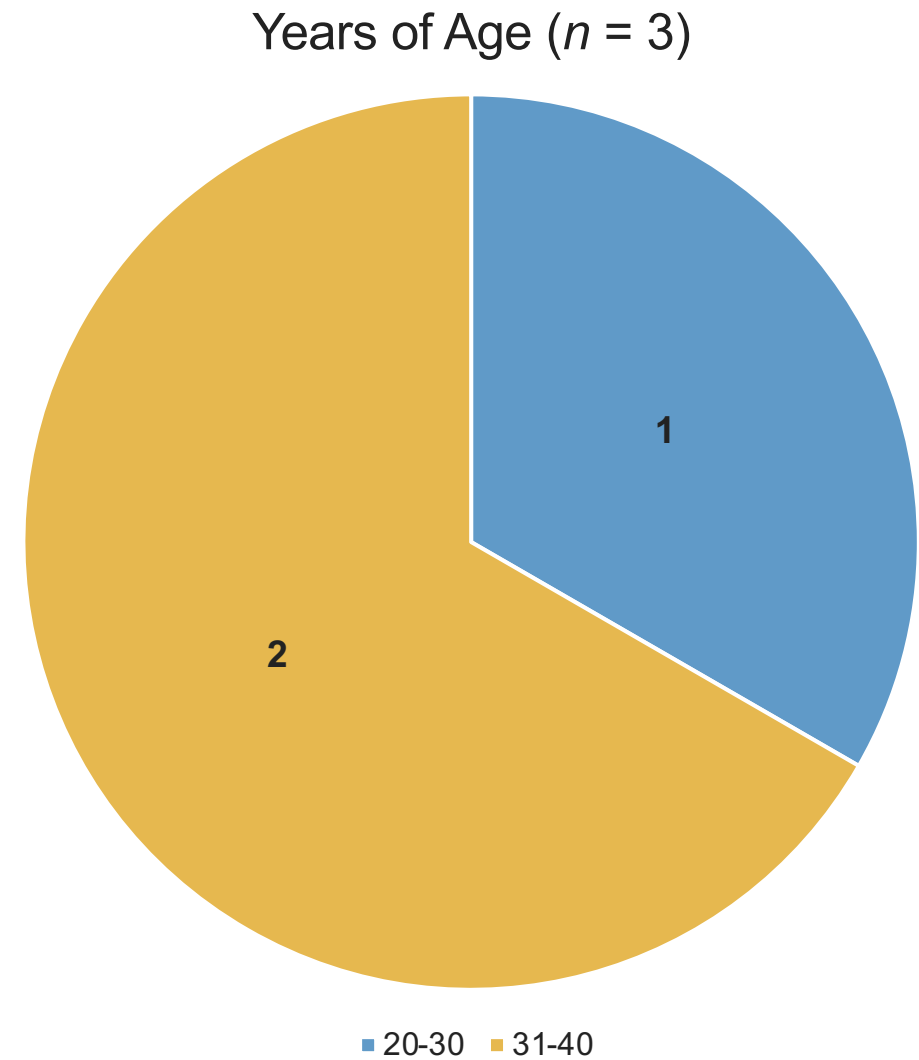
- Demographics
  - Calculated frequencies

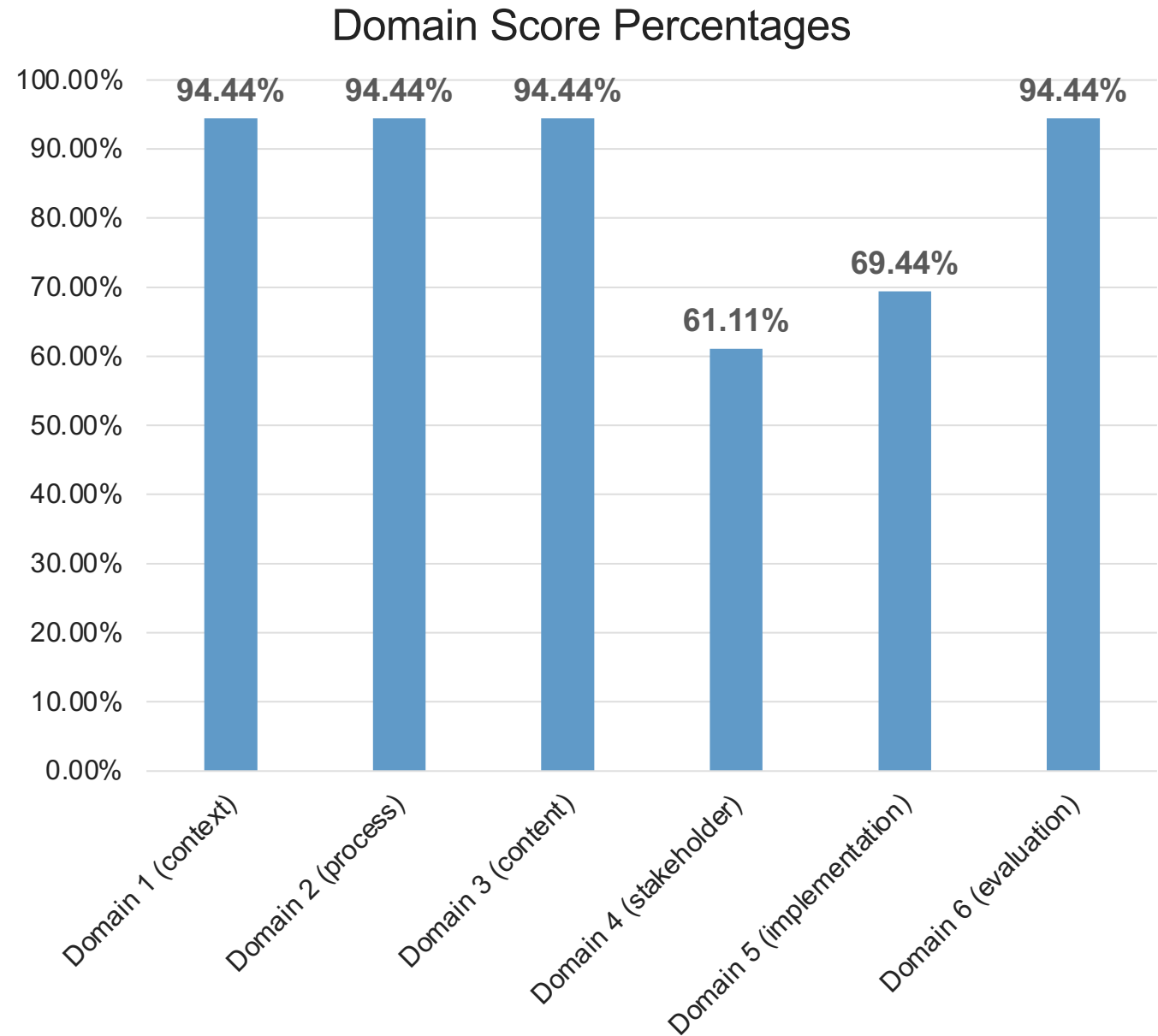# Results

► Demographics

Time in Profession (n = 3)

■ 0-5 years ■ 21-25 years

Results

► Demographics

Years of Age (*n* = 3)

■ 20-30 ■ 31-40

Results

► HrPAT

Domain Score Percentages

Domain	Score
Domain 1 (context)	94.44%
Domain 2 (process)	94.44%
Domain 3 (content)	94.44%
Domain 4 (stakeholder)	61.11%
Domain 5 (implementation)	69.44%
Domain 6 (evaluation)	94.44%

Results

► Policy Revisions
  — Based the HrPAT's 2 lowest scoring domains
  1. Reworded longer procedural steps into multiple shorter steps
     — Domain 4
  2. Information added on 'how' and 'why' virtual reality is beneficial
     — Domain 4
  3. Information added on troubleshooting virtual reality equipment
     — Domain 5

Discussion

- ► Created an evidence-based policy for the use of virtual reality with pediatric patients undergoing burn wound care

- ► Policy evaluation completed by the burn unit's staff

- ► Policy revisions done based on the evaluation

Discussion

- ► HrPAT Domain 4: Stakeholder Consultation
  - — Addresses: stakeholder needs and views
  - — Policy revisions: better address the stakeholders

- ► HrPAT Domain 5: Implementation
  - — Addresses: planning, stakeholder involvement, and resources
  - — Policy revisions: improve clarity and efficiency in the process

Discussion

- ► Strengths
  - — Led by a nurse who understands the unit's needs
  - — Quick implementation
  - — Minimal associated costs
  - — Policy evaluation by staff who will be using it
  - — Policy revisions based on staff feedback

- ► Limitations
  - — Small sample size
  - — Homogenous sample
  - — Participant bias
  - — Adapted data collection tool

Discussion

- ► Implications
  - — Fills a gap in the literature
  - — Beneficial to other institutions
- ► Next Steps
  - — Involve multiple institutions
  - — Include other patient populations

Conclusion

► Virtual Reality: an effective adjunct pain treatment for pediatric patients undergoing burn wound care

► Created an evidence-based policy
— Based on burn unit staff evaluations
— For the use of virtual reality with pediatric patients receiving burn wound care
— Appears to be the first

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