



From Button to Bedside: Exploring Limitations and Nursing-Driven Alternatives to Patient-Controlled Analgesia

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INTRODUCTION

Patient-controlled analgesia (PCA) with hydromorphone is widely used for postoperative and critical care pain management, offering rapid relief and patient autonomy.

This project was inspired by a **23-year-old trauma patient** with **bilateral mandibular fractures (unable to speak)** and **bilateral arm fractures (unable to press PCA)**. His **pain, agitation, inability to communicate, and physical limitations** excluded him from standard PCA. Nurses improvised by using an **EKG lead as a tactile PCA button substitute**, highlighting a critical gap in accessibility.

Literature reveals that:

- PCA requires both cognitive clarity and physical ability, which many neurologically or cognitively impaired patients lack.¹
- Trauma, paralysis, weakness, or restricted mobility commonly preclude PCA use because modern devices require manual button activation.²
- Hydromorphone PCA provides strong analgesia but may affect cognition and psychomotor performance in vulnerable groups.³
- Alternatives—nurse-administered boluses or continuous infusions—may delay analgesia and increase nursing workload.⁴
- PCA pump programming itself is complex, increasing workflow burden.⁵
- Hands-free designs (voice, gaze, breath, adaptive switches) remain experimental. **No systematic data exist on PCA inaccessibility or on nursing perspectives regarding workaround strategies**, representing a major gap in the literature.^{6–7}

OBJECTIVE

To identify barriers to PCA accessibility and evaluate nursing-identified alternatives and adaptations for effective pain management in patients unable to operate standard PCA devices.

METHODS

- A **brief, voluntary, anonymous survey** was administered to **nurses** on the **surgical and medical ICUs over a two-week** period
- A 3-minute, multiple-choice Qualtrics **survey assessed nursing perspectives** on PCA accessibility, alternative pain-control strategies for patients unable to operate standard PCA devices, nursing work burden caring for PCA and non-PCA patients, perceived adequacy of analgesia without PCA, and ideas for hands-free PCA interfaces or bedside workarounds.
- The survey link was distributed via email and via QR codes.
- No identifiable information was collected. IRB review determined the project met criteria for exempt status.

RESULTS

Figure 1. Frequency and Causes of PCA Inaccessibility

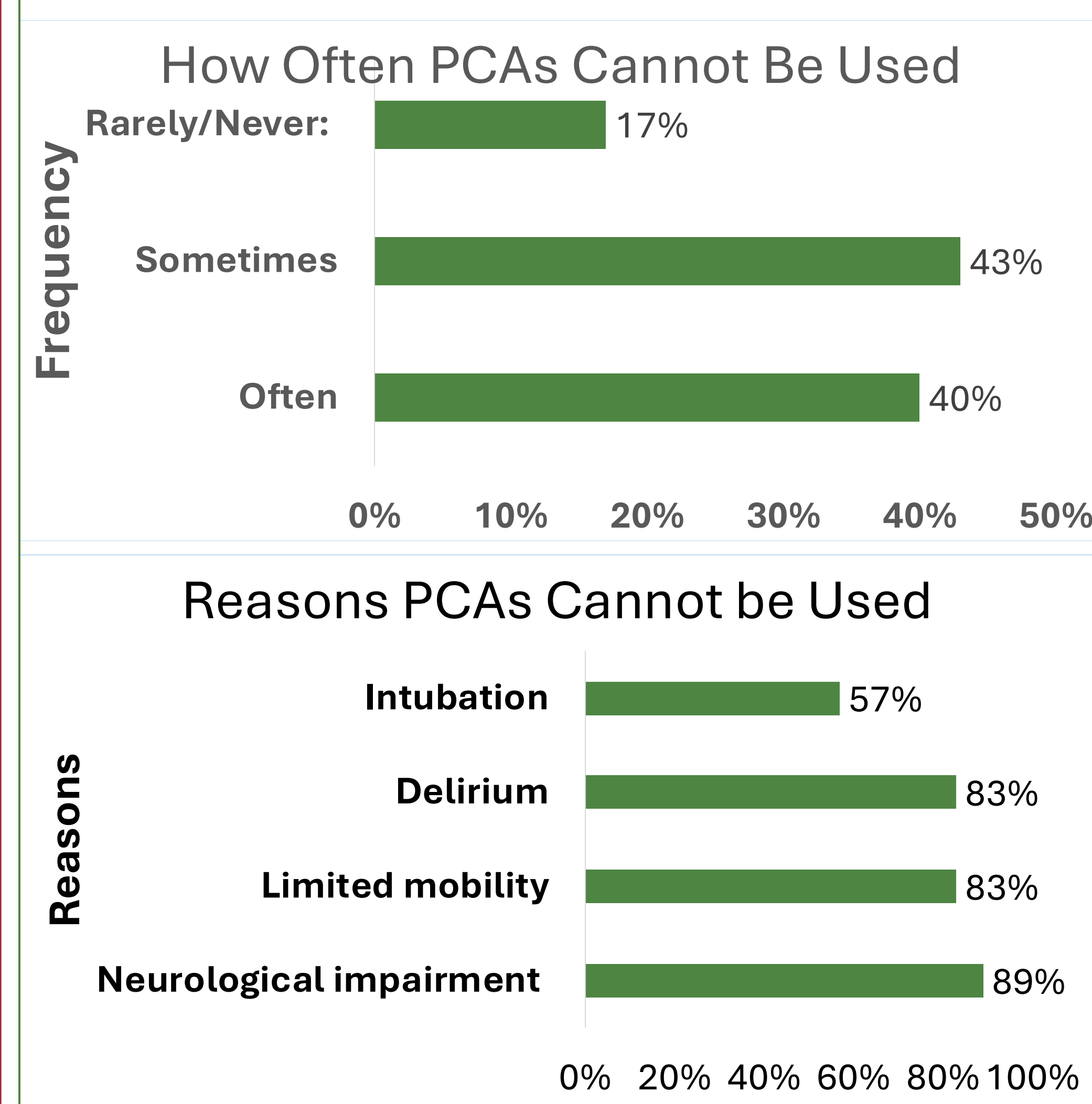


Figure 3.

Nurse responses to added workload with nurse-administered medication when PCA is not used

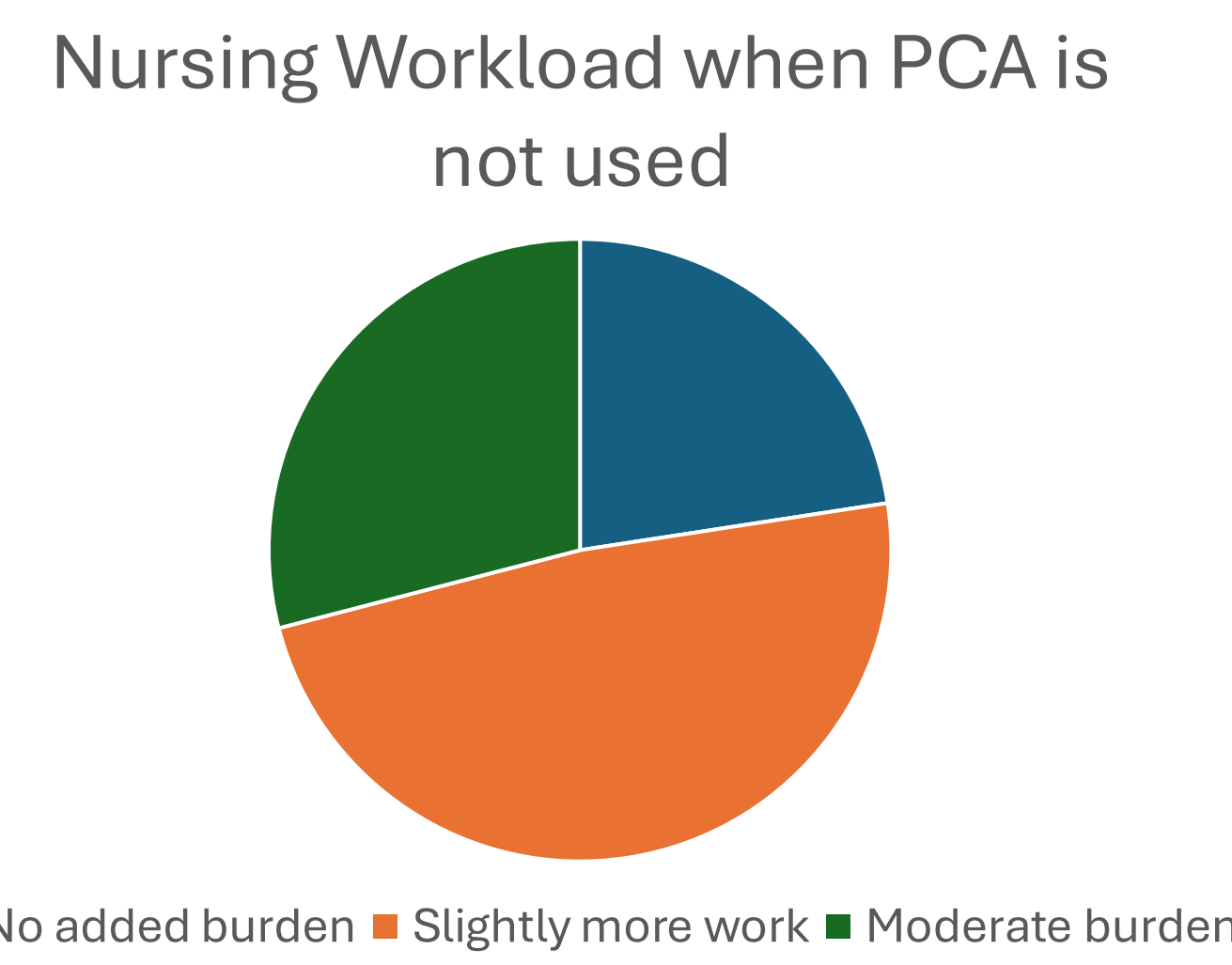
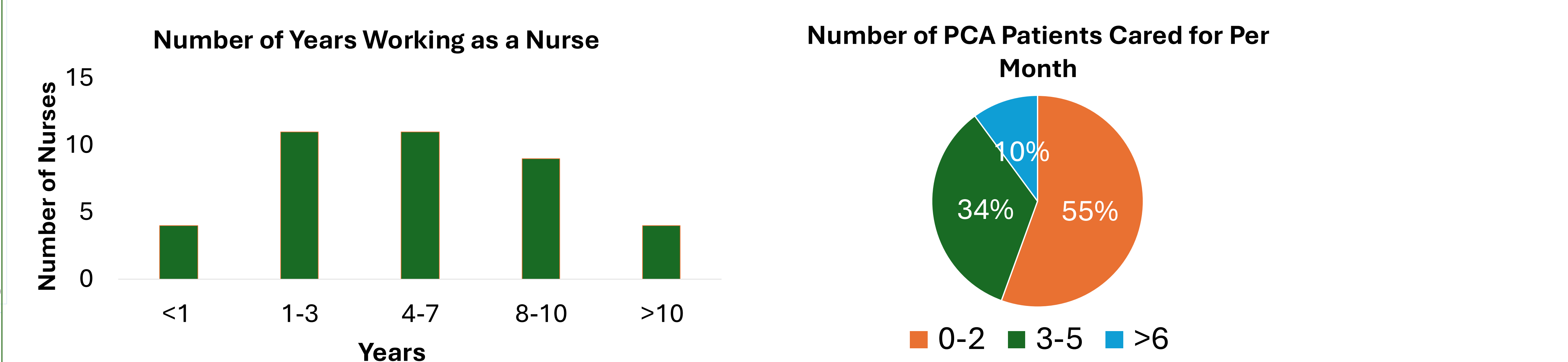
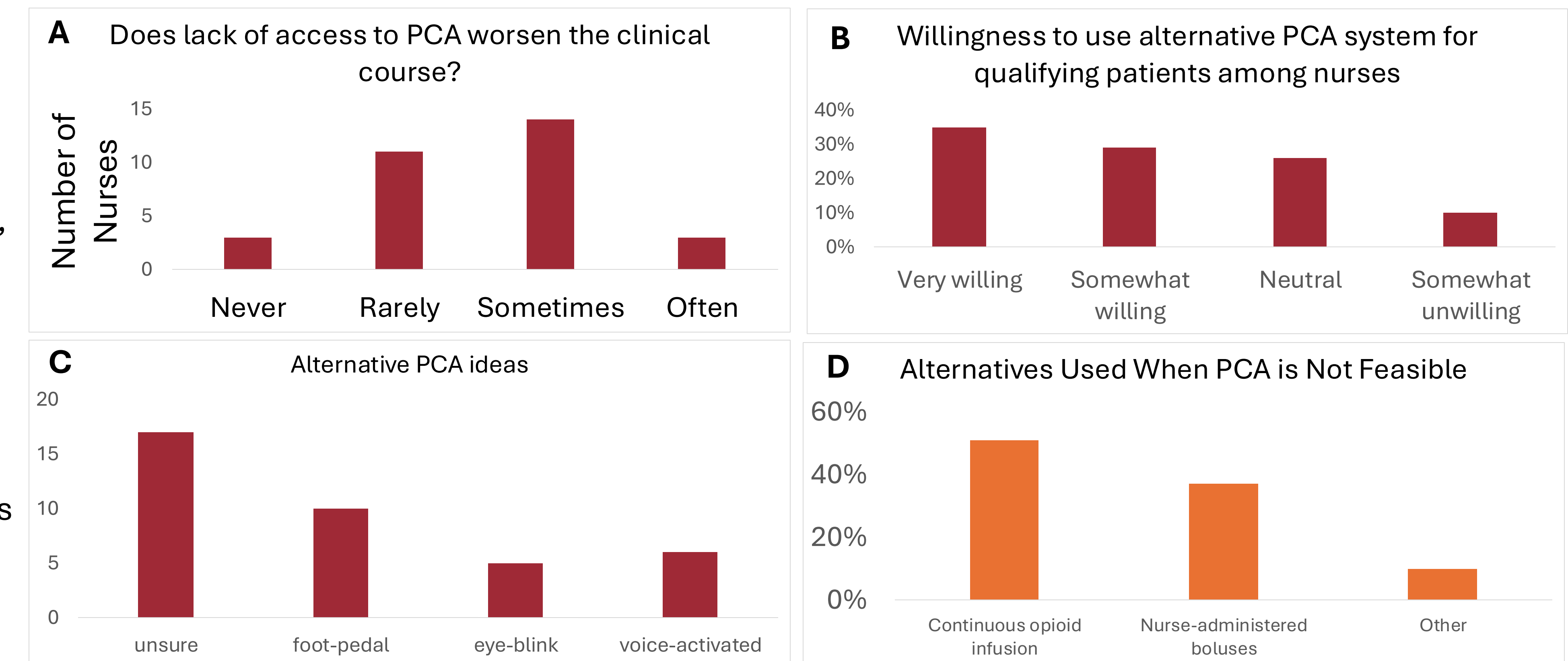


Figure 2. Average PCA exposure and Nurse Experience among 38 nurses in the ICU at a Level 1 Trauma Center.



Strategies to improve pain control included **closer collaboration between physicians and nurses** on appropriate PRN doses and frequency, **consultations** with toxicology or acute pain services, **multimodal pain control**, and **close patient monitoring**.

Figure 4. (A) Nurse-assessed worsening of clinical symptoms (agitation, delayed mobilization, poor sleep) without PCA accessibility, **(B)** current nursing-administered alternatives when PCA is unavailable, **(C)** hypothetical nursing-proposed alternative ideas to PCA, **(D)** assessment of willingness for nursing implementation of feasible PCA alternatives for qualifying patients



DISCUSSION

- Pain control without PCAs** for patients with accessibility barriers relies on continuous infusions and nurse-administered boluses, **increasing nursing workload** and delaying optimal analgesia.
- Non-PCA pain control methods may be adequate but inconsistent, with a subset of **patients experiencing inadequate relief when PCA is inaccessible**.
- Most nurses report that the absence of PCA can negatively impact a patient's clinical course; PCAs allow for accessible pain-delivery systems.
- Nurses expressed willingness and creativity for **non-button PCA interfaces**, highlighting a clear **opportunity for innovation in hands-free or adaptive PCA technology**.

FUTURE DIRECTIONS

- Perform a larger, multi-unit or multi-center study** to quantify PCA inaccessibility rates and associated outcomes.
- Develop and test hands-free PCA interfaces** (e.g., foot pedals, head-mounted switches, voice-, gaze-, or breath-activated systems) suggested by nurses
- Evaluate the clinical and workload impact** of newer PCA-accessibility solutions compared to standard nursing workarounds.
- Encourage interdisciplinary collaboration** for multimodal pain control between nurses and physicians to optimize workload and effective analgesia

REFERENCES

