

# Implementation of a Needleless Jet Injector to Decrease Needle Pain



University of Iowa  
Stead Family  
Children's Hospital

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## Background

**Purpose:** To pilot use of a Needleless Jet Injector (J-tip) to prevent needle pain associated with IV placement in pediatric patients in a procedural area at University of Iowa Stead Family Children's Hospital

**Objectives:** To pilot and evaluate strategies leading toward successful implementation of the J-tip which could be used in future locations throughout the children's hospital including:

- Needed modifications to initial standard of practice
- Successful staff education strategies and teaching tips for other new users
- Learning curve length and time to adopt the change into practice
- Most effective device and noise description for patient/family education

## Synthesis of Evidence

The J-tip has demonstrated superior pain control compared to:

- Lidocaine cream – 4% (L.M.X.4) (Spanos, et. al., 2008)
- Lidocaine and prilocaine cream (EMLA) (Jimenez, et. al., 2006)
- Buffered lidocaine (1%) administered through a fine gauge intradermal needle (Zsigmond, et al., 1999)
- Vapocoolant spray or sham (Lunoe, et. al., 2015)

The J-tip has the lowest incremental cost-effectiveness ratio when compared with other interventions such as intradermal injection of buffered lidocaine, nitrous oxide, heated lidocaine/tetracaine patch, L.M.X.4 cream or EMLA cream (Pershad, et. al., 2008)

Nurses have an ethical responsibility to relieve pain and the suffering it causes (ANA Position Statement, 2018)

External benchmarking completed with other nationally recognized children's hospitals

## Practice Change

- Interprofessional team developed (nursing, pharmacy, child life, pediatrics)
- Challenges and solutions identified to filling buffered lidocaine syringes: bicarbonate shortage, pharmacy personnel time to fill syringes, stability questions
- Standard of practice developed and protocol for timely prescribing approved
- Pilot unit identified (Pediatric Procedural Suite):
  - Patient population requires frequent venipuncture
  - Limited number of staff ; all experts in pediatric venipuncture; willing to implement and evaluate new product
- Product approved via Products Committee and process developed to stock buffered lidocaine syringes in automated dispensing cabinet
- Alternate process determined to stock J-tip in supply cabinet since not stored in hospital storeroom
- Educational materials developed (competency checklist, important information summary, pocket card)
- Evaluation metrics determined

## Implementation

- Pre-implementation data collected (e.g., parent survey, nursing time spent)
- 30 minute training classes for those administering the J-tip:
  - Scheduled over 2 days early in shift to facilitate attendance and device utilization
  - Assigned day/time to distribute attendance and for staff opportunities to use J-tip on patient the same day
- J-tip administration demonstrated by the representative; return demonstration completed by each staff member
  - Syringes filled with 0.25 mL saline to simulate buffered lidocaine
  - Transferred to J-tip
  - Deployed onto fabric covered IV arm boards with a visual of a vein
  - Emphasis placed on correct placement (either at side of vein or using Z-track) and maintaining contact with skin for 3 seconds after deployment
  - Training supplies remained available following classes; staff encouraged to practice before use on patients
- Company representative verified competency during initial use(s); subsequently competent staff verified peer competency
- Informational sessions held for other interested clinicians across children's hospital
- Resources added to clinical communication smartphones:
  - Video portraying sound of CO2 expelled from device ("pop") for patient/family education
  - Short training video for staff reference
- Post-implementation data collected:
  - Parent surveys and time spent surveys repeated
  - Staff completed a questionnaire after each J-tip use during pilot period
  - Staff survey distributed after pilot completion

University of Iowa Stead Family Children's Hospital *Tell us what you think!*

We want to learn more about what helps kids who have an IV placed. Your answers will not affect your care. Your name will not be on the paper.

With the help of a parent, usually children who are about 7 years old can answer the questions below. For younger children, a parent can fill out the form.

- Who is filling out this form?
  - Patient
  - Parent
  - Other: \_\_\_\_\_
- How old are you (the patient)? \_\_\_\_\_
- How much did it hurt when the nurse started your IV?
 

|            |            |          |             |           |                  |   |   |   |   |    |
|------------|------------|----------|-------------|-----------|------------------|---|---|---|---|----|
| 0          | 1          | 2        | 3           | 4         | 5                | 6 | 7 | 8 | 9 | 10 |
| Not at all | Little bit | Moderate | Quite a bit | Very much | Worst imaginable |   |   |   |   |    |
- Did the nurse or any staff member do anything that helped you feel less pain? Yes/No
  - Tell us what helped you.
  - Was there anything that did not help you?

Please leave this form in your room at discharge or hand it to any staff. Thank you for your help! We are anxious to hear your thoughts!!

Time spent starting IVs

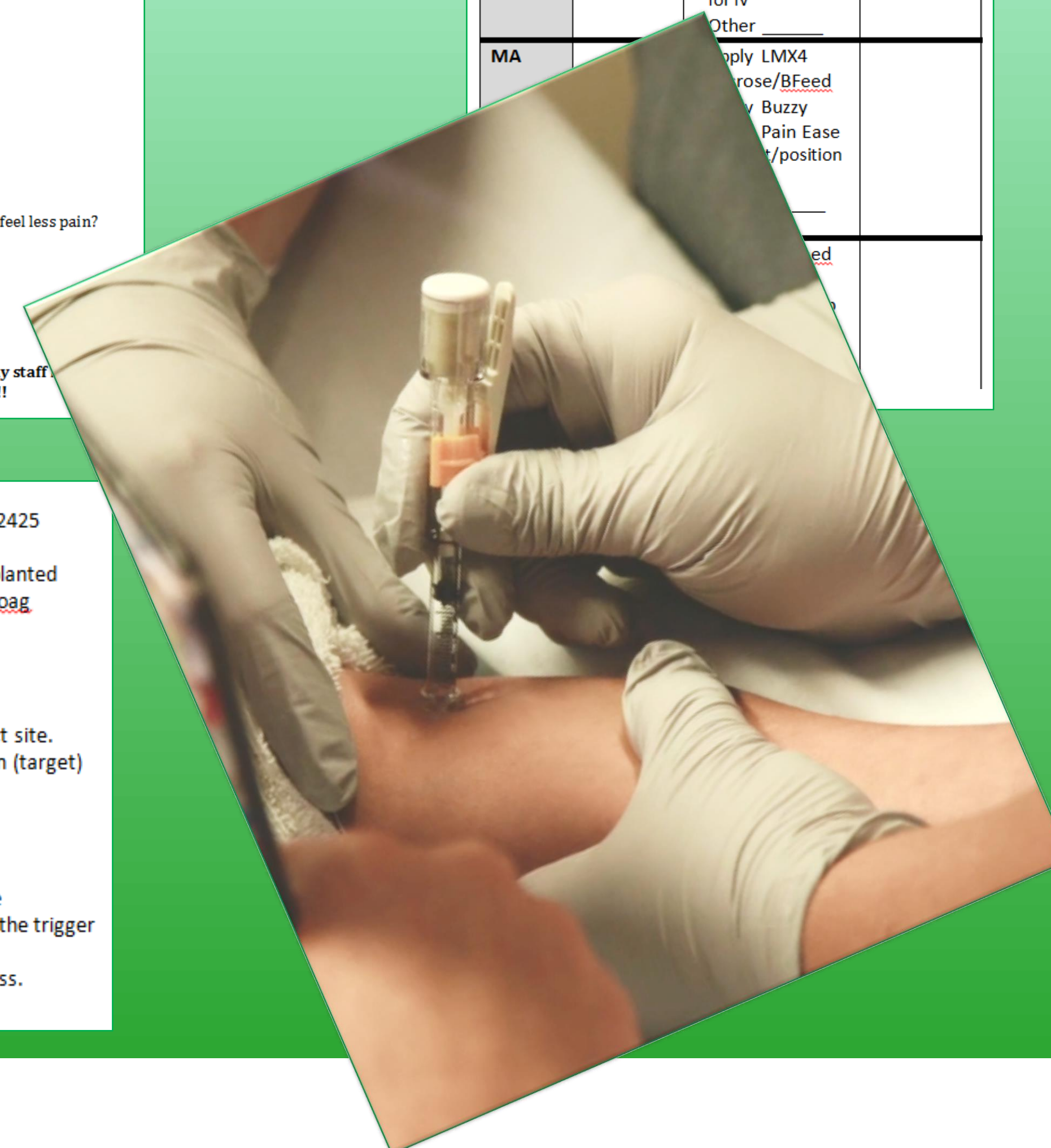
Time Patient Came into Room: \_\_\_\_\_

Time patient left for procedure: \_\_\_\_\_

| Role: | Time into the room for IV | IV Activities:   | Time out of the room. Approx # min related to starting IV |
|-------|---------------------------|--|---|
| RN    |                           | <input type="checkbox"/> Apply LMX4<br><input type="checkbox"/> Apply J-tip<br><input type="checkbox"/> Sucrose/BFeed<br><input type="checkbox"/> Apply Buzzy<br><input type="checkbox"/> Apply Pain Ease<br><input type="checkbox"/> Start IV<br><input type="checkbox"/> Support/position for IV |   |
| MA    |                           | <input type="checkbox"/> Other<br><input type="checkbox"/> Apply LMX4<br><input type="checkbox"/> Sucrose/BFeed<br><input type="checkbox"/> Buzzy<br><input type="checkbox"/> Pain Ease<br><input type="checkbox"/> Support/position   |   |

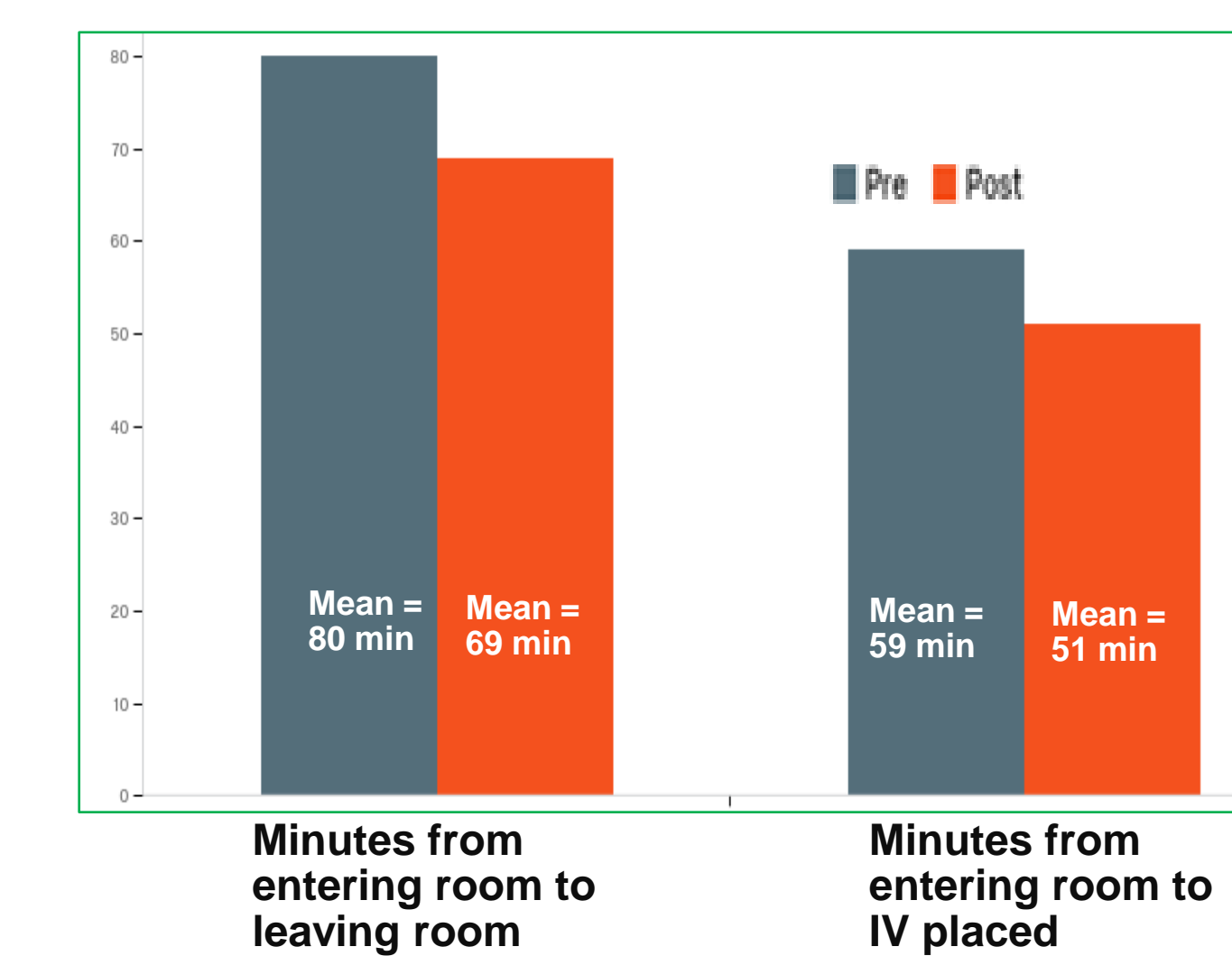
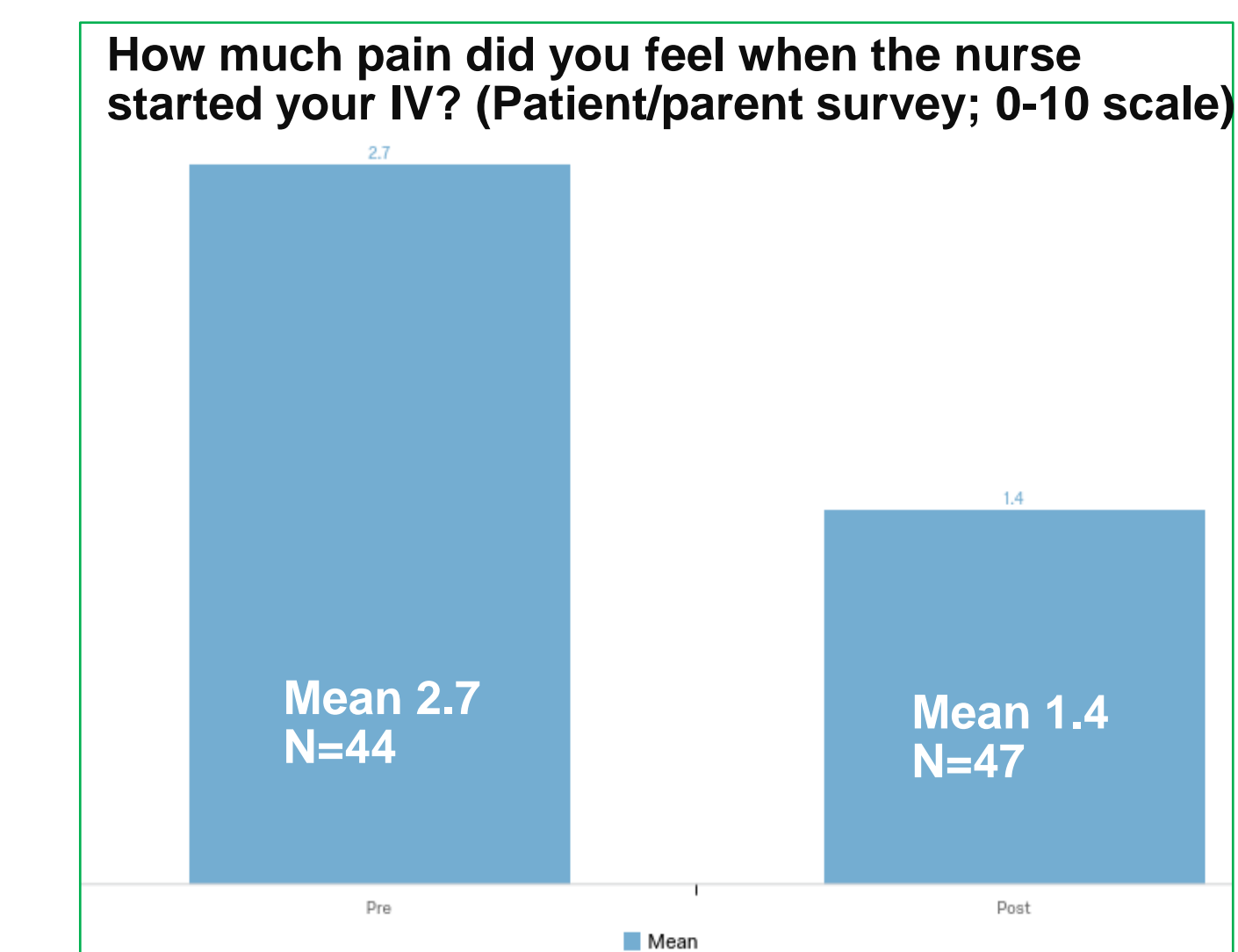
**J-Tip Procedure**  
(0.25ml/2.5mg 1% Buffered Lidocaine); Stores # 122425  
Max dose 4.5 mg/Kg

- Contraindications:** Allergy to lidocaine, < 4Kg, over implanted port, platelets < 30K, compromised skin, caution in coag disorders/hemophilia, pts receiving anticoagulants
- Ensure order is present
- Obtain medication and transfer into J-tip device
- Explain procedure and device sound.
- Select site and remove tourniquet, don gloves, disinfect site.
- Remove the sterile cap, mark the area of administration (target) over the vein or just lateral to the vein
- Remove or slide down the orange safety ring.
- Move skin laterally to avoid injection over the vein
- Hold syringe with vent away from people
- Hold at a 90 degree angle and maintain firm pressure throughout while counting "3, 2, 1 blastoff", pressing the trigger and counting "1,2,3"
- Use a 2x2 to disperse medication and wipe away excess.
- Wait 2 minutes prior to needlestick. 5/18



## Results

- J-tip seemed to decrease pain with IV start over L.M.X.4
  - L.M.X.4 mean 2.7; J-tip mean 1.4 (1-10 numeric or Faces scale)
  - Several patients stated they didn't feel anything with J-tip
- Administration site was normal (blood reflux, small skin wheal and slight redness) in all patients evaluated (N=56);
- No incident reports related to J-tip use
- During each use, child distress was evaluated by clinician(s) before and after the "pop" (release of CO2 during deployment); distress levels were unchanged
- Nursing survey findings (N=16):
  - J-tip very easy to use (87%) and nurses would use again (93%)
  - Most users comfortable using J-tip after 1-5 uses (64%); 6-10 uses (27%); 11-15 uses (9%)
  - J-tip increased efficiency (81%)
- Time surveys demonstrated improved efficiency (n= 64 pre/43 post)
  - Time from arrival in room to IV placement decreased 8 minutes
  - Time from arrival in room to leaving for procedure decreased 11 minutes
- Staff surveys identified most helpful learning strategies:
  - Viewing a demonstration
  - Practicing deployment on armboards to perfect technique
  - Observation by an expert while using device on patients first few times



## Future Steps and Conclusions

- Following pilot, J-tip implemented in Pediatric Specialty Clinic, Non-Oncology Infusion Suite and Pediatric Prep/Recovery Area. Ongoing discussion related to expansion to other areas.
- Evaluation continues related to frequency of vasoconstriction and impact on venipuncture success as well as dosage (0.2 mL vs 0.25 mL)
- Future reinfusion to include review of deployment steps, device placement and use of Z-track near large vessels
- Continued evaluation of patient satisfaction planned

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