Visual Analogue Scale Specific Patient-Controlled Analgesia (VAS Guided PCA)

**Corresponding Author:**
Dr. Deepak Gupta,
Anesthesiologist, Wayne State University, 48201 - United States of America

**Submitting Author:**
Dr. Deepak Gupta,
Anesthesiologist, Wayne State University, 48201 - United States of America

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Author(s): Gupta D

My opinion

As an anesthesia provider, we are responsible for ensuring adequate perioperative analgesia. One of the pain management modality that is frequently used in perioperative settings is patient-controlled analgesia (PCA) for the parenteral opioids [1]. Since the famous presidential address of James Campbell (1996) to the American Pain Society [2], pain has come a long way as an established fifth vital sign [3]. With aggressive policies at diagnosing, documenting and managing pain of the patients, PCA has become an important modality that is utilized more than often beyond the realms of perioperative settings. The application of PCA is no longer limited to acute perioperative pain; but it includes management of difficult-to-intractable acute pain in chronic pain patients who are admitted for inpatient management of pain-related or pain-unrelated symptoms. The most common pain assessment tool used in adult patient population is visual analogue scale (VAS) [4-6] that is available primarily in two forms: 0-100 mm scale and 0-10 Numerical Rating Scale (NRS). Their sensitivity to assess pain are approximately equal [7] and NRS is apparently more popular due to patient’s ease in reporting 0-10 VAS scores.

The currently available versions of PCA deliver a-predetermined intravenous dose of opioids (as appropriately adjudged by the ordering physician) on patient’s decided dosing interval; the interval can be as low as every 6 minutes (the lockout interval). The current versions of PCA are not equipped to record the actual VAS scores because each time the patient feels pain requiring medication, irrespective of the VAS scores the patient pushes the same single-button mechanism (Figure 1) to deliver the same predetermined dose as fed in the PCA’s software. In my opinion, it is time that single-button PCA should be replaced with a 1-10 numbered-remote PCA (Figure 1). The lowest score of VAS ‘0’ in NRS scale may not be needed in this remote because VAS score ‘0’ may not prompt the patient to push the number on the remote as patient is not expecting any pain medication relief for VAS score=0. The patients will get this remote and push the number on the remote corresponding to their VAS scores. Consequently, the PCA’s software will deliver VAS-specific variable doses (including zero dose for low non-zero VAS scores) as pre-determined by the ordering and the inputting physician. To avoid inadvertent pushing of the remote’s numbers, the remote will have a hard transparent plastic cover that will be lifted by the patient each time he/she will need to activate PCA for VAS-specific dose. The major advantages of this improvisation will be that

(a) In comparison to single-button PCA, the patient will have to be more alert as well as oriented to push the correct number on numbered-remote PCA for VAS scores

(b) The PCA’s software database will have the VAS scores recorded over times as recording of VAS will be possible at all the time; however the demands (as recorded in current versions of PCA) will be attributed to those instances when VAS-specific dose per PCA software will not be delivered due to the lockout interval

(c) The patient will not have to worry about reporting VAS scores as well as requesting medications separately

(d) The physicians will have option to input VAS-guided doses in the PCA’s software

(e) The physicians will have option to run a ‘Sham PCA’ wherein the patients will be counseled to use the numbered-remote PCA only for regular recording of VAS scores; and the medications (in form of IV PUSH or oral doses) will be administered by the nursing staff. This VAS-specific PCA model is not a new innovation but an improvisation of old school of pain medicine and imbibing into the PCA-based analgesia regimens wherein the patient controls his/her pain reporting and consequently appropriate analgesic administration. The physicians ordering pain medication as a range of dose as well as a range of dosing interval (e.g. morphine 1-2mg IV every 2-4 hours) was a common place till recently when patient safety regulatory entities recently curtailed this practice to avoid medication error and overdosing [8-9]. However, the regulatory entities allow the medication dose range orders [10] if the corresponding pain assessment tool range is also included with clear cut instructions about withholding medications depending on patient’s status and other vital signs (e.g. morphine 1-2 mg IV every 2-4 hours; 1mg for VAS scores 4-6, 2mg for VAS scores 7-10).
scores 7-10, decide dosing interval keeping Modified Ramsay Sedation Score ≥3 [11]. These range orders have not been limited for use of intravenous medications but pain physicians have used these range orders for oral opioids with similarly clear cut directions of administration by the nursing staff.

The few cautions that will be needed for this numbered-remote PCA to succeed are that instead of wireless remotes, cables with predetermined lengths will be required so that remote-PCA by proxy can be avoided. Additionally, the wireless remotes will potentially increase the electromagnetic pollution/interference in the patient’s room. Moreover, the cables will ensure the continued safety against lost/misplaced/far-placed remotes in case the patient emergently needs to press for VAS-specific number to self-administer medication. The major incentive for patients will be that they will crowd and vouch for the hospitals that have more comprehensive pain scores databases as extracted from these VAS-specific PCA’s software. The aims of the catering hospitals will be to keep these pain scores graphs (areas under line-curve) under a minimum efficacious numbers as determined by their site-specific and general population validation studies. These target areas under curves will be different for acute pain patients, and acute on chronic pain patients. These areas under line-curve will be determined as following [12]: the ‘area’ below the average values minus the ‘area’ below the average values wherein the “area” above the average values is the sum of (value, average) where value, are the values that are greater than average value and the “area” below the average values is the sum of (average - value, ) where value, are the values that are lower than average value.

Let us consider this example based on 10 random numbered VAS score generated from http://www.random.org/ [13]. Random VAS numbers: 10, 9, 4, 7, 6, 1, 2, 1, 1, 1. ‘Area’ above average (Average VAS for these ten numbers=4): Sum (2, 3, 5, 6)=16. ‘Area’ below average: Sum (3, 3, 3, 3, 2)=14. Thus the final ‘area’ under the line-curve is 2. Even though this example calculated average VAS based on the random ten numbers, the hospitals can decide to universally consider average and acceptable VAS=5 that can then used as a cut off to decide about the ‘area’ above VAS=5 and ‘area’ below VAS=5. The other method of ‘area under line-curve’ called ‘TRAPEZOID RULE’ [14] cannot be used as the time difference between the two recorded VAS in the numbered-remote PCA will not be uniformly spaced and often times VAS scores will be zero that the patient will not be inputting in the software. These discontinuities and sporadic reporting of VAS in the PCA database will interfere with the ‘TRAPEZOID RULE’ based assessment of ‘area under line-curve’.

In summary, it is high time to have this innovation in pre-existing PCA models so that clinical trials can be initiated for the validity of this scenario because in my opinion, it is worth a transition for correct VAS scores database and corresponding medication use with patient-controlled analgesia regimens.

References

Illustrations

Illustration 1

PCA's Single-Button and Proposed PCA's Numbered-Remote
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