18. DESIGN AND IMPLEMENTATION OF PCA DOSAGE INFORMATION GENERATOR

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Introduction: The patient-controlled analgesia (PCA) service has become the major pain treatment method because of its characteristic of instant self-administering medication. The improvement of pain care quality is important for medical services. To ensure the PCA service quality, the following issue should be addressed: how to keep the patients conscious and comfortable enough to engage in rehabilitation. The precise dosage consumption produces effective analgesia with acceptable side effects. However, many facts may correlate with PCA dosage consumption. Since the PCA logs stored all events during the PCA therapy such as drug delivery setting, patients' utilization process related to the PCA and analgesia. Therefore, we proposed a PCA dosage information gen- erator to explore the relationship among patients' char- acteristics and total PCA consumption during the 3-day postoperative course [1–5].

PCA information generator extracted the detail dosage of Loading Dose, Bolus Dose and Infusion Rate and the count of Demand and Delivery. Through the process of PCA information generator, the patient anesthetic infor- mation will be generated as referable medication. Anesthesiologists could make use of the patient anesthetic information to optimize dosage consumption. It leads to make lower adverse effects, enhance patient safety, promote patients' satisfaction, and upgrade overall medical quality.

Methods: The PCA dosage information generator consists of three activities: lexical analysis, analgesic event parsing, and dosage information extraction. They are

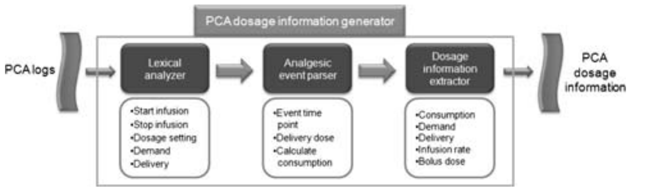

Fig. 1. PCA dosage information generator.

performed by units in the generator known as the lexical analyzer, analgesic event parser, and dosage information extractor as shown in Figure 1.

The detailed descriptions are presented in the following.

1. Lexical analyzer: This process extracts useful text messages from PCA logs that including the events of start/stop infusion, initial setting and reconfiguration, demand and delivery, etc.
2. Analgesic event parser: After lexical analyzer process, the event parsing processes the event timestamp and infusion rate. The extracted information includes demand/delivery counts, dosage setting variation with the changing time, bolus dose and infusion rate.
3. Dosage information extractor: While calculating the total drug consumption, the event timestamp must be clearly identified. The extraction of dosage information summaries the demand and delivery counts corresponding to the consumption dosage.

Results: In this work, we proposed a PCA dosage information generator to explore the relationship among patients' characteristics and total PCA consumption. The developed software, as shown in Figure 2, retrieves and analyzes PCA microcomputer logs. Two major functions and five display windows were designed in the PCA dosage information generator. The file open function enables the file selection of microcomputer logs. The stop function sends halt alert to stop the program. After selecting the required data logs, the file handling and analyzing process will be activated. The information extracted from PCA microcomputer logs is displayed on five windows of the user interface. The first window showed the original PCA logs, it provides user to view all events during the treatment period. The secondary window displayed the setting events including the start or stop infusion stream, all the infusion rate configuration, and date update. The third window demonstrated all demand events. The fourth window exhibited all delivery events including dosage. The PCA therapy is generally a 3-day postoperative course. Since the treatment duration was always between 48 and 72 h. For the purpose of evaluation, we divided the first 48-h into 4 time frames named I (0–12), II (12–24), III (24–36), and IV (36–48). All the

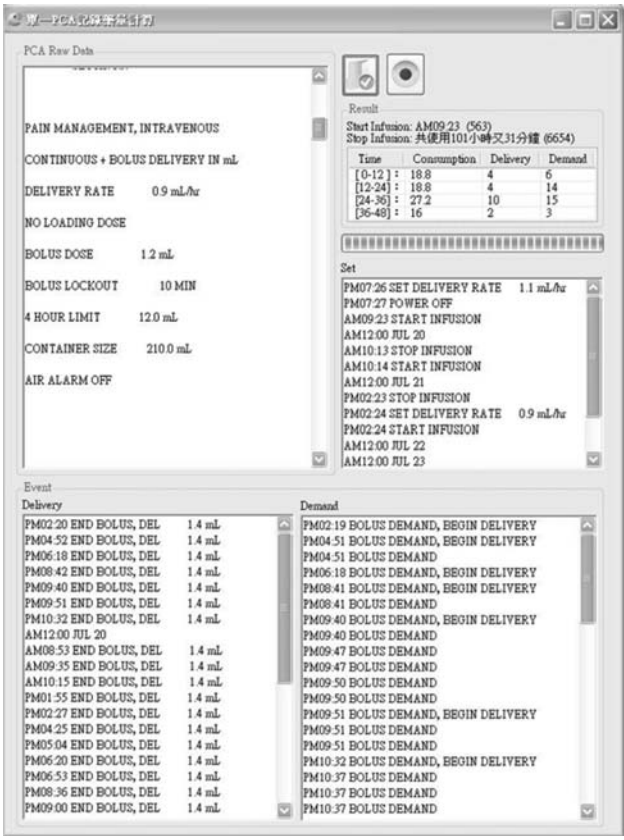

Fig. 2. PCA dosage information generator.

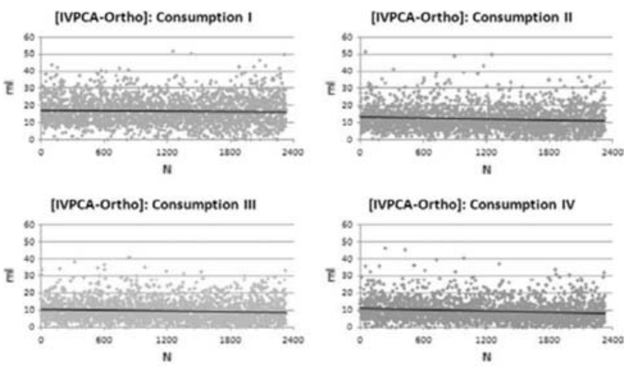

Fig. 3. Four time frames of IVPCA drug consumption in orthopedic.

calculated results will be analyzed within four time frames respectively. The fifth window is the display of calculated consumption, demand, delivery, and infusion rate with respect to the time frames.

As depicted in Figure 3, we collected 2329 cases of intravenous patient-controlled analgesia (IVPCA) drug consumption in orthopedic, each point represent a patient. It is obviously that the total analgesic consumption decreased gradually from time frame I to IV. This is because as time increased and human body self-recovery, the analgesia requirement decreased.

Discussion: The proposed generator can extract the dos- age consumption to demonstrate the total analgesic con- sumption decreased gradually within the PCA therapy. It plays an important role and is essential to setting the anal- gesic dosage. The clinical verification is still working with cooperative medical department. We analyzed the PCA logs within 48-h therapy divided into four time frames as time unit, and this may extend to more time frames or choose the PCA patients with full period of 72-h treatment for further study. Based on the primary results, the anes- thesiologist can provide more accurate dosage setting to improve the quality of patient-controlled analgesia.

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