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Postoperative opioid consumption data repository incorporated in electric medical record based on PCA device data extraction program.

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Pain, as ‘the fifth vital sign’, is a crucial element of the current patient care. As the word appeals, it has become more obvious that pain has to be assessed and adequately controlled just as much as the other vital signs. In particular, the importance of the postoperative analgesia cannot be overstated since it is known to be related to various postoperative complications and the quality of recovery. Therefore, the issue of postoperative analgesia is an indispensable and a constant mission for perioperative care physicians. Patient-controlled analgesia (PCA) is one of the valuable tools for such endeavor, providing optimal postoperative analgesia by allowing the patient to self-administer small boluses of analgesic to relieve pain [1]. It is also recommended over the intermittent bolus dosing of opioids initiated by health care provider [2].

Several electrical or elastomeric PCA devices have been widely used. Among them, some electrical devices enable settings such as bolus dose, lockout interval, background infusion rate, dose limits, and loading dose. In addition, detailed 'history data' of the device use can easily be stored and extracted via a designated software. The authors would like to briefly introduce the Data integrated managing system (Dr. PCA, Data repository for postoperative clinical audit) which is incorporated into the electronic medical record (EMR) system (Supplemental file 1).

In our institution, the PCA device is returned to a designated place for data extraction upon completion of its use. Using the dedicated software of our PCA device installed in computers connected to the hospital network, PCA data are extracted and detailed log records are
automatically saved to a repository server in the our hospital. For security, the raw data is stored in a separate server, and only the processed relevant information is retrieved from the EMR. The software of PCA device creates data based on event logs which makes it possible to calculate the operating time of the device and process the accumulated data over time.

The data management system consists of mainly four types of information (Table 1).

1. Patient-specific clinical information
2. PCA device settings
3. Processed data regarding the device use
4. Clinical assessments done by the PCA management team

As noted above, the system integrates not only the information extracted from the device but also the data from the PCA management team. In Korea, one of the items of interest for quality assessment of anesthesia practice is the operation of a ‘PCA management team’. The clinical assessment in our institution routinely includes pain score (NRS; maximum and minimum) and adverse effects relevant to PCA (e.g. postoperative nausea and vomiting, somnolence, and dizziness). In this manner, clinicians can evaluate their practice more thoroughly and gain feedback more efficiently. Also, as this system operates in regular basis and consistently stacks comprehensive 'pain related' outcomes, a certain protocol or regimen for postoperative analgesia can be readily evaluated and modified systematically.

Along with the ‘opioid crisis’, concerns regarding chronic opioid use beyond the acute phase of postoperative period is growing [3]. In line with these concerns, minimizing or optimizing perioperative opioid use is also a noteworthy issue. To make up a model to deal with such issue may need a large dataset consisted of detailed information regarding postoperative analgesia. Therefore,
the importance of a system for cumulating relevant data in a systematic way is increasing. An analysis of varying patterns of analgesic demand over time of each patients may provide us further insight of perioperative analgesia. If concerns about device hacking by wireless network connection are resolved in the future, real-time usage patterns and pain assessments can be monitored remotely, and it is believed that more advanced acute pain service will be provided. In addition, we expect that PCA data as big data will be used to predict the use of opioids for individual surgery patients [4].
References


Table 1. Variable category types and descriptions of variables

<table>
<thead>
<tr>
<th>Category</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Patient-specific clinical information</td>
<td>Patient id, Name, Age, Sex, Height, Weight, Department, Surgery name, Order date, Order drug, etc.</td>
</tr>
<tr>
<td>- Expansion of patient information</td>
<td></td>
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<tr>
<td>considered necessary in the management</td>
<td></td>
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<td>window by adding additional columns</td>
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<tr>
<td>2. PCA device settings</td>
<td>Total drug amount (unit), Total volume, Infusion rate (unit), Bolus dose, Lock out time (min), Loading dose, Bolus attempt, Bolus given, Demand and delivery ratio.</td>
</tr>
<tr>
<td>3. Processed data regarding the device use</td>
<td>1. Cumulative consumption amount per pre-determined hour (in our institution, we setted 3,6,9,12,24,48 hours after end of surgery time)</td>
</tr>
<tr>
<td></td>
<td>2. To check the time setting error of PCA device, compare the last log recording time of the device (device time) and the time the data was transmitted to the server (real time).</td>
</tr>
<tr>
<td>4. Clinical assessments done by PCA management team</td>
<td>Ward rounding information of PCA management team recorded at the ward site using mobile EMR (PONV, pain score min max at postoperative day 0,1,2)</td>
</tr>
</tbody>
</table>

PCA, Patient-controlled analgesia; EMR, electronic medical record; PONV, postoperative nausea and vomiting.