Quality in Practice

Switching from heparinized saline flush to normal saline flush for maintaining peripheral venous catheter patency

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Abstract

Background. The practice of using heparinized saline as a flush fluid for maintaining peripheral venous catheter patency of hospitalized patients in Siriraj Hospital in Bangkok, Thailand is not evidence-based.

Objective. To switch from heparinized saline flush to normal saline flush for maintaining peripheral venous catheter patency in the patients hospitalized to medical wards.

Methods. Study sites were 10 medical wards containing 240 beds. The interventions included (i) disseminating evidence-based clinical practice policy on using flush fluid for maintaining peripheral venous catheter patency to responsible personnel, (ii) reminding the prescribers on using normal saline flush instead of heparinized saline flush, (iii) providing technical advice on using normal saline flush to nurses who encountered peripheral venous catheter clot while using normal saline flush, (iv) confirming a necessity of heparinized saline flush order with the prescriber, and (v) setting up a regulation on marking a special symbol on heparinized saline flush prescription if one really needed heparinized saline flush. The information on using flush fluids was collected from the physicians’ order sheets in the medical records at baseline, every 2–4 weeks during the intervention periods, and at 6 months after launching intervention.

Results. All hospitalized patients in medical wards who had peripheral venous catheter locks received heparinized saline flush in February 2005. The practice was totally switched to normal saline flush in June and November 2005.

Conclusion. The key features critical to success of this implementation are dissemination of evidence-based clinical practice policy and a regulation of having prescriber mark a specific sign right after the heparinized saline flush order.

Keywords: heparinized saline flush, normal saline flush, peripheral venous catheter patency

Siriraj Hospital is a tertiary care university hospital in Bangkok, Thailand. The capacity of the hospital is 2300 beds; 2200 beds in 111 general wards and 135 beds in 10 intensive care units. The total number of personnel is approximately 10 000, in which 1300 are physicians (700 faculty and 600 residents) and 4200 are nurses. There are approximately 1 000 000 outpatient visits and 100 000 in-patients per year. Up to 75% of the patients admitted to Siriraj Hospital require a peripheral intravenous catheter to provide access for administration of drugs and fluids. Maintenance of the patency of indwelling peripheral intravenous catheters could be done by continuous drip of the fluid via the catheter or connecting the catheter with a device called intravenous catheter lock. The intravenous catheter lock has advantage for the patient to move around without carrying the fluid bottle. However, indwelling peripheral intravenous catheter lock requires a periodical flush with fluid to prevent a clot. The work instruction regarding the use of flush fluid for maintaining peripheral venous catheter patency was prepared in 2001 and was revised in 2003. Both versions of the work instruction recommended heparinized saline as a flush fluid. A survey on the use of the fluids for flushing peripheral venous catheter locks was conducted on 7 September 2004. There were 2021 hospitalized patients on that day. Three hundred and thirty-five patients (16.6%) received peripheral venous catheter locks; 88.7% of them received heparinized saline as a flush fluid, whereas 11.3% received normal saline. In addition to several known disadvantages of using heparin for flushing peripheral venous catheter locks, e.g. bleeding, abnormal coagulation test results, thrombocytopenia, and drug interaction, the cost of heparin used for this purpose was estimated to be 2.4 million baht (US$60 000) per year. The evidence from three meta-analyses found no...
significant difference in the incidence of catheter clotting and phlebitis between peripheral venous catheters flushed with normal saline and those flushed with 10 or 50 units per milliliter of heparinized saline [1–3]. Therefore the use of heparinized saline as a flush fluid for peripheral venous catheter lock in Siriraj Hospital is not evidence-based and this practice should be corrected. Normal saline should replace heparinized saline for maintaining peripheral venous catheter patency in more than 95% of hospitalized patients with peripheral venous catheter locks. We are certain that the existing evidence to be used for forming change strategies is valid, relevant, and applicable to our situation for several reasons.

In addition to the aforementioned meta-analyses, two randomized controlled studies conducted by the nurses in Siriraj Hospital and Ramathibodi Hospital in Bangkok also observed similar findings as reported in the meta-analyses [4,5]. Many hospitals in Thailand use normal saline as a flush fluid for peripheral venous catheter locks. Moreover, three patient-care areas in Siriraj Hospital have used normal saline flush for maintaining peripheral venous catheter patency for many years without any problems.

The objective of the study was to change an opinion-based health service to an evidence-based health service on the use of fluid flush for maintaining peripheral venous catheter patency for patients hospitalized to medical wards in Siriraj Hospital.

**Methods and results**

Study sites were 10 medical wards containing 240 beds. The information on using flush fluids was collected from the physicians’ order sheets in the medical records of all hospitalized patients with peripheral venous catheter locks in medical wards by the author (AI). The author (AI) also interviewed the nurses responsible for caring for peripheral venous catheter locks. The baseline information gathered on 18 February and 25 February 2005 revealed that all of the patients with peripheral venous catheter locks received heparinized saline flush, as summarized in Table 1. Evidence-based clinical practice policy on maintaining peripheral venous catheter patency with normal saline flush was prepared. It was one-page document containing a significance of the guideline, the evidence, the recommendation, and the grade of recommendation and references. The evidence-based clinical practice policy was disseminated to medical residents and nurses stationed in all medical wards in March 2005. The information on flush fluid use gathered on 25 April and 4 May 2005 found that heparinized saline flush was used in about one-third of the patients as summarized in Table 1. The main reasons for using heparinized saline are as follows: (i) heparin was ordered by a new batch of final year medical students who were not aware of the clinical practice policy; (ii) some residents still ordered heparinized saline flush because they were so familiar with this prescription and they thought that this device was called ‘heparin lock’ even though they did not originally intend to use heparin; and (iii) some nurses in some wards felt that the catheters clotted more often when they used normal saline flush so they returned to use heparinized saline flush. Hence, additional measures were employed on 12 May 2005. The author (VT) distributed the clinical practice policy to the final year medical students. The medical residents were reminded to adhere to normal saline flush instead of heparinized saline flush. The author (VT) asked the chief nurse to convince the nurses who complained of experiencing clot more often that this was due to the technique of flushing peripheral venous catheter lock and to inform them the appropriate technique. The information on using flush fluids gathered on 18 May 2005 found that heparinized saline flush was used in about one-fourth of the patients as summarized in Table 1. The main reasons for using heparinized saline flush are as follows: (i) heparin was ordered by a new batch of final year medical students who were not aware of the clinical practice policy; (ii) some residents still ordered heparinized saline flush because they were so familiar with this prescription and they thought that this device was called ‘heparin lock’ even though they did not originally intend to use heparin; and (iii) some nurses in some wards felt that the catheters clotted more often when they used normal saline flush. Hence, more additional measures were employed on 26 May 2005. The author (VT) called on the meeting with the nurses from all medical wards. During the meeting, the evidence and the advantages of using normal saline flush were emphasized. The nurses from patient-care areas who had used normal saline flush for many years were invited to join the meeting, and they shared their experiences of using normal saline flush with the nurses from medical wards. It was agreed that if any nurse received an order of heparinized saline flush from the in-charge physician, she would ask the prescriber if he/she really needed heparin. The author (VT) also circulated the clinical practice policy to the new batch of the final year medical students rotating to medical wards. It was decided that it would be difficult and time consuming for monitoring and circulating the clinical practice policy to the responsible personnel and reminding the prescribers. Therefore a regulation on marking a specific sign right after the order of heparinized saline flush was set.

<table>
<thead>
<tr>
<th>Date</th>
<th>Patients who received heparinized saline flushes, ( u (%) )</th>
<th>Patients who received normal saline flushes, ( v (%) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 February 2005</td>
<td>90 (100)</td>
<td>0</td>
</tr>
<tr>
<td>25 February 2005</td>
<td>64 (100)</td>
<td>0</td>
</tr>
<tr>
<td>25 April 2005</td>
<td>23 (34.3)</td>
<td>44 (65.7)</td>
</tr>
<tr>
<td>4 May 2005</td>
<td>23 (32.9)</td>
<td>47 (67.1)</td>
</tr>
<tr>
<td>18 May 2005</td>
<td>21 (23.3)</td>
<td>69 (76.7)</td>
</tr>
<tr>
<td>6 June 2005</td>
<td>1 (1.6)</td>
<td>61 (98.4)</td>
</tr>
<tr>
<td>20 June 2005</td>
<td>0</td>
<td>56 (100)</td>
</tr>
<tr>
<td>30 June 2005</td>
<td>0</td>
<td>66 (100)</td>
</tr>
<tr>
<td>30 November 2005</td>
<td>0</td>
<td>105 (100)</td>
</tr>
</tbody>
</table>
prescriber really wanted to use heparinized saline flush, one must write ‘*’ right after the order, otherwise the nurse would use normal saline flush even if the order read heparinized saline flush without ‘*’. This regulation was notified to medical residents, final year medical students rotating to medical wards, and the responsible nurses. The information on flush fluids use gathered on 6 June, 20 June and 30 June, and 30 November 2005 found that normal saline flush totally replaced heparinized saline flush as summarized in the Table 1.

Discussion

Health research findings should be appropriately utilized and ultimately have impact on policy, practice, and patients’ outcomes. The key messages from the 2004 World Report on Knowledge for better Health are (i) biomedical discoveries cannot improve people’s health without the study to find out how to apply them specifically within different health systems, population groups, and diverse political and social contexts; (ii) and stronger emphasis should be placed on translating knowledge into actions to improve health thereby bridging the gap between what is known, and what is actually being done [6]. Knowledge translation has been a concern, and the strategies for closing the gap between practice and evidence were proposed [7–9]. The interventions we used to switch from heparinized saline flush to normal saline flush for maintaining peripheral venous catheter patency included educational interventions and administrative interventions. We believed that the key features critical to success of this implementation were dissemination of evidence-based clinical practice policy and a regulation of having prescriber mark ‘*’ right after the heparinized saline flush order. Our successful knowledge translation confirms the observation that getting research findings to practice needs multifaceted interventions. In addition to promoting an evidence-based health service by switching from heparinized saline flush to normal saline flush for maintaining peripheral venous catheter patency in our institution, this change also has an impact on enormous saving resources of the patients, the hospital, and the responsible people.

It is hoped that the aforementioned case study would encourage responsible health care institutions to pay more attention on narrowing the gap between the knowledge which we have and what is actually done as well as on developing a culture where decisions taken by policy-makers, health professionals, and the public are based on evidence.

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References


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