Evidence based decisions in nursing and their effect on quality of care
Versloot, M.N.

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Long-term adherence to a local guideline on postoperative body temperature measurement: mixed methods analysis

MN Storm-Versloot
AM Knops
DT Ubbink
A Goossens
DA Legemate
H Vermeulen

ABSTRACT

**Aim:** To find out whether a successful multifaceted implementation approach of a local evidence-based guideline on postoperative body temperature measurements (BTM) was persistent over time, and which factors influenced long-term adherence.

**Methods:** Mixed methods analysis. Patient records were retrospectively examined to measure guideline adherence. Data on influencing factors were collected in focus group meetings for nurses and a plenary meeting with an interactive questionnaire for doctors.

**Results:** Records from 102 surgical patients were studied, totalling 1226 BTM. According to the guideline, an indication for BTM was present in 55% (679/1226). Actually, BTM were taken in 60% (736/1226), of which 55% (403/736) was in accordance with the guideline. The overall adherence rate to the guideline was 50% (617/1226). Belief in the advantages of the guideline and strong staff support appeared to facilitate long-term adherence. Barriers were: the controversial nature of the guideline, the lack of self-efficacy among nurses and doctors as to clinical judgement to identify an infection when refraining from BTM, and a lack of management and staff doctor support. Furthermore, newly appointed nurses and doctors were trained to measure BTM during their initial medical or nursing education, which was in contradiction with the guideline.

**Conclusions:** A multifaceted implementation strategy is not sufficient to maintain long-term adherence. To ensure long-term adherence, especially of controversial guidelines, adherence should be monitored and reported regularly over time. Strong staff support and leadership on all wards is crucial to maintain awareness. Medical and nursing curricula should include the pros and cons of taking BTM, combined with enhancing self-efficacy.
Clinical guidelines are considered to improve the quality of care and close the research evidence-practice gap.\textsuperscript{1,2} Non-adherence to guidelines may lead to unnecessary diagnostics, suboptimal treatment, or even adverse events.\textsuperscript{3,4} Even though, it is still a challenge to implement evidence-based guidelines and their recommendations into clinical practice and achieve high adherence rates.\textsuperscript{5-7}

A large body of literature is available on the effective implementation of clinical guidelines, but the “magic bullet” does not exist.\textsuperscript{8,9} Passive implementation strategies, such as the presentation and publication of a guideline, will hardly change professional behaviour.\textsuperscript{10} To optimize adaptation, it has been proposed that guidelines should be simple and supported by active and multifaceted implementation strategies.\textsuperscript{11-13}

A multifaceted strategy includes presentations, personal visits, feedback, reminders, and letters.\textsuperscript{14} Such a strategy was used in order to break through unnecessary postoperative routine body temperature measurements (BTM), after the development of an evidence-based guideline in our hospital [Appendix 1].\textsuperscript{15,16} In short, the results of the studies showed that routine BTM could - and should - be abandoned. Serious postoperative infections were found to occur without an accompanying increase in temperature, while fever was frequently not accompanied by an infection. The strategy for the (short-term) implementation of this guideline was tailored to the facilitators and barriers, as indicated by nurses and doctors. The main barriers were self-efficacy and disagreement with the nature of the guideline as routine BTM is still considered as good patient care.

The multifaceted approach resulted in a 91% adherence to the guideline, six months after its release [Appendix 2].\textsuperscript{17} Thereafter, the responsibility for the use of the guideline was transferred to the staff surgeon and the head nurse on each ward involved. Although short-term guideline adherence may be achieved,\textsuperscript{18,19} regression to old habits is a common human flaw.\textsuperscript{20} The last was expressed by several nurses and staff surgeons on our wards. They observed signs of decline in adherence to the guideline and this was intercepted by the study group.

Subsequently, a study was performed on the facilitators and barriers to long-term adherence to this local guideline. The aim was to find out whether a successful multifaceted implementation approach is persistent over time, and which factors were influencing long-term adherence to evidence-based guidelines.

METHODS

\textbf{Setting}

This mixed-methods study with retrospective and prospective, as well as qualitative and quantitative, components was performed at the Department of Surgery of a 1000-bed university hospital in the Netherlands. The Department of Surgery consists of nursing
wards for short stay, traumatology, vascular surgery, and general surgery, which includes gastro-enterology, hepatic, pancreatic, and biliary surgery patients. Because this study merely monitored daily practice, approval by the local medical ethics review board was not needed.

**Guideline**
The guideline was approved by the medical and nursing management teams of the surgical departments in 2000. The guideline consists of the BTM recommendation and states that body temperature needs not to be measured postoperatively for surgical cases of non-infectious diseases [Appendix 1]. Indications for BTM were the presence of an infectious disease preoperatively, or patients contracted an infection postoperatively, or blood transfusion.

**Methods of evaluation**
*Assessment of long-term guideline adherence*
Quantitative data on long-term adherence to the guideline was retrospectively determined, as any prospective determination is likely to influence the behaviour of nurses and, thus, bias the results. From all elective and emergency surgical procedures performed during a three-month period in 2007, 25 records from each surgical ward for evaluation were selected at random. The three-month period was the same time frame as used in the initial guideline adherence measurement.

Two investigators (MNSV, AMK) independently examined patient records for BTM and their indications in accordance with the guideline. Four outcomes were possible: BTM could have been taken appropriately or inappropriately, or they could have been omitted appropriately or inappropriately. Disagreement about indications, which occurred in 16 patients (16%), were referred to a third investigator (DTU) and resolved by discussion.

Adherence rate was defined as the number of appropriately measured and omitted BTM relative to the total number of BTM. The total number of BTM was calculated following the definitions used in the diagnostic study, and the subsequent determination of the initial adherence rate. In these studies BTM were recorded twice a day until discharge or until a maximum of 14 days postoperatively.

*Focus group meetings with nurses*
For registered and student nurses from surgical wards, structured focus group meetings were organized to explore facilitators and barriers influencing long-term guideline adherence. Nurses could attend the meetings only once. The aim of the meeting was explained, that data would be processed anonymously, and that answers were not judged as being good or bad. Furthermore, it was emphasized that discussion on the topic was important.

Nurses were asked first, whether they were aware of the guideline and how they had learnt about it; second, whether they adhered to the guideline; third, if they had experienced staff support (staff surgeon or head nurse) regarding guideline adherence; and fourth, all
facilitators and barriers experienced by them regarding guideline adherence were listed. All nurses wrote down their appreciation of positive or negative reasons pertinent to guideline adherence. These reasons were plenary discussed and clustered into several positive or negative themes until the group was satisfied with the result. Any new themes that came up during the discussion were added. One investigator led the discussion (AMK) and another took field notes (MNSV). After each session, the impressions of both investigators were added to the field notes. Both investigators independently categorized the clustered themes under one of the six main factors that influence implementation according to Grol: 1) belief in or the change itself; 2) those who have to work with the changes; 3) social context; 4) organizational aspects; 5) economic, political, and legal aspects; and 6) aspects of the implementation strategy chosen. The last factor was irrelevant and not used, because the guideline was not implemented at this point in time. Disagreement was discussed with a third investigator (AG) and a final categorization was made by consensus. The focus group meetings were continued until saturation was reached: in the last two sessions no additional themes or insights were discovered.

*Plenary meeting with doctors*
A structured plenary meeting was organized with the staff surgeons, surgical residents and medical students from all surgical wards and they were confronted with an interactive questionnaire. The questions were derived from the nurses’ focus group results and addressed adherence to the guideline itself and whether the facilitators and barriers mentioned by the nurses agreed with the doctors’ views. In addition, details on position and specialization were asked.

*Data analysis*
Guideline adherence was expressed as a percentage. In the analysis of long-term adherence, a distinction was made between wards with (i.e. management enforces compliance with the guideline) and without ‘staff support’—considering that this is an obvious factor influencing guideline adherence. The plenary meeting with doctors was performed with the aid of an interactive audience response system (TurningPoint, Reivo Ltd, Theale, UK) and imported into SPSS v.14 (SPSS Inc., Chicago, Illinois, USA). Also, descriptive statistics of the data obtained during the plenary meeting and the guideline adherence rates were performed using SPSS.

**RESULTS**

**Characteristics of respondents and awareness of the guideline**
Forty-seven nurses from four surgical wards attended the focus group meetings. After seven meetings no additional information or insights had appeared. Nurses’ functions are shown in Table 1. Thirty-four out of 47 (72%) nurses reported to be aware of the guideline, mainly because they had participated in the original study 7 years earlier (59%) or because
they had been informed by colleagues (38%). Nurses from two out of the four wards stated they were not aware of whether or not the staff had decided to apply the guideline. Hardly any (15%; 3/20) of these nurses claimed to have followed the guideline in contrast with the two wards where nurses experienced staff support (95%; 21/22) (Table 1).

During the plenary meeting, 42 doctors responded to the questionnaire. Doctors’ functions are presented in Table 1. Specializations and functions were representative for the total surgical staff. In general, 33% (14/42) of the doctors were aware of the guideline. Most of them (93%; 13/14) were staff surgeons.

**Assessment of actual long-term guideline adherence**

In total 102 patient records were reviewed. Baseline patient characteristics are given in Table 2. In these patients, a maximum of 1226 BTM could have been taken if they had been measured following the definitions used in the determination of the initial adherence rate (twice a day up until discharge or up to 14 days postoperatively). According to the guideline 679 out of 1226 (55%) BTM should have been taken. Actual BTM were taken in 736 out of 1226 (60%) of which 403 out of 736 (55%) was in accordance with the guideline. The overall adherence rate was 617 out of 1226 (50%) (Table 3) and did not differ between wards with and without staff support. However, the percentages of inappropriately BTM were much lower for the wards with staff support (110/277: 40%) than for those without (223/270: 83%).

**Table 1: Respondents’ functions and nurses’ self-reported guideline adherence**

<table>
<thead>
<tr>
<th>Staff support (n)</th>
<th>No staff support (n)</th>
<th>Total, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nurses’ functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered nurses</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Student nurses</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22 (47%)</td>
<td>25 (53%)</td>
</tr>
<tr>
<td><strong>Self-reported adherence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td><strong>Doctors’ functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff surgeons</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Surgical residents</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Medical students</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>17 (40%)</td>
<td>25 (60%)</td>
</tr>
</tbody>
</table>
Factors influencing guideline adherence according to the nurses

The information retrieved from the focus group meetings are summarized below for each factor separately. Table 4 presents the most important facilitators and barriers.

1. The belief in or the change itself: as to abandoning routine postoperative BTM.

   Especially at the wards with staff support, almost all nurses stated that the main advantage of the guideline was the reliance on clinical judgement rather than on the routinely sampled, and possibly misleading body temperature. This advantage was mentioned particularly when a patient had clinical signs of an infection, without an increased body temperature. Other nurses believed many patients on their wards did not meet the guideline criteria, because these patients were at high risk of developing an infection.
2. **Those who have to work with the change:**
   At the wards without staff support, the majority of the nurses stated clinical judgement is subjective and varies as it depends on the knowledge, experience, and expertise of nurses and doctors. Therefore, routine BTM were obtained in order not to miss any infection. Moreover, some of these nurses stated, when an indication to BTM is present, it can wrongfully be forgotten, which might be harmful for the patient.

3. **Social context: Attitude and expectations**
   Most nurses stated it would be easier to adhere to the guideline if doctors did so in the first place, but new doctors were usually unaware of the guideline and often requested for the BTM. Nurses needed to exonerate themselves from not taking the temperature. Furthermore, some nurses took BTM routinely and others only for the indications as described in the guideline. This lack of uniformity made it more difficult for nurses to discuss the value of BTM with patients.

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**Table 4: Statements of nurses regarding facilitators and barriers for guideline utilization**

<table>
<thead>
<tr>
<th>Facilitators</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Innovation itself: the believe in or the change itself</strong></td>
<td></td>
</tr>
<tr>
<td>* Trust in the scientific basis of the guideline</td>
<td>* To take measurements may be a useless ritual, but it is harmless, easy to do, and not time-consuming</td>
</tr>
<tr>
<td>* To prevent superfluous diagnostic tests</td>
<td>* There are too many patients that are at high risk of infection</td>
</tr>
<tr>
<td>* To stimulate the development of clinical judgement</td>
<td></td>
</tr>
<tr>
<td><strong>Individual professional: those who have to work with the change</strong></td>
<td></td>
</tr>
<tr>
<td>* Confidence in personal clinical judgement for identifying a postoperative infection</td>
<td>* No confidence in personal clinical judgement for identifying a postoperative infection; clinical findings can be misleading</td>
</tr>
<tr>
<td></td>
<td>* BTM combined with clinical findings improve earlier diagnosis of infection</td>
</tr>
<tr>
<td><strong>Social context: attitude and expectations</strong></td>
<td></td>
</tr>
<tr>
<td>* Staff support in using the guideline</td>
<td>* Doctors ask for the BTM routinely</td>
</tr>
<tr>
<td>* Nurses correct each other when inappropriate measurements were taken.</td>
<td>* Nurses correct each other when a BTM was missed out</td>
</tr>
<tr>
<td></td>
<td>* Patients are expecting BTM to be taken</td>
</tr>
<tr>
<td><strong>Organizational context</strong></td>
<td></td>
</tr>
<tr>
<td>* Standard procedures on wards were given to newly appointed nurses, including the content of the guideline</td>
<td>* Standard procedures on wards were given to newly appointed nurses, not including the content of the guideline</td>
</tr>
<tr>
<td>* It is always hard to find a thermometer on the ward</td>
<td>* Only the doctors on the departments of general surgery had adopted the guideline</td>
</tr>
<tr>
<td><strong>Economic, political, and legal context</strong></td>
<td></td>
</tr>
<tr>
<td>* None mentioned</td>
<td>* Taking routine BTM is still instructed at nursing school</td>
</tr>
</tbody>
</table>

BTM, body temperature measurements.
4. Organizational aspects

*Patient population:* Obviously, during the period of 7 years following the initial guideline implementation, organizational changes in departments and wards had occurred. Some wards accommodated other specialties than surgery as well, e.g. plastic surgery and urology. Therefore, specialties that had not participated in the primary study were not familiar with the guideline and doctors still requested BTM.

*Staff support:* Almost all nurses on two wards were poorly aware whether or not the staff had decided to apply the guideline. In contrast, new nurses on the two wards with staff support were told that routine postoperative BTM were not considered a routine practice to perform, but only in specific situations.

5. Economic, political, and legal aspects

Routine BTM were still regarded as an esteemed ritual in nursing, even in the education of student nurses and doctors.

**Factors influencing guideline adherence according to the doctors**

Among the doctors who were aware of the guideline, more claimed to adhere to the guideline on the wards with staff support (5/6) than on those wards without staff support (2/8). About half of the doctors (20/42: 48%) routinely asked for a patient’s temperature, especially if they were unaware of the guideline. The majority (21/30: 70%) of staff surgeons and surgical residents did not want to know the temperature on a daily basis, but did if patients had clinical signs of a postoperative infection. In contrast, medical students did want to know body temperatures routinely (7/12: 58%). Especially on the ‘no staff support’ wards, some doctors claimed that patients did not match the guideline because they were at high risk for postoperative infections.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Aware of guideline (n = 14, 33%)</th>
<th>Not aware of guideline (n = 28, 67%)</th>
<th>Total (n = 42)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopting the guideline</td>
<td>7</td>
<td>NA</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>Trusting the evidence</td>
<td>9</td>
<td>NA</td>
<td>9</td>
<td>64</td>
</tr>
<tr>
<td>Asking routinely for the temperature</td>
<td>5</td>
<td>15</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Almost never asking for the temperature</td>
<td>6</td>
<td>3</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Want to know the temperature on a daily basis</td>
<td>3</td>
<td>11</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>Want to know the temperature when patients have clinical signs of an infection</td>
<td>10</td>
<td>16</td>
<td>26</td>
<td>62</td>
</tr>
<tr>
<td>Patient group fits into the guideline</td>
<td>9</td>
<td>21</td>
<td>30</td>
<td>71</td>
</tr>
<tr>
<td>Belief many patients are at risk of postoperative infection</td>
<td>4</td>
<td>5</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Trust their own clinical judgement</td>
<td>9</td>
<td>7</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>Trust the nurses’ clinical judgement</td>
<td>8</td>
<td>10</td>
<td>18</td>
<td>43</td>
</tr>
</tbody>
</table>

NA, not applicable
The amount of confidence in personal clinical judgement for identifying postoperative infections without BTM was highest for the staff surgeons, and lowest for medical students. Staff surgeons and medical students had more confidence in the nurses’ clinical judgement for identifying a postoperative infection than surgical residents did. Table 5 summarizes the doctors’ responses to the statements with a distinction for awareness of the guideline.

DISCUSSION

This study shows that an initially applied successful multifaceted implementation strategy does not guarantee long-term adherence to an evidence-based guideline. The overall adherence rate had decreased to 50%, after the initial adherence rate of 91%. Facilitators for long-term adherence were: a belief in the advantages of the guideline, and staff support. Barriers were, first, the controversial nature of the guideline with faded awareness, second, a lack of self-efficacy: e.g. distrust in personal clinical judgement to identify an infection when refraining from BTM, and third, for nurses a lack of management and staff doctor support.

Same facilitators and barriers have been reported in studies on short-term guideline adherence. One of the few studies focusing on long-term adherence showed that sustained adherence to guidelines is more likely if they contain clear recommendations, are evidence-based, are non-controversial, and do not demand a change in existing routines. The guideline studied here did not meet the latter two criteria, which may explain the declined adherence rate over time.

As to the controversial nature and changing existing routines, the guideline recommended only taking BTM when infection was diagnosed. This was a titanic change in daily practice, which was achieved initially, but not sustained over time on all wards. In general, student nurses as well as residents learned that routine BTM is considered as good patient care and these conceptions are still incorporated in medical and nursing curricula. Therefore, only on the wards with strong staff support and leadership, newly appointed nurses were notified with information on the content of the guideline and awareness and familiarity was sustained. Although these nurses were informed, newly appointed surgical residents were not. As a consequence, awareness in especially the surgical residents was fading.

As to self-efficacy, this study showed that even the majority of staff surgeons frequently asked for BTM when patients had clinical signs of an infection. This misinterpretation on the content of the guideline led to discussion among doctors and nurses about the validity of clinical judgement when to take BTM. Different misconceptions on BTM among graduates have also been described in literature. In general, nurses and doctors still consider BTM to be essential to support their clinical judgement and confirm clinical signs of infection and although the majority of staff surgeons were confident to identify an infection without BTM, the surgical residents were not. A lack of self-efficacy in doctors has been described.
as a main barrier to guideline adherence and can be present in up to 65%. In addition, residents distrusted not only their own, but also the nurses’ clinical judgement. Distrust between doctors and nurses is depending on and related to doctors’ perceptions of the individual nurses’ competence. Nurses also expressed a lack of self-efficacy, but in contrast they stated that stimulating the development of clinical judgement was an advantage of the guideline and should therefore be supported and taught to student nurses.

As to staff support, nurses’ need for support from management and doctors was very important. A lack of staff support hampered long-term adherence. The same has also been described for successful implementation of guidelines in nursing practices. This study is somewhat extraordinary as a mix of quantitative and qualitative, but also retrospective and prospective methods were used. Mixed-methods are increasingly used in implementation and quality improvement research. However, some limitations of this study should be mentioned. Adherence was measured only once and after a long time. Maybe an interrupted time series analysis would have given a better overview of the changes in adherence rate to the guideline and yielded earlier signs of non-adherence. Nowadays, the incorporation of long-term boosters through the development of quality indicators is recommended to monitor and report the change of behaviour. At that time we were not aware of that and, as a 91% adherence was reached, it was believed that the responsibility for endured adherence could be transferred to the staff surgeon and the head nurse on each ward. Furthermore, reasons for the lack in self-efficacy were not explored. This should be studied more thoroughly in future implementation studies.

Our findings indicated that an active multifaceted implementation strategy can be effective for deploying a guideline, but it is not sufficient to root practice change and to accomplish long-term adherence. A strong self-efficacy and staff support seemed necessary to maintain awareness and sustained adherence. Therefore, some recommendations may be useful for long-term adherence in guidelines. First, in especially controversial guidelines, adherence rate and barriers have to be monitored and reported over time. Enforcement through leadership is needed by health care providers at every professional level, and indicators to monitor the required changes. When adherence rate tends to decline, any barriers should be explored again and accordingly addressed with tailored interventions. Second, staff support on all wards is necessary to maintain awareness. Third, it is necessary to influence and build the self-efficacy of nurses and doctors. Fourth, guideline recommendations should be incorporated in medical and nursing curricula. This all together should enable to ensure long-term adherence of guidelines.
REFERENCES


Appendix 1

Summary: development of the guideline ‘postoperative temperature measurements’ (2000)

Problem: Widespread traditions in clinical practice associated with questionable effectiveness are still present. One such tradition is the routine use of body temperature measurements (BTM) in postoperative patients (at least twice a day until discharge) in order to detect or exclude an infection at an early stage. In mostly retrospective and unblinded studies it has been suggested that early postoperative fever was of little use in clinical practice.15 If fever is present, doctors are more likely to order additional diagnostic tests, but if the temperature is normal, they are less likely to consider the probability of an infection. This daily routine translates into countless BTM and medical actions per year. In the era of evidence based practice it has become necessary to rationalize these traditions.

Aim of the study: To prospectively assess the diagnostic accuracy of routine postoperative BTM by comparing them with the presence or absence of postoperative infection in a general surgical population.

Results: From 2282 BTM taken from 284 patients, a temperature ≥ 38°C appeared to have the following diagnostic parameters: Sensitivity: 37% (95% Confidence Interval [CI]: 16-62%); Specificity 80% (95% CI: 75-85%); Negative Predictive Value: 90% (95% CI: 89-91%); Positive Predictive Value: 8% (95% CI: 5-13%).

Conclusions: BTM are a poor indicator for detecting an infection; a patient may have an infection without fever and vice versa.

Guideline content: Routine postoperative BTM are abolished. BTM are indicated only if: patients underwent surgery because of an infection to monitor its progression; patients contracted an infection postoperatively; patients received a blood transfusion.
Appendix 2

**Summary: implementation of the guideline (1999-2001)**

**Introduction:** Before the start of the diagnostic study ‘postoperative BTM’ we realized that the acceptance of omitting routine BTM could be low in nurses and doctors. Nurses and doctors need to learn to rely more on their clinical judgement than relying on the BTM. Therefore, baseline facilitators and barriers were assessed by means of a questionnaire and by formal and informal meetings. The main barriers were: self-efficacy and agreement.

**Baseline description:** 50% of the doctors wanted routine BTM versus 8% of the nurses. For BTM on indication this was respectively 43% and 69%. At the start of the study, about 30% of doctors and nurses were afraid of missing an infection or detecting infections later if they had to rely solely on their clinical judgement. Approximately 75% of doctors and nurses expected that patients would feel unsure when BTM were not carried out.

**Multifaceted strategy:** Strategies used were based on these barriers: involvement of doctors and nurses in the prospective study, daily visits to the departments for providing information and feedback, regular information letters and presentations, study recognition, posters, reminders, patient information letters, a short guideline description with recommendation in the (electronic) protocols, and evaluation of the implementation strategy.

**Methods:** Evaluation of the implementation strategy was prospectively monitored. For a period of 3 months, guideline adherence was measured by chart review, where reasons for BTM were stated. A maximum of two BTM per day up until discharge or until 14 days postoperative were recorded. A post-questionnaire measured the self-reported adherence of doctors and nurses as well as their motives to be adherent.

**Results:** Adherence: The guideline was completely followed in 50% (37/75) patients, and partly in the other patients. BTM were taken in 14% (157/1086) of which 33% (55/157) was in accordance with the guideline. In total 91% (984/1086) BTM were in accordance with the guideline.

Reasons for non-adherence: Clinical complaints and symptoms of a postoperative infection. Motives for adherence: Motives of the 93% followers (doctors and nurses) of the guideline were based on scientific proof (59%), convincing arguments (37%), and always wanting to measure on indication (30%).