Should nurses be allowed to perform the pre-operative surgical site marking instead of surgeons? A prospective feasibility study at a Swiss primary care teaching hospital

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Abstract

Background: Surgical site marking is one important cornerstone for the principles of safe surgery suggested by the WHO. Generally it is recommended that the attending surgeon performs the surgical site marking. Particularly in the case of same day surgery, this recommendation is almost not feasible. Therefore we systematically monitored, whether surgical site marking can be performed by trained nursing staff. The aim of the study was to find out whether surgical site marking can be carried out reliably and correctly by nurses.

Methods: The prospective non-controlled interventional study took place in a single primary care hospital of Uster in Switzerland. During a pilot phase of 3 months (starting October 2012) the nursing staff of a single ward was trained and applied the surgical site marking on behalf of the responsible surgeon. After this initial phase the new concept was introduced in the entire surgical department. 12 months after the introduction of the new concept an interim evaluation was performed asking whether the new process facilitates daily routine and surgical site marking was performed correctly. 22 months after the introduction a prospective data collection monitored for one month whether the nursing staff carried out surgical site marking independently and correctly. Data were collected by a patient-accompanying checklist that was completed by the nursing staff, the staff in the operating room and the responsible surgeons.

Results: The stepwise implementation of the new concept of surgical site marking was well accepted by the entire staff. 150 patient-accompanying checklists were analyzed. 22 data sheets were excluded from the analysis. 90% (n = 115/128) of the surgical site markings were correctly performed. For the remaining 10% either a surgical site marking was not necessary or the nursing staff asked a surgeon to mark the correct surgical site. During the whole study time of almost 3 years, no wrong-site surgery occurred.

Conclusion: Surgical site marking can be performed by trained nurses. However, the attending surgeon remains fully responsible of the correct operation on the correct patient.

Keywords: Surgery, Safety, Time-out, Implementation, Surgical site marking, Wrong-site surgery
Wrong-site surgery (WSS) is a complication with potentially devastating effects [1, 2]. The incidence is estimated at 1 in 30,000 to less than 1 in 100,000 surgeries [3, 4]. But the true incidence might be higher due to a reporting bias. In 2008 the WHO introduced the safe surgery checklist with the aim to reduce mistakes in patient care and adverse events by improving teamwork and communication [5, 6]. Many hospitals worldwide accepted the principles of safe surgery and introduced, inter alia, a team time-out before and after surgery. One important cornerstone for eradicating WSS is the surgical site marking before the intervention [7, 8]. The introduction of surgical safety checklists improved markedly the surgical outcome [9].

There is a large variance in the adherence to the principals of safe surgery and the use of checklists [8, 10, 11]. Generally, it is recommended that the attending surgeon himself marks the surgical site on the patient before surgery [6, 12–14]. In everyday practice with same day surgery this is often impossible due to a crowded schedule in the operating room. The time available between patient’s entry at the surgical ward, pre-medication and transfer to the operating room is often kept very short to avoid waiting time, especially in efficiently organized outpatient or same day surgery. Hence, it is often not possible that the attending surgeon or a resident marks the surgical site of the patient. It is also not reliable and responsible that the patient participates in the surgical site marking [15].

Therefore we asked whether surgical site marking could be assigned by trained nursing staff at the admission without affecting patient’s safety.

Methods
The prospective non-controlled interventional study took place from 2012 until 2015 at the clinic for general and orthopedic surgery in the primary care hospital of Uster in Switzerland. The hospital of Uster is a public teaching hospital with a catchment area of app. 200,000 inhabitants with 5,000 in-patients and 19,000 out-patients per year in all surgical units. The different surgical specialties include orthopaedic surgery, general and trauma surgery, abdominal surgery, hand surgery and urology. The hospital follows the guidelines of the WHO surgical safety checklist. Before 2012 the attending surgeon or the surgical resident assigned surgical site marking. A timeline of the study is given in Fig. 1.

Phase 1: pilot
During 3 months (August 2012–October 2012) the nursing staff on a single surgical ward applied the pre-operative site marking and completed a patient-accompanying checklist regarding the upcoming intervention. All participating nurses were trained regarding the correct surgical site marking.

Phase 2: implementation
After the pilot phase, the process was established on all surgical wards of the clinic in January 2013. Twelve months after implementation a questionnaire-based first evaluation of the new process was done asking nursing staff and physicians about feasibility and satisfaction about the new process. Quality control: 22 months after implementation an additional questionnaire determined whether the surgical site marking was attached independently, whether uncertainties existed regarding the marking, or whether a surgeon was called to label the surgical site correctly. This questionnaire was filled in simultaneously by the surgeon in charge, the nurses applying the surgical site mark, and the staff of the OR. Data were collected from October 15th until November 15th 2014. During the team time-out shortly before surgery, the attending surgeon recorded on the checklist whether the site marking was done properly. All surgical site markings were recorded prospectively with a patient-accompanying checklist and questionnaire. Emergencies were excluded from data collection.

Results
After closing the pilot phase, a written evaluation filled in by 13 participating nurses showed a positive attitude towards the new process and a significant benefit in the daily business (Fig. 2). Thereafter, the new process was implemented to the entire surgical department.

Twelve months after implementation 50 members of the nursing staff were asked whether they felt confident to place the surgical site marking and whether the process facilitated daily routine. 40 surgeons were asked whether surgical site marking was performed correctly and reliably by the nursing staff (Fig. 3).
Eighty-seven percent of the nursing staff felt confident to place the surgical site marking and 89% mentioned that the process facilitated daily routine. Almost all surgeons (97%) trusted the surgical site marking done by the nursing staff and 86% of the surgeons noticed facilitation. Both surgeons and nursing staff felt a positive side effect in inter-professional collaboration (Fig. 3).

Twenty two months after implementation a prospective data collection took place. During one month 353 patients for elective surgery were recorded and surgical site marking was performed by the nursing staff. The return rate of the patient-accompanying checklist and questionnaires was 42% ($n = 150/353$). Twenty two data sheets were incomplete and therefore were excluded from the analysis. One hundred twenty-eight data sheets were available for analysis (Fig. 4). In 90% ($n = 115/128$) surgical site markings were correctly performed. In only two cases (1.7%; $n = 2/115$) the nursing staff were not able to perform the site
marking and asked a surgeon to mark the patient. In 10% 
\(n = 13/128\) surgical site marking was performed although 
it was not necessary (e.g., laparoscopic cholecystectomy or 
rectosigmoid resection). Analysis of the team-time out be-
fore surgery indicated that surgical site marking was done 
correctly in all of the 353 patients and no WSS occurred 
during the study period.

Discussion
The study shows that surgical site marking can be 
assigned safely by the nursing staff at the patient's 
asmission. Due to a stepwise implementation the new 
process was introduced without difficulties. All surgical 
side markings were performed properly and on the 
correct side. The evaluation of the modified process of 
surgical site marking was done by the nursing staff 
and surgeons. Both groups noticed a facilitation of 
daily routine work.

Although the return rate of the data sheets was only 
42%, no wrong site surgical site marking occurred during 
the time of the study. Apparently, there was a non-
compliance regarding the completion of the question-
naires for the study but not of the surgical site marking. 
The reason may have been lack of time during the work-
day or a general lack of interest in surveys. We did not in-
sist on full completion of the questionnaires to the staff to 
avoid a response bias. However, the questionnaires indi-
cate the daily workload was reduced for surgeons and 
nursing staff. On the one hand the nursing staff does not 
have to organize or wait for a surgeon during the admis-
sion process, especially in the case of same day surgery. 
On the other hand the surgeon does not have to interrupt 
daily routine by e.g., changing clothes from the operation 
room and walk to the admission ward.

A central criticism of the concept might be that the 
surgeon distances himself from the patient. Without 
signing one's site before surgery the opportunity is lost 
to engage the patient and to ease anxiety regarding the 
upcoming surgery [16, 17]. But in the setting of same 
day surgery the surgeon meets the patient in advance in 
the outpatient clinic to discuss the risks and benefits of 
the intervention. The outpatient clinic provides an un-
disturbed and quiet environment to discuss all aspects 
within an adequate time frame.

We also asked lawyers from three different institu-
tions, whether tasks like surgical site marking could be 
performed on a legal basis in Switzerland by the nursing 
staff. The involved institutions were a) Swiss Foundation 
for Patient Safety b) Swiss Professional Association of 
Care and c) Cantonal Medical Service of Zurich. All 
three lawyers agreed that surgical site marking can be 
delegated to the nursing staff. However, the surgeon re-
mains fully responsible for the correct intervention.

The results of the study also suggest that the imple-
mentation of the principles of safe surgery including 
safety checklists and surgical site marking are more im-
portant than the question of who should perform surgi-
cal site marking. Although the surgeon is responsible for 
his intervention, all staff has to carry out the principles 
of safe surgery to avoid mistakes [18, 19].

Conclusion
Based on this study we have introduced surgical site 
marking during the admission process as a task of the 
nursing staff and hereby facilitated the daily routine of 
surgeons and nurses, especially in the setting of same 
day surgery. However, as wrong site surgery is a very 
rare surgical event, future large-scale studies are neces-
sary to strengthen the results of our study. It should be 
emphasized that every practising surgeon remains fully 
responsible of performing the correct operation on the 
correct patient.
Abbreviations
OR: Operating room; WHO: World health organization; WSS: Wrong site surgery

Acknowledgements
The authors wish to thank Mrs. Angela Munson for revising the article regarding the English language.

Funding
There is no funding in the study.

Availability of data and material
The datasets used and analyzed during the current study available from the corresponding author on reasonable request.

Authors’ contributions
AB and GM initiated the change and conducted the pilot phase. JS conducted the data collection, supported by GM. JS and CS were major contributors in writing the manuscript. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

Consent for publication
Not applicable.

Ethics approval and consent to participate
Not applicable.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 29 November 2016 Accepted: 25 March 2017
Published online: 04 April 2017

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