

# Exploring challenges and solutions in the preparation of surgical patients

Thea Palsgaard Møller<sup>1</sup>, Kristine Husum Münter<sup>2</sup>, Doris Østergaard<sup>1</sup> & Lone Fuhrmann

## ABSTRACT

**INTRODUCTION:** Handover of surgical patients from ward to operating room is a sensible point for information and communication failures. Guidelines were developed for preparation of surgical patients. Our aim was to explore if patients are sufficiently prepared for surgery according to local guidelines and to identify challenges and solutions for correct preparation through interactive table simulation-based workshops involving the various professions and specialties.

**METHODS:** Firstly, specific tasks in the hospital guidelines were monitored for all surgical procedures during one week. Secondly, workshops including table simulations involving the various professions and specialties were held.

**RESULTS:** In total, 314 surgical procedures were performed of which 196 were eligible for analysis. Emergency procedures showed the poorest results with non-completed tasks comprising 58% of electronic patient management system tasks, 26% of anaesthesia record tasks, 24% of medication tasks, 14% of blood test tasks and 12% of patient record tasks. In two workshops held for each of four specialties, a total of 21 participants mapped the preoperative patient journey with related responsibilities, tasks and written documentation. Furthermore, challenges and suggestions for solutions were identified.

**CONCLUSIONS:** Completion of mandatory tasks for surgical patient preparation was poor. Workshops with table simulations actively involved the stakeholders from various professions and specialties in describing the patient trajectory and mandatory tasks according to hospital guidelines in addition to identifying challenges and solutions for improvement.

**FUNDING:** none.

**TRIAL REGISTRATION:** not relevant.

Perioperative handovers and patient safety are attracting increasing attention [1-3]. Handover from surgical wards to operating rooms is a vulnerable situation in which quality depends much on completion of tasks related to the preparation of patients, including the planning of the surgical trajectory, completion of prescribed tasks and sufficient information transfer to the receiving surgery and anaesthesia team. One study found that information degraded from one perioperative phase to another, the preoperative period being the most sensible point for information and communication failures [4]. Another study found communication breakdown in

60 of 444 surgical procedures with malpractice claims, 38% of those occurring during the preoperative handover [5]. Insufficient preparation can lead to adverse events, ultimately harming the patients. Cancellation of surgical procedures is one example of an unfortunate consequence that delays or impedes necessary treatment and interrupts the operating room schedule [6].

In our hospital, guidelines for preparation of surgical patients and pre-operative handover were developed based on best evidence and in accordance with a political demand for accreditation of Danish hospitals [7]. Yet, no evaluation of the implementation of the guidelines was performed. The anaesthesia team expressed a trend towards insufficient adherence and an increase in inadequately prepared patients. However, they lacked data to support their arguments and methods for developing ideas for solutions.

Interactive methods such as full-scale simulation have proven effective in identifying discrepancies in institutional policies and practice [8]. Table-top simulation using a small-scale set-up and simple models is used to involve health professionals in innovative solutions when designing new facilities [9]. Team processes are accepted as an important factor influencing clinical performance [10]. The handover process involves team members from different professions and specialties. Hence, a common understanding of each team member's responsibilities is important. We speculated that simulation with handover teams could be used to identify challenges and solutions in preoperative handover situations.

The aims of the study were: 1) to explore if surgical patients are sufficiently prepared for surgery according to local guidelines; and 2) to identify challenges and solutions in the various work processes related to the preparation of surgical patients through interactive table simulation-based workshops involving the various professions and specialties.

## METHODS

The project was divided into two phases:

1) Specific tasks in the hospital guidelines for preparation of surgical patients were monitored for all surgical procedures during one week. 2) Workshops with table simulations involving participants from the various pro-

## ORIGINAL ARTICLE

1 Danish Institute for Medical Simulation, Capital Region of Denmark  
2) Department of Anaesthesiology and Intensive Care, Herlev Hospital, Denmark

Dan Med J  
2015;62(10):A5141

 TABLE 1

List of the mandatory tasks to be completed in the ward prior to handover of the patient to surgery. This list is used for monitoring of patient preparation in our pilot. The mandatory tasks are divided into categories depending on the type of task. All the mandatory tasks are described in the local guideline on preparation of patients for surgery.

Category	Comments
<i>EPM and medication</i>	
Preoperative antibiotics must be prescribed in the EPM	Preoperative antibiotics must be given physically in the OR
Thrombosis prophylaxis must be prescribed in the EPM	Preoperative thrombosis prophylaxis must be given physically on the ward
Thrombosis prophylaxis must be physically given to the patient and marked as "administered" in the EPM	
Glucose-insulin infusion must be prescribed in the EPM	All diabetic patients except the first on the OR programme must have their blood glucose measured and start infusion of glucose-insulin on the ward
Glucose-insulin infusion must be physically started and marked as "administered" in the EPM	
<i>Blood test</i>	–
Blood test results must be available	
Deviant blood tests must be followed-up on the ward prior to handover to the OR	Mandatory in planned surgery In emergency surgery, this may not be possible
Blood test result must be sufficiently new	Depending of the status of the patient and the type of surgery
Blood type must be available	All patients
Blood screen test must be available	Depending on type of surgery
<i>Anaesthesia record</i>	
An anaesthesia record must be available	Maximum 60 days since update
Blood tests and paraclinical examinations prescribed in the anaesthesia record must be available	–
Medication prescribed to the patient in the anaesthesia record must be given physically to the patient	–
<i>Patient record</i>	
An updated patient record must be available	Maximum 30 days since update
The indication for surgery must be documented in the patient record	Maximum 30 days since update
Patient's informed consent must be documented in the patient record	Maximum 30 days since update

EPM = electronic patient management system; OR = operating room.

fessions and specialties were held.

The study was initiated by the Department of Anaesthesiology and Intensive Care in a large university hospital in Denmark. The department covers six surgical specialties: gynaecology, abdominal surgery, orthopaedic surgery, urology, plastic surgery, and mamma surgery, with approximately 17,000 procedures performed annually.

#### Data collection in the operation theatre

To explore gaps and challenges in the preoperative preparation of the patient, we conducted a one-week (Week 38, 2011) monitoring of the completion of mandatory tasks according to the guidelines, which are presented in **Table 1**. We used a data collection scheme based on tasks contained in those guidelines. It contained 19 questions organised into five main categories: electronic patient management system (EPM), patient medication, blood tests, anaesthesia record and patient record. The scheme had to be filled out by the anaesthetist for all surgical procedures regardless of time at day and type of procedure.

#### Workshop participants

The workshop participants in the second part of the study were selected by the managers of the involved departments (abdominal, orthopaedic, urology and gynaecology) and represented the multi-professional team involved in the preoperative handover: surgeons, surgical ward nurses, anaesthesiologists, nurse anaesthetists and scrub nurses.

Workshops with table simulation

#### Workshops with table simulation

We used workshops with table simulation to map procedures related to the preparation of surgical patients and to identify challenges and solutions in the various work processes in this context. We started the workshops by presenting data from the data collection week in order

 FIGURE 1

Illustration of table simulation used in workshops.



to highlight and pinpoint the problems and motivate the participants to explore the underlying causes and find ideas for solutions. A floor plan of the hospital was placed on a table, and mini-mannequins represented patients and hospital staff. This set-up allowed visualisation of the patient flow and the procedures in preoperative preparation of elective and emergency surgical patients (**Figure 1**).

For each of the participating surgical specialties, the preparation of surgical patients was investigated by the team in two-hour workshops. The process mapping was facilitated by experienced simulation instructors, but predominantly performed by the staff. Two workshops were held at a one-month interval.

#### **Workshop 1: Mapping of patient flow**

In this workshop, we aimed at mapping the workflow for patients' ideal preoperative preparation. Special focus was given to the previously investigated categories of mandatory tasks. The flow of the surgical patient trajectory started at the emergency department or outpatient clinic and ended in the recovery room. The mini-mannequins were placed on the hospital floor plan on the table, one person drew the journey indicating each step taken, and sticky notes in different colours were used to demonstrate specific tasks related to the individual step. The colour of the sticky notes represented either a human, technical or organisational task. After the workshop, a comprehensive resume was written and e-mailed to all participants for approval. Figure 1 illustrates the process.

#### **Workshop 2: Identification of challenges and solutions**

Prior to workshop 2, the participants received the accepted resume of workshop 1 so that all could recall the achieved consensus on the ideal patient flow before continuing the innovative process. Again, table simulation was the method used. In this workshop, we aimed at seeking a more in-depth understanding of existing problems and barriers to sufficient preparation according to guidelines. The participants identified steps in the patient flow where challenges were present and reflected on specific solutions to these challenges. Afterwards, another comprehensive resume was prepared and e-mailed to all participants for approval.

#### **Analysis**

For the data collection, absolute numbers and percentages were calculated for emergency/elective procedures and completed/not-completed tasks. We excluded cases with no indication of whether the procedure was emergency or elective. For each question in the data collection scheme, the possible answer categories were "yes", "no", "don't know" or "not relevant." In each data col-

lection scheme, a main category of task completion was considered "not completed" if the answer was "no" to a single question within this specific main category. For a synthesis of the workshop reflections and conclusions, we grouped elements from the resumes according to point in time in the patient trajectory and according to problems identified in the data collection phase.

*Trial registration:* not relevant.

## **RESULTS**

### **Data collection from surgical procedures in a one-week period**

In all, 314 surgical procedures were performed at the hospital in the data collection week. A total of 196 data collection schemes were eligible for analysis (62%). The proportion of elective and emergency procedures was 74% and 26%, respectively. **Figure 2** presents the answers from the data collection schemes for all included procedures in total and proportions of completed main task categories within emergency and elective procedures. The poorest results were seen for emergency procedures, where the proportion of not completed tasks was 58% of EPM tasks, 26% of anaesthesia record tasks, 24% of medication tasks, 14% of blood test tasks and 12% of patient record tasks.

### **Workshops with table simulation**

Two workshops were held for each of the four specialties (abdominal, orthopaedic, urology and gynaecology) with a total of 21 participants from surgical and anaesthesiological departments. **Table 2** presents the synthesis of the workshop resumes. A description of challenges and suggestions for solutions is given for each time point in the surgical patient flow and according to the problems identified in the data collection phase. In workshop 1, the preoperative patient flow with related responsibilities, tasks and written documentation was mapped. In workshop 2, challenges and suggestions for solutions were identified within eight areas. Overall, the challenges represented organisational, technical and human aspects. Unclear understanding of tasks and responsibility and unclear communication were some of the human aspects mentioned. General solutions were: Education of staff and development of tools to facilitate a safe and structured communication including a clear understanding of work processes.

## **DISCUSSION**

Overall, completion of mandatory tasks for preparation of surgical patients was poor indicating an insufficient implementation of guidelines. The poorest results were seen for EPM and medication-related tasks. Elective patients were better prepared for surgery than were emer-

gency patients. Our findings are in line with the challenges in preoperative handovers identified by Nagpal et al [4, 11]. Examples of known barriers to guideline adherence in general are lack of agreement, lack of awareness, or lack of outcome expectancy [12]. We aimed at identifying reasons behind these challenges in the workshops and at developing a common understanding [10].

The analysis of the workshops underlined that preoperative handover was a complex situation, which implies that there is no simple solution to this challenge. Several initiatives are needed to increase patient safety in this context. Challenges and solutions were identified within eight areas representing organisational, technical and human aspects. Blood-test-related issues such as long latency and unclear procedures were mentioned as organisational aspects, whereas EPM-related issues were technical challenges. Lack of competence was addressed, including lacking awareness of own responsibility, uncertainty of how to prepare patients or poor un-

derstanding of the consequences of insufficient preparation. The possible reasons for this comprise inadequate introduction or no available checklists. The most important reason was unclear communication. We find the simulations successful as they made the participants discover the situation from the perspectives of others. This is one of the most important elements that may help improve interventions [13]. The table simulations actively involved the participants in the process and gave them ownership to the solutions. Interaction between groups is considered very important where multiple stakeholders are involved. The quality of the relations and the debate are essential to understand the process, especially in transitions [14]. Our intention of bringing professionals from various departments together is in agreement with a paper arguing that this can have a profound effect on diffusion of new initiatives or innovations [15]. The innovative mapping process evoked an obvious need for further elaboration of the

FIGURE 2

Results from data collection week. All questions are included in the left columns and proportions of completed main mandatory task category within emergency and elective procedures are illustrated in bar charts in the right column.

Task category	Question in data collection scheme	Answers from all included procedures, total, n					Mandatory task category completion within emergency/elective surgical procedures <sup>a</sup>
		yes	no	do not know	not relevant	missing	
EPM	Is antibiotics prescribed in the EPM?	77	37	3	69	10	Emergency Elective
	Is thrombosis prophylaxis prescribed in the EPM?	78	25	7	77	9	
	Is thrombosis prophylaxis marked as dispensed/administered in the EPM?	37	55	6	88	10	0 20 40 60 80 100 %
	Is glucose-insulin infusion prescribed in the EPM?	3	11	0	172	10	
	Is glucose-insulin infusion marked as dispensed/administered in the EPM?	3	10	0	173	10	
Medication	Is thrombosis prophylaxis given to the patient?	36	46	12	85	17	Emergency Elective
	Is glucose-insulin infusion given to the patient?	6	12	1	149	28	
Blood test results	Are blood test results available?	164	6	2	18	6	Emergency Elective
	Are deviant blood test results followed-up?	22	5	7	142	20	
	Are blood test results sufficiently new?	158	8	4	21	5	
	Is blood type and screen test ready?	72	10	3	101	10	
Anaesthesia record	Is the anaesthesia record available?	177	17	0	1	1	Emergency Elective
	Has prescribed blood tests been taken?	39	7	4	137	9	
	Has prescribed medication in the anaesthesia record been effectuated?	49	17	4	120	6	
	Has prescriptions of further examinations been effectuated?	11	2	1	171	11	
Patient record	Are results or descriptions from specialists available?	20	3	8	149	16	Emergency Elective
	Is the patient record available?	173	4	5	1	13	
	Is the indication for surgery documented?	162	6	15	3	10	
	Is the patient's informed consent documented?	143	14	18	3	18	

EPM = electronic patient medication system.

a) Not completed mandatory task categories were defined as cases where 1 of the questions in the data collection scheme had a "no" as the answer.

Blue = Completed; Red = Not completed.

challenges and solutions. The hospital and department heads initiated a change in work processes and established working groups to refine and implement the solutions accordingly. One thought worth exploring is the development of a common checklist for preoperative handover. Studies have demonstrated a better outcome for patients for whom a surgical checklist has been used [16, 17]. The potential benefits of checklists in general are also described [18, 19].

### Methodological discussion

In the data collection phase, we aimed at presenting the problems quantitatively rather than at investigating causal relations. Therefore, the method was simple and without calculation of effect measures. Data collection schemes were filled out by nurse anaesthetists or anaesthesiologists, who might be the group most frustrated by insufficient patient preparation, and this approach entails a risk of reporting bias. We chose table simula-



TABLE 2

Key challenges and solutions in preoperative handover identified in workshop 2. Challenges and solutions identified for emergency and elective procedures are presented in the same table.

Stage of surgical care pathway	Key challenges	Suggestion for solution or discussion point for work groups	Mandatory task category addressed	
<i>Preoperative preparation</i>				
Pre-anaesthesia assessment and planning/anaesthesia record	Unreadable handwriting in anaesthesia record	Prescriptions for the surgical ward personnel must be written in the EPM	Anaesthesia record	
	Unclear prescriptions of medicine in anaesthesia record	All prescriptions must be written in the EPM to include all details about prescription		
	Unclear how to read/interpret the anaesthesia record for the surgical ward staff	Information/education of the staff in order to create a shared understanding of the record		
	Missing overview of which patients have received a pre-anaesthesia assessment (elective)	A discussion of whether ORBIT can be used		
	Not totally clear if and how to pause medication in relation to surgery	Simplification of guidelines		
	Unclear which anaesthesiologist assessed the patient?	Initials and phone number should be written on the anaesthesia record so it is possible to establish immediate contact if needed		<sup>a</sup>
	Unclear who is responsible for the patient at the ward or in the outpatient clinic	Name and initials of responsible nurse is written on the anaesthesia record so he/she can be contacted in case of uncertainty		<sup>a</sup>
<i>Day of surgery</i>				
Medication on the day of surgery	It is time-consuming to update the EPM for patients with self-administrative medications, and confusion may occur	Patients could bring their own medication and let the ward nurse administer this medication along with temporary medications	<sup>b</sup>	
	It is not clear for patients which medication to take on the day of surgery, which can lead to medication incompatibility	Patients could be provided with a list clearly indicating which medication to take and not to take It should be discussed whether patients shall administer medications themselves on the day of surgery	Anaesthesia record	
	Glucose-insulin infusion cannot be prescribed in the EPM until the patient's blood glucose level is known	Technical problem A solution could be to making it possible to prescribe the glucose-insulin infusion in the electronic prescription system	EPM and medication	
Blood tests and blood screen	Long latency on blood test results, which can be a risk for the patient	Latency is to be evaluated A meeting with laboratory managers must be held to find a solution Maybe the blood test can be taken at the surgical ward by a laboratory technician	Blood tests	
	Emergent blood tests to be taken in nightshifts are performed by the ward nurse or junior doctor causing a delay in procedures	An alternative must be discussed in a ward working group		
	Confusion regarding which patients are in need of which tests	Overall clarity and information Guidelines		
	Many blood type and blood screen tests are wasted due to an unclear procedure Blood type and blood screen test are sometimes changed to a "type test only" in the laboratory without passing this information to the ward Unclear durability of the blood type and blood screen test.	The staff should receive training to learn how to perform the procedure Logistic problem Contact to managers from the Department of Clinical Immunology must be established		
	Inconsistency in guidelines exists	Contact to managers from the Department of Clinical Immunology must be established with a view to standardising the guidelines		

EPM = electronic patient medication system; ORBIT: electronic surgery booking system.

a) Lack of structure in communication.

b) Inappropriate workflow.

Continues on the next page

 TABLE 2, CONTINUED

Key challenges and solutions in preoperative handover identified in workshop 2. Challenges and solutions identified for emergency and elective procedures are presented in the same table.

Stage of surgical care pathway	Key challenges	Suggestion for solution or discussion point for work groups	Mandatory task category addressed
Junior doctor competence in wards	They do not have the overview of influence of co-morbidity on the perioperative flow Lack of understanding of the consequences of insufficient preparation of surgical patients and the responsibility they have assumed They do not know the surgical procedures, which makes it difficult to have an adequate understanding of required preparation Do not know when medical supervision concerning the patient is needed	Comprehensive introduction to the ward, the surgical procedures, and to the preparation of surgical patients Definition of who has the responsibility Educational interventions	Patient record EPM and medication Blood tests
Nurse competence	Lack of knowledge about required preparation of surgical patients	Comprehensive introduction to the ward, the surgical procedures, and to the preparation of surgical patients Definition of who has the responsibility Educational interventions	Patient record EPM and medication Blood tests
	Many different checklists for preparation of the surgical patient exist	Simplification of checklists	
	It can be difficult to follow up on blood test results when the ward is busy	Priority of tasks – clear division of responsibility	Blood tests
Patient-related problems	Vital parameters are recorded in different places and deviations are not always acted on	Early warning score is to be implemented at the hospital and could be a solution to this problem	<sup>b</sup>
Communication	No consensus on how to use ORBIT	Guidelines, education and standardisation	<sup>a</sup>
	Items in the surgical checklist are sometimes ticked, without having been completed	A clear statement of who has the responsibility to facilitate follow-up on any violations	<sup>a</sup>
	Nurse anaesthetist does not always use ORBIT	Guidelines and information ORBIT must always be used	<sup>a</sup>
	Surgical checklist in ORBIT is either too long or contains irrelevant items for the individual procedure	Preparation of a new user-friendly common checklist to be completed in ORBIT	<sup>a</sup>
EPM	Several challenges	Possible solutions to be discussed in a separate working group	EPM and medications

EPM = electronic patient medication system; ORBIT: electronic surgery booking system.

a) Lack of structure in communication.

b) Inappropriate workflow.

tion as a method to identify challenges and solutions in the work processes. Table simulation has previously been used as a method to analyse the tasks and the organisation of work in an ambulatory, and the benefits of bringing different professionals together to develop a common picture of the situation have been described previously [9]. The drawback of simulation is that it involves only few representatives from each profession and specialty. Hence, it might not have identified all relevant challenges and solutions. Nor did we analyse the possible impact of each solution. Other methods, such as failure mode effect analysis (FEMA) have been used to identify challenges in the perioperative handover [11]. This method identifies the steps in a given process and provides thorough process insight, whereas table simulation provides a broader view on a process, but less detail.

We included health-care professionals with daily patient contact to ensure that they had insight into the

contextual workflow and every-day challenges. Involving health professionals at an early stage builds ownership to solutions and may facilitate later implementation.

## CONCLUSIONS

Overall, completion of mandatory tasks for preparation of surgical patients was poor indicating an insufficient implementation of guidelines. Workshops with table simulations actively involved the health-care stakeholders from the various professions and specialties in describing the patient trajectory and the mandatory tasks according to hospital guidelines in addition to identifying challenges and solutions for improvement.

**CORRESPONDENCE:** *Thea Palsgaard Møller*, Brådervej 4, 3500 Værløse, Denmark. E-mail: thea.palsgaard.moeller@regionh.dk

**ACCEPTED:** 25 June 2015

**CONFLICTS OF INTEREST:** Disclosure forms provided by the authors are available with the full text of this article at [www.danmedj.dk](http://www.danmedj.dk)

## LITERATURE

1. Kalkman CJ. Handover in the perioperative care process. *Curr Opin Anaesthesiol* 2010;23:749-53.
2. Siemsen I, Madsen M, Petersen L et al. Factors that impact on the safety of patient hand overs: an interview study. *Scand J Public Health* 2012;40:439-48.
3. Petrovic MA, Martinez EA, Aboumatar H. Implementing a perioperative handoff tool to improve postprocedural patient transfers. *Jt Comm J Qual Patient Saf* 2012;38:135-42.
4. Nagpal K, Vats A, Ahmed K et al. An evaluation of information transfer through the continuum of surgical care: a feasibility study. *Ann Surg* 2010;252:402-7.
5. Greenberg CC, Regenbogen SE, Studdert DM et al. Patterns of communication breakdowns resulting in injury to surgical patients. *J Am Coll Surg* 2007;204:533-40.
6. Caesar U, Karlsson J, Olsson L-E et al. Incidence and root causes of cancellations for elective orthopaedic procedures: a single center experience of 17,625 consecutive cases. *Patient Saf Surg* 2014;8:24.
7. IKAS: Kvalitetsudvikling i sundhedsvæsenet. Aarhus: IKAS. [www.ikas.dk/default.aspx](http://www.ikas.dk/default.aspx) (4 Dec 2014).
8. Andreatta P, Frankel J, Boblick Smith S et al. Interdisciplinary team training identifies discrepancies in institutional policies and practices. *Am J Obstet Gynecol* 2011;205:298-301.
9. Broberg O, Edwards K. User-driven innovation of an outpatient department. *Work* 2012;41(suppl 1):101-6.
10. Schmutz J, Manser T. Do team processes really have an effect on clinical performance? A systematic literature review. *Br J Anaesth* 2013; 110:529-44.
11. Nagpal K, Vats A, Ahmed K et al. A systematic quantitative assessment of risks associated with poor communication in surgical care. *Arch Surg* 2010;145:582-8.
12. Cabana MD, Rand CS, Powe NR et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA* 1999;282:1458-65.
13. Batalden P. Making improvement interventions happen – the work before the work: four leaders speak. *BMJ Qual Saf* 2014;23:4-7.
14. Van de Ven AH, ed. *The innovation journey*. New York: Oxford University Press, 1999.
15. Fitzgerald L, Ferlie E, Wood M et al. Interlocking interactions, the diffusion of innovations in health care. *Hum Relat* 2002;55:1429-49.
16. Bergs J, Hellings J, Cleemput I et al. Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. *Br J Surg* 2014;101:150-8.
17. Haugen AS, Søfteland E, Almeland SK et al. Effect of the World Health Organization checklist on patient outcomes: a stepped wedge cluster randomized controlled trial. *Ann Surg* 2015;261:821-8.
18. Rabøl LI, Siemsen IM, Trier H et al. Checklists have a potential in health care. *Ugeskr Læger* 2011;173:1879-82.
19. Thomassen Ø, Espeland A, Søfteland E et al. Implementation of checklists in health care; learning from high-reliability organisations. *Scand J Trauma Resusc Emerg Med* 2011;19:53.