Journal of Critical Care 32 (2016) 170–174

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

The effect of a checklist on the quality of patient handover from the operating room to the intensive care unit: A randomized controlled trial

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ARTICLE INFO

Keywords:
Postoperative period
Patient handover
Checklist
Critical care
Patient safety

ABSTRACT

Purpose: Handover of patient care is a potential safety risk for the patient due to loss of information which may result in adverse outcome. We hypothesized that a checklist for handover from the operating room (OR) to the intensive care unit (ICU) will lead to an increase of quality regarding information transfer compared with a nonstandardized handover procedure.
Materials and methods: The study was conducted as a prospective, randomized trial in a university hospital. The quality of handovers with checklist was compared with handovers without checklist. Handovers were recorded by digital voice recorder and analyzed using an individual rating sheet for each patient. This enabled to discriminate between items that "must be handed over" (red items) and items that "should be handed over" (yellow items).
Results: A total of 121 patient handovers from OR to ICU were included. Significantly more red items were handed over in the study group compared with the control group (study group: median 87.1%, 25-27 percentile 77.1%-90.0%; control group: median 75.0%, 25-75 percentile 66.7%-88.6%; $P < .01$).
Conclusions: This study gives first evidence that the use of a standardized checklist for patient handover from OR to ICU increases the quantity and quality of transmitted medical information.

1. Introduction

Handover of patient care and responsibility is a potential safety risk for the patient due to loss of information with influence on patient outcome [1]. However, transfer of patient responsibility is unavoidable because care for the individual often outlasts one working shift or a patient is transferred between different departments in the hospital. During their treatment, patients undergoing major surgery are frequently exposed to multiple handovers. One of them is the handover from the operating room (OR) to the postanesthesia care unit or the intensive care unit (ICU). These patients often undergo major surgical procedures frequently associated with acute pathophysiologic deteriorations and furthermore exhibit extensive comorbidities. Their transfer is a highly complex work process. In consequence, many of those patients require complex treatment during the phase of handover, such as mechanical ventilation and/or hemodynamic support by continuous infusion of catecholamines, which requires constant attention from the care giving team. In the handover process, responsibility for these critically ill patients is completely transferred from one team to another one. Earlier studies have shown that postoperative handovers are often informal, brief [2–4], and frequently incomplete [5,6]. A medical error caused by insufficient transfer of information may lead to patient harm [7]. An analysis of adverse clinical incidents occurring in the recovery area showed that 14% of incidents happened because of communication failure [8].

To avoid loss of information during patient transfer, standardized protocols can help to increase the completeness of postanesthesia handover [6,7,9–11]. These types of protocols, such as a checklist, have been demanded for years by different medical associations and the World Health Organization [12,13]. Although many studies have dealt with health care handover, only few have focused on handover in the perioperative setting [14] and critically ill patients. Furthermore, it is not clear if handover checklists only increase quantity, for example, the number of single items handed over regardless of their relevance for the individual patient in this particular situation, or if they also increase their quality, for example, a gain of patient- and context-specific information handed over.

Therefore, the aim of the present study was to investigate the effect of the use of a checklist for postanesthesia handover in the ICU. Our primary end point was that a checklist will lead to an increase of quantity (less items will be omitted). Secondary end point was also quality (the individually important items will be handed over) of information transfer compared with non-standardized handovers.

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http://dx.doi.org/10.1016/j.jcrc.2015.12.016
0883-9441/

2. Methods

After approval of the ethics committee of the Medical Board of the City of Hamburg (PV4074) and the institutional workers' council of the Hamburg-Eppendorf University Medical Centre and with written informed consent of the participating anesthesiologists and critical care physicians, 121 handovers of patients transferred from the OR to the ICU were included into this study. Because no specific personal or medical records directly related to patients were assessed, written informed consent from patients was waived by the ethics committee.

The study was conducted as a prospective, randomized trial in a high-volume academic medical center in northern Europe from March 2013 until July 2013. The quantity and quality of handovers with use of a standardized checklist were compared with those of handovers without use of the checklist. The primary outcome was the percentage of items handed over from the caregiving anesthesiologist (resident) to the ICU physician and ICU nurse that were declared as "important to be handed over" by the supervising anesthesiologist (attending). The secondary outcomes were the percentage of items handed over from the caregiving anesthesiologist to the ICU physician which were declared as "should be handed over" by the supervising anesthesiologist and the duration of the handover.

For that purpose, 2 documents were developed: First is a checklist, which was used in the study group for the handovers from the OR to the ICU. This checklist contained 13 categories of patient information, which should be addressed during patient handover (Appendix 1) by the anesthesiologist directly responsible for the patient (residents or board-certified staff anesthesiologists). Second is an assessment sheet for each patient enrolled in this study (both study and control group), which had to be filled out by the supervising anesthesiology attending responsible for the OR in which the surgery took place. In this institution, 1 attending is routinely responsible for supervision of a set of 4 ORs at a time (but not all of them with patients included in the study), so the attending has knowledge about patients and interventions, especially complications, but is not present in the OR during the entire procedure. Different to other studies (where all patient handovers had the same sheet for rating), this sheet was designed to create an individual rating scale for each patient to meet the different concerns of each patient and each intervention and therefore each individual handover. This assessment sheet contained 54 handover items and additional blank spaces that could be checked by the attending, depending on the patients' characteristics and surgical intervention (Appendix 2). The supervising attendings were asked to work through the assessment sheet and decide for the individual patient which items had to be included in the handover. There were 2 rating categories: red items were defined as "must be handed over" to ensure patient safety, and yellow items were defined as "should be handed over" because it is additional useful information for the care giving team but omittance would not directly compromise patient safety.

All surgical procedures in abdominal surgery, gynecology, urology, ear/nose/throat surgery, oral/maxillofacial surgery, orthopedic/trauma surgery, neurosurgery, spine surgery, neuroradiology, and vascular surgery on weekdays from 7:00 AM until 10:00 PM were checked for inclusion and exclusion criteria (Table 1). All handovers eligible to enter the study were consecutively included in the study. During the course of surgery, one of the investigators (VM or CS) went into the OR and handed out the assessment sheet to the responsible attending. The attending then filled out the assessment sheet on the basis of patient data and her/his knowledge of the course of surgery. They were not allowed to show the sheet to the caregiving anesthesiologist and were not informed about group allocation. At the end of surgery, the investigator randomized the caregiving anesthesiologist via closed envelop method to the study group or to the control group. The assessment sheet was collected from the responsible attending. On arrival in the ICU, either a checklist was handed out to use for the handover to the caregiving anesthesiologist (study group) or not (control group). All handovers were recorded by a digital voice recorder (VN-711PC, Olympus) positioned in the front pocket of the anesthesiologists' scrubs. Handovers were later stored digitally and deleted from the voice recorder. The investigator waited outside the patient room until the handover was over to not disturb the usual workflow during postoperative handover. As it is routine in this institution, surgical handover was conducted by the surgeon independently from the postoperative anesthesiological handover. Usually, the surgical handover is conducted between surgeon and intensivist before the arrival of the patient. This is due to the workflow in the OR. Surgeons step off the OR table and go directly to the ICU, whereas surgical assistants, OR staff, and the anesthesia team transfer the patient from the OR table to a bed, transfer equipment, and respirator and therefore arrive in the ICU after the surgeon. This study investigated only the anesthesiological handover and not the handover conducted by the surgeon. If more than one handover of the same anesthesiologist was included in the study, the physician was only randomized into control or intervention group once and stayed in this group for all following handovers. This intervention was essential because if one anesthesiologist was randomized into the study group first, using the checklist for handover, and would be randomized into the control group for a second handover, this anesthesiologist would know the content of the checklist and would be biased during the following handovers.

All recorded handovers were analyzed independently by 2 investigators (VM and CS). All items handed over by the anesthesiologist of the study and the control group were recorded on the assessment sheet by checkmark or handwritten comments. Ratings of both investigators were recorded in a digitalized sheet for later comparison. Investigators were not informed about group allocation of the participating anesthesiologist. After analysis of the handovers by the investigators, results of the assessment sheet filled out by the supervising attending were transferred into a digitalized study sheet and were compared with the results of the analysis of the investigators.

The duration of the handover was recorded in seconds using a stop watch while listening to the recordings.

Table 1
Inclusion and exclusion criteria

Inclusion	Exclusion
Patient ≥18 y	Patient < 18 y
Postoperative transfer to ICU	Patient known on ICU
Written informed consent of caring anesthesiologist and critical care physician	Refusal of physicians to participate in study

3. Statistical analysis

Sample size calculation for the primary study end point was based on an aimed difference in the information items handed over of 20% between the control and the intervention group. With a power of 80% and a statistical significance of $P < .05$, a total of 116 patients had to be included, 58 per group. Data were analyzed using Microsoft Excel 2010 (Microsoft, Redmond, WA) and SigmaPlot 12.0 (Systat Software, Hamburg, Germany). The percentage of demanded items handed over was calculated for every handover. All data were tested for normality distribution (Shapiro-Wilk). For comparison of differences of the specific items between the groups, the χ^2 test or Fisher exact Test was applied depending on sample size. For comparison of overall items (red and yellow), subgroup analysis, and duration of the handover, the t test or Mann-Whitney rank sum test for not normally distributed data was used. Statistical significance was designated as $P < .05$.

4. Results

The handovers of 134 patients were included in this study. Two handovers were missed because of overlapping handovers. One hundred thirty-two handovers were recorded. From those, 11 handovers