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ORIGINAL ARTICLE

Exploring postoperative handover quality in relation to patient condition: A mixed methods study

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Abstract

Aims and Objectives: To describe postoperative handover reporting and tasks in relation to patient condition and situational circumstances, in order to identify facilitators for best practices.

Background: High-quality handovers in postoperative settings are important for patient safety and continuity of care. There is a need to explore handover quality in relation to patient condition and other affecting factors.

Design: Observational mixed methods convergent design.

Methods: Postoperative patient handovers were observed collecting quantitative (n = 109) and qualitative data (n = 48). Quantitative data were collected using the postoperative handover assessment tool (PoHAT), and a scoring system assessing patient condition. Qualitative data were collected using free-text field notes and an observational guide. The study adheres to the GRAMMS guideline for reporting mixed methods research.

Results: Information omissions in the handovers observed ranged from 1–13 (median 7). Handovers of vitally stable and comfortable patients were associated with more information omissions in the report. A total of 50 handovers (46%) were subjected to interruptions, and checklist compliance was low (13%, n = 14). Thematic analysis of the qualitative data identified three themes: "adaptation of handover," "strategies for information transfer" and "contextual and individual factors." Factors facilitating best practices were related to adaptation of the handover to patient condition and situational circumstances, structured verbal reporting, providing patient assessments and dialogue within the handover team.

Conclusions: The variations in items reported and tasks performed during the handovers observed were related to patient conditions, situational circumstances and low checklist compliance. Adaptation of the handover to patient condition and situation, structured reporting, dialogue within the team and patient assessments contributed to quality.

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Relevance to clinical practice: It is important to acknowledge that handover quality is related to more than transfer of information. The present study has described how factors related to the patient and situation affect handover quality.

KEYWORDS
interprofessional care, nursing handover, patient, patient safety, postoperative care, quality of care, transitional care

1 | INTRODUCTION

The initial postoperative observation period is important for patient safety because patients are at risk of complications after surgery and anaesthesia (Kellner et al., 2018). This phase is initiated by the handover to transfer responsibility for patient care from the operating room (OR) to the postanaesthesia care unit (PACU). Patient handovers in health care represent a point of vulnerability and risk of patient harm (Arora & Farnan, 2016; Nagpal et al., 2010). Handovers in the PACU after surgery and anaesthesia often take place bed side, to ensure that the patient is observed while information is exchanged, and responsibility transferred between transferring and receiving healthcare professionals. Team interaction is of short duration and the team involved consists of different clinical groups: nurse anaesthetist, OR nurse, PACU nurse and sometimes anaesthesiologist. These factors increase complexity and the risk of information omissions and failures (Møller et al., 2013; Segall et al., 2012).

A study mapping patient journeys in the PACU found that patient pain and omissions of information during handover led to an escalation of nursing activities in the postoperative phase (Lillibridge et al., 2017). Further, Bittner et al. (2012) found an association between lower quality handovers and increased length of stay in the PACU. Therefore, high-quality handovers after surgery and anaesthesia are important to secure patient-centred, efficient and safe postoperative care. The present study has explored how handover quality is related to patient condition and other affecting factors in the situation.

What does this paper contribute to the wider global community?

- Postoperative handover quality may be affected by factors related to patient condition and situational circumstances.
- Best practices were related to adaptation of handover, patient assessments and dialogue within the handover team, in addition to conducting a structured verbal report.
- The study points at a need to further explore how contextual factors affect handover quality.

2 | BACKGROUND

Previously published recommendations and guidelines for postoperative patient handovers involve preparation, prioritising patient tasks before reporting, having relevant team members present, using documentation, standardisation of the handover process and allowing for questions (Agarwala et al., 2019; Barbeito et al., 2018; Pucher et al., 2015; Redley et al., 2016; Segall et al., 2012). Handover quality has also been related to teamwork and establishment of a shared understanding between the transferring and receiving healthcare professionals (Manser et al., 2010). A previous study from our research group assessing nurses' evaluations of postoperative handover quality found that the transferring and receiving nurses had different perceptions of the patient and handover situation (Reine, Ræder, et al., 2019). Different professional groups having different perceptions and focus during postoperative patient handover was reported by Randmaa et al. (2017), and also a finding in a qualitative study by our research group (Reine, Rustoen, et al., 2019).

Further, Redley et al. (2016) described postoperative patient handovers to be affected by patient condition, working environment, interprofessional interactions and risk perceptions. In our previously mentioned qualitative focus group study, participants described patient condition, structure, timing, characteristics of individuals involved and team composition as factors affecting handover quality (Reine, Rustøen, et al., 2019).

Based on these findings, the current literature suggests that patient condition and several other factors have an impact on the postoperative patient handover. Previous research on postoperative handover quality has to a large degree been focused on standardisation efforts and contents of verbal reporting only (Gardiner et al., 2015; Pucher et al., 2015; Segall et al., 2012). Therefore, there is a need to explore how the patient's condition and other factors in the situation (e.g. interruptions, team composition, type of surgery) affect patient handover quality (Møller et al., 2013; Reine, Ræder, et al., 2019; Reine, Rustoen, et al., 2019).

The present study aimed to describe postoperative handover reporting and tasks in relation to patient condition and situational circumstances, in order to identify facilitators for best practices. The objectives of the study were explored through the following research questions:

- What are the contents of verbal reporting and tasks performed during postoperative patient handovers, and how are they related to patient condition and situational circumstances?

- How can best practices in postoperative patient handovers be facilitated?

3 | METHODS

3.1 | Design

To provide a comprehensive description and understanding of postoperative handover reporting, tasks, patient condition and situational circumstances, an observational mixed methods convergent design was applied. This design involved the collection of qualitative and quantitative data in the same timeframe with separate analysis, before integration with equal weighing on both data sets (Creswell & Plano Clark, 2018; Doyle et al., 2016). In the present study, patient handovers after surgical procedures were observed collecting quantitative and qualitative data. The study has been reported according to the Good reporting of A Mixed Methods Study (GRAMMS) checklist (O'Cathain et al., 2008; Appendix S1).

3.2 | Study settings and participants

To collect data from different postoperative patient handover situations (i.e. patient groups, type of surgery and different teams), observations were conducted in two different PACUs within the same university hospital in Norway. The first unit cared for patients after neurosurgical, maxillofacial surgery, trauma and gastroenterological procedures. This unit was a combined intensive care unit and PACU with 24 beds and 75 employed nurses. The second unit was an orthopaedic PACU with nine beds and 16 employed nurses.

In the Norwegian setting, the surgical team consists of the following professional groups: surgeon, anaesthesiologist, nurse anaesthetist and OR nurse. The nurse anaesthetists are anaesthesia providers, qualified to administer general anaesthesia for minor surgical procedures to otherwise healthy patients accepted for surgery by an anaesthesiologist. For major surgery or patients with more complex illnesses, nurse anaesthetists work closely with anaesthesiologists. Nurse anaesthetists and OR nurses have a bachelor degree in nursing, and a master degree or further education within their speciality. The team transferring patients to the PACU usually consists of a nurse anaesthetist and OR nurse, and if the patient's condition requires it; an anaesthesiologist will accompany the team. Further, the nurses working in the PACU are either registered nurses or trained critical care nurses with a masters degree or further education in critical care.

A postoperative handover reporting checklist based on the identification, situation, background, assessment and recommendation (ISBAR) communication tool (Marshall et al., 2009) had been implemented for the nurse anaesthetists and OR nurses 9 months prior to start of data collection. The handover reporting checklist consisted of 32 items: 18 to be reported by the nurse anaesthetist and 14 for the OR nurses' report. For the anaesthesiologists and PACU nurses, no such intervention had been employed.

On predetermined days, adult patients due for surgery were provided with written and oral invitations to participate in the study. Patients were recruited by members of the research team. Inclusion criteria were aged over 18 years, ability to provide consent and planned care in one of the PACUs included in the study. Nurse anaesthetists, OR nurses, anaesthesiologists and PACU nurses received information about the study at department meetings and by email.

3.3 | Sample

Data were collected in two waves with 1 year between the two datasets. After the first wave of data collection (n = 50), we realised the study needed a larger sample size to examine subgroups of patients in the quantitative data set as well as more detailed descriptions in the qualitative data. No relevant known changes to handover practices were performed in the involved units during the period between the two data collection waves.

Based on previous research on postoperative patient handovers (Nagpal et al., 2011, 2013; Petrovic et al., 2015), a sample size of 100 was considered adequate for the quantitative analyses. To compensate for possible missing data, the study aimed at recruiting a total of 110 patients across both data collection waves.

A total of 114 patients were invited to participate and 112 patients provided consent. Because handovers coincided with other patients participating in the study, two patients were excluded. After data collection, one patient withdrew consent. Thus, 109 patient handover situations were available for the quantitative analyses; 50 in the first wave of data collection and 59 in the second. Qualitative data were collected from a subgroup of 20 handovers in the first wave and 28 in the second. The first wave of data collection was conducted in the period from June 2017–January 2018, and the second wave in the period from January–February 2019.

3.4 | Quantitative data collection

The first author (E.R), co-authors (A.T., R.A.) and two trained observers collected the quantitative data in the study. All observers were nurse anaesthetists with knowledge of the local context and experience with postoperative patient handovers. To assess inter-rater reliability in the quantitative data, 10 handovers in each data collection wave were rated by two observers. This resulted in a total of 20 handovers assessed for reliability (18%).

3.4.1 | The postoperative handover assessment tool (PoHAT)

The PoHAT was developed by Nagpal et al. (2011) and used to assess the verbal reporting and tasks performed in the handovers

observed. It consists of 21 items assessing the verbal report and eight items assessing handover tasks. The items assessed in the verbal report are related to patient information (name, age, medical history, allergies and diagnosis), anaesthetic information (anaesthetic course, pain relief, medications received, patient's current condition, plan for lines, plan for intravenous fluids, blood transfusions and plan for monitoring) and surgical information (blood loss, antibiotic plan, plan for deep venous thrombosis prophylaxis, drains and plan, intraoperative surgical course, feeding plan and postoperative investigations). Handover tasks assessed are related to equipment (monitors and alarms set up before handover, syringe pumps ready, lines arranged, and drains and urine bag secured) and patient (patient receiving oxygen, well covered and having good pain relief). Patient's pain was assessed by the observers during the handover; patients who were observed to be in severe pain and/or needed treatment for pain during or immediately after handover were rated as "not having good pain relief."

Before data collection, the PoHAT was pilot tested on five handovers, followed by a few modifications made to the instrument. Because not all handovers involved all items to be reported and tasks to be assessed according to the POHAT, the alternative of "not relevant" was added to the following items: "number of drains and plan," "blood transfusion (has/needs) location of blood bags," "drains located safely," "urine bag located safely," "syringe pumps ready" and "lines arranged and set-up". Because oxygen therapy is not necessarily required for all patients, the patient's oxygen saturation level was recorded. Further, the item "plan for lines" was adjusted to include peripheral intravenous lines in addition to arterial and central venous lines. Each handover report was scored for number of information omissions according to the PoHAT, with items "number of drains and plan" and "blood transfusion (has/needs) location of blood bags" adjusted for relevance.

3.4.2 | Patient condition

Data on the patient's condition was collected using the scoring system provided by White and Song (1999), where patient condition is assessed on a 0–1–2 scale on seven items: consciousness, activity, hemodynamic stability, respiratory stability, oxygen status, pain and nausea. All seven items were summarised to a total score providing a maximum White and Song score (WSS) of 14. Patients who are awake, mobile, free from pain and nausea with stable vital signs would receive the maximum score.

3.4.3 | Clinical characteristics and situational circumstances

Data were collected on type of surgery, anaesthesia technique, team composition, American Society of Anesthesiology (ASA) physical status (Hurwitz et al., 2017), patient age, gender and surgery duration. The observers further registered if the handover was interrupted and if the implemented ISBAR-based checklist was used. Because students being present may affect practice (Waters et al., 2018), the observers also registered if students were present during the handovers. In the first wave of data collection, observers had noticed that handovers varied in duration. Therefore, handover duration was measured in the second wave of data collection.

3.5 | Qualitative data collection

Qualitative data was collected by the first author (E.R.) who spent a total of 40 h in the involved units at times when patient handovers were likely to occur. A subsample of the handovers were observed using a qualitative non-participant observation method (Creswell, 2013). The observations started when the patient arrived in the PACU and lasted until the receiving nurses had assessed the patient and gained an overview of the perioperative documentation. For the observations in the first wave of data collection (n = 20), qualitative data was collected by writing free-text open field notes (Green & Thorogood, 2018) to describe details regarding the handovers. Based on preliminary analysis of data from the first wave of data collection and a previous study by the research group (Reine, Rustøen, et al 2019), an observational guide was developed for the qualitative observations in the second wave to improve data quality and secure detailed descriptions (Green & Thorogood, 2018). The cases in wave two (n = 28) were mapped using the guide, which consisted of the following topics: team organisation, structure, patient condition and handover environment.

After handover observations, the first author also conducted conversations with some of the healthcare professionals involved. To observe handover preparation, five handovers were observed starting with the transfer from the OR in addition to the handover in the PACU. The observer was also present in the PACU before patient arrivals in six handovers to observe preparation for the new patient. To ensure detailed descriptions of the patient handovers, 10 of the handovers were observed with the first author focusing on qualitative data collection only, while one of the other observers collected quantitative data. In the remaining handovers with mixed data collection (n = 38), quantitative and qualitative data were collected simultaneously.

Qualitative sampling criteria were based on achieving a broad sample of different handover situations (Creswell, 2013; Green & Thorogood, 2018). Therefore, the qualitative data collection was focused on collecting data from different patient groups, surgical procedures and transferring team compositions (i.e. nurse anaesthetist only, nurse anaesthetist and OR nurse, anaesthesiologist present). Analysis of the qualitative data collected from the last five handovers did not yield new codes compared with the qualitative data collected previously. This indicates that data saturation was reached (Green & Thorogood, 2018; Morse, 2015).

3.6 | Data analysis

3.6.1 | Quantitative data analysis

The quantitative data was analysed using IBM SPSS Statistics version 25. Descriptive statistics were used to describe handover characteristics. Data are described using median and range for the continuous variables as they were not normally distributed. Categorical variables are described using counts and percentages. Bivariate correlations were performed between the total score of information omissions for the handovers, the patients' WSS, surgery duration and handover duration (in the handovers for which duration was available). All correlations were performed using Spearman's correlation.

Patients' ASA physical status (higher ASA category indicates more coexisting disease) was dichotomised into ASA 1–2 and ASA 3–4. Further, patients' WSS were dichotomised into high (12–14) and low scores (≤11). The Mann–Whitney test (for independent samples) was used to compare information omissions between different groups: handovers with interruptions compared with those without interruptions, handovers of ASA 1–2 patients compared with ASA 3–4 patients, students present or not, and high and low WSS. The Kruskal–Wallis test was used to compare information omissions between the different types of surgery.

Chi-square tests were used to evaluate possible differences between groups for categorical data: monitoring before reporting and anaesthesiologist present during handovers was compared with ASA group (dichotomised), and reporting plan for pain relief with patient pain during handover.

Inter-rater reliability was calculated using Cohen's kappa (McHugh, 2012). The ratings were compared as to whether the two observers provided the same ratings or not on the items in the PoHAT and WSS, in addition to observational data collected on team composition, checklist use, interruptions and patient identity check.

For sensitivity analyses; the Mann–Whitney test was used to explore possible differences in information omissions, surgery duration and patients WSS between the two PACUs in the study and the two data collection waves. The chi-square test was used to compare patients' ASA (dichotomised) between the two data collection waves. *p*-values <.05 were considered statistically significant.

3.6.2 | Qualitative data analysis

The qualitative data was analysed using thematic analysis as described by Braun and Clarke (2006). Phase 1 involves familiarisation with the data followed by generation of initial codes (phase 2) and searching for themes in phase 3. In the first three analytical phases, the data were read, analysed and coded independently by authors E.R, A.T and R.A. After comparing and discussing the different codes identified individually by the authors, three themes were identified. In phase 4 of the analysis, the themes were further reviewed and compared with the data transcripts. The themes were further defined and named in phase 5. In phase 6, the narratives representing the themes were produced from the data material. The data analysis was reviewed by author K.A. in phases 4, 5 and 6, who also suggested revisions when appropriate.

3.7 | Integration

After separate analysis of the qualitative and quantitative data, the preliminary findings were presented and discussed with the members of the research group. The data sets were merged by comparing the themes and subthemes identified in the qualitative data analysis with statistical results. In this way, it was possible to explore consistency, explanations and divergence, between the qualitative and quantitative data (Creswell & Plano Clark, 2018; Doyle et al., 2016).

3.8 | Ethical considerations

The Regional Ethics Committee concluded that the project is considered as a quality improvement project and not notifiable for the committee (2014/2289). Further, the hospital internal review board (2017/5948, 18/18374) and heads of departments involved approved the study. Each patient's written consent was obtained before or after observations. If the patient declined participation after observation, the data was erased. Nurses and physicians employed in the involved departments had the opportunity to withdraw from the study before or during data collection. None of the professionals observed declined participation. No identifiable data about healthcare professionals was collected in the study.

All observers collecting data were employed in the hospital of the present study and had signed confidentiality statements. To avoid inviting patients who were not able to provide informed consent, the observers contacted nurses in the involved departments before approaching patients or observing handovers.

4 | RESULTS

Characteristics of patient handovers observed are presented in Table 1. The transferring team composition most frequently observed was nurse anaesthetist with OR nurse (*n* = 72, 66%). In the teams with anaesthesiologist present during handovers (*n* = 17), 10 (59%) were patients with ASA groups 3–4. Of the 92 handovers conducted without anaesthesiologist present, 25 of 92 (27%) were patients with higher ASA (ASA 3–4) (*p* = .02). The patients' White and Song scores were in the range of 4–14, with a median of 12 for the total sample and 11 for the subsample where qualitative data was included. Handover duration was measured for 57 of the 59 handovers in wave two; median handover duration was 7 min (range 3–21). In the 20 (18%) handovers assessed for reliability, Cohen's kappa was in the range of .82–1.00, representing strong to almost perfect agreement (McHugh, 2012).

TABLE 1 Characteristics of the handover situations observed

Characteristics	Total sample of handovers observed, *N* = 109 *N* (%)	Subsample with qualitative observations, *N* = 48 *N* (%)
Type of surgery		
Gastroenterological surgery	41 (38)	18 (38)
Neurological and oral surgery	35 (32)	17 (35)
Orthopaedic surgery	33 (30)	13 (27)
Patient ASA classification		
ASA 1	25 (23)	11 (23)
ASA 2	49 (45)	23 (48)
ASA 3	33 (30)	12 (25)
ASA 4	2 (2)	2 (4)
Type of anaesthesia		
General	97 (89)	45 (94)
Regional	8 (7)	3 (6)
Other (sedation/local anaesthetic)	4 (4)	
Gender		
Male	56 (51)	22 (46)
Female	53 (49)	26 (54)
Transferring team composition		
Nurse anaesthetist and OR nurse	72 (66)	28 (58)
Nurse anaesthetist	17 (16)	9 (19)
Nurse anaesthetist, OR nurse, and anaesthesiologist	12 (11)	8 (17)
Nurse anaesthetist and anaesthesiologist	5 (5)	2 (4)
Other	3 (3)	1 (2)
Students present during handover[a]	23 (21)	10 (21)
	Median (range)	**Median (range)**
Patients age (years)	57 (18–91)	56 (23–73)
Procedure duration (min)	116 (6–562)	104 (6–562)
Patient's White and Song Score	12 (4–14)	11 (4–14)

Abbreviations: OR, operating room.

[a]Students in nurse anaesthesia or OR nursing.

4.1 | Quantitative results

4.1.1 | Content of verbal reporting and handover tasks

Table 2 presents the frequency of PoHAT items reported verbally and tasks performed during the handovers. The item most frequently reported was name of procedure (100%). Postoperative plan for lines was reported in only 11% (n = 12) of handovers. For the handover tasks observed, 99% of the patients were well covered with blankets to prevent postoperative hypothermia (Table 2). While relevant for only 19 handovers, surgical drains attached to the patient were located safely before the transferring team had left the PACU for nine of these handovers (47%). A total of 50 (46%) handovers were subject to interruptions during the verbal report.

The frequency of omitted items for the PoHAT varied from 1–13 with a median of 7. Table 3 presents a description of handover omissions related to handover circumstances (i.e. patient condition, students present), checklist use and interruptions. For handovers with nurse anaesthetist and OR nurse using the ISBAR-based checklist, information omissions were significantly lower compared to handovers where the checklist was not used or with only one of the nurses using the checklist (Table 3). No significant differences were found in information omissions between the different types of surgery (neuro and maxillofacial surgery, gastroenterological surgery and orthopaedic surgery) ($p = .94$).

4.1.2 | The relationship between patient condition, handover reporting and tasks

For patients with a high White and Song score (i.e. more vitally stable and comfortable), there were more information omissions according to the PoHAT (rho = .33, $p < .01$). Moreover, for patients with WSS of

TABLE 2 Frequency of PoHAT items reported verbally and tasks performed during handover

	N (%)
Items reported (*N* = 109 handovers)	
Name of procedure	109 (100)
Relevant medications received by the patient in theatre	108 (99)
Intraoperative anaesthetic course and any complications	107 (98)
Medical history	101 (93)
Antibiotic plan	96 (88)
Number of drains and plan (relevant for 21 cases)	18 (86)
Blood transfusion (had/needs) location of blood bags (relevant for 12 cases)	10 (83)
Patient name	90 (83)
Intraoperative surgical course and any complications	82 (75)
Patient's current condition and vitals	80 (73)
Deep venous thrombosis prophylaxis plan	78 (72)
Diagnosis	73 (67)
Blood loss	73 (67)
Allergy status	61 (56)
Patient's age	59 (54)
Feeding plan	53 (49)
Plan for pain relief	50 (46)
Plan for intravenous fluids	27 (25)
Postoperative investigations	26 (24)
Plan for monitoring (vital parameter range and action)	16 (15)
Plan for lines (central, venous or arterial)	12 (11)
Tasks assessed (*N* = 109 patient handovers)	
Patient well covered	108 (99)
Lines arranged and set up (relevant for 96 cases)	85 (89)
Patient having good pain relief	88 (81)
Syringe pumps ready[a] (relevant for 10 handovers)	7 (70)
Patient monitored before start of anaesthesia reporting[b]	73 (67)
Urine bag located safely (relevant for 73 handovers)	43 (59)
Patient receiving oxygen	59 (54)
Drains located safely (relevant for 19 handovers)	9 (47)

[a]Data missing for 2 handovers.

[b]Data missing for 4 handovers.

12–14 (n = 59) the median frequency of information omissions was 8, whereas for those with a score ≤11 (n = 50), the median frequency of information omissions was 6 (p < .01, Table 3). The frequency of information omissions was lower in patients with longer duration of surgery (rho = .30, p < .01).

There were no statistically significant differences between patients with ASA status 1–2 and those with ASA status 3–4 (Table 3) in the number of information omissions in the verbal report. Seventy-three (70%) of the patients were monitored before reporting from the nurse anaesthetist (Table 2). No statistically significant differences were found between patients' ASA classification and establishment of monitoring (blood pressure, electrocardiogram and saturation) before the handover report. Of the 59 (54%) patients who received oxygen therapy during the handover (Table 2), one patient had a saturation level of 90% and the rest had saturation levels of 93–100%.

Plan for pain relief was discussed in 50 (46%) of the handovers observed (Table 2). For patients assessed to have severe or moderate pain (n = 21, 19%), plan for pain relief was discussed in 16/21 handovers (76%), which was statistically significantly (p < .01) different from patients assessed to have good pain relief at the handover (34/88; 38%).

In the handovers where duration was measured (n = 57), there was a positive correlation value of .42 (rho), (p < .01) between patient ASA classification and handover duration. Handovers of patients with coexisting disease required more time. Further, there was a negative correlation between patients' WSS and handover duration (rho = −.45, p < .01), with a shorter duration for stable and comfortable patients.

4.2 | Qualitative results

The qualitative data analysis (Table 1) identified three themes: "adaptation of handover," "strategies for information transfer" and "contextual and individual factors." Table 4 presents a description of the qualitative themes and subcategories with narratives.

4.2.1 | Adaptation of handover

This theme describes how by healthcare professionals adapted the patient handover reporting and activities to the current handover situation. The following subcategories were identified: patient condition, patient-centred team organisation and receiver nurse preparation and workload (Table 4).

In handovers with patient problems, the healthcare professionals observed would stop reporting and tend to the patient (e.g. administer pain relief and assess vitals) until the situation was stabilised. The observer noticed that the verbal report was more thorough, due to the fact that some handovers were lengthier when patient problems occurred during the handover (e.g. patient pain, low blood pressure and impaired respiration) or after complex surgery of long duration. Conscious patients received information about the handover and tasks performed.

For handovers with patient problems or involving more advanced monitoring and equipment, the team would apply a patient-centred team organisation and dedicate one team member to take care of the patient while others reported. If other nurses were available in the PACU, they would assist with monitoring and tend to the patient so that the transferring clinicians could focus on providing their

TABLE 3 Information omissions in verbal report related to checklist use, patient condition, interruptions and students' presence

Items measured	Frequency of information omissions Median (range)	Items measured	Frequency of information omissions Median (range)	*p*-Value
Checklist used by NA and OR nurse *n* = 14	5 (1–10)	Checklist not used or partly used[a] *n* = 95	7 (3–13)	<.01
White and Song score <12 *n* = 50	6 (1–10)	White and Song score 12–14 *n* = 59	8 (4–13)	<.01
Verbal report interrupted *n* = 50	6 (1–12)	No interruptions of verbal report *n* = 57	8 (4–13)	.17
Patient ASA 1–2 *n* = 74	7 (3–11)	Patient ASA 3–4 *n* = 35	6 (1–13)	.41
Students present[b] *n* = 23	7 (3–13)	Students not present *n* = 85	7 (1–11)	.64

Abbreviations: NA, nurse anaesthetist; OR, operating room.

[a]Checklist used by nurse anaesthetist or OR nurse.

[b]Students in nurse anaesthesia or OR nursing.

report to the receiving nurse. In these cases, the handover reporting would start before patient monitoring was initiated. After handover reporting was completed and the transferring team had left the PACU, receiving nurses would assess the patient and secure equipment (surgical drains, lines and urine bag).

The handovers were further adapted to receiver nurse preparation and workload. At times of high workload in the PACU, the transferring team stayed with the patient while waiting for the receiving nurse to be ready. Further, if the handover was interrupted by a problem with another patient that the receiver nurse had to tend to, the transferring team would stay with the patient until the nurse returned.

4.2.2 | Strategies for information transfer

This theme describes how the team applied different strategies to ensure the transfer of important information during the postoperative patient handover. The following subcategories were identified: using documentation and checklists, guidance and patient assessments, seeking and cross-checking information (Table 4).

The receiving nurses had access to relevant information about surgery, anaesthesia and plans for postoperative care in the perioperative electronic documentation system. In addition, verbal handover reporting was conducted in all handovers observed. The nurses and anaesthesiologists observed used different strategies to organise their report. While some of the transferring nurse anaesthetists, OR nurses and anaesthesiologists would use the electronic documentation system actively during reporting, others would use handwritten notes, the department checklist, or present the verbal report without using any aids. The implemented ISBAR-based checklist was not available bedside in the handovers observed; some of the transferring nurses had a copy of the checklist in their pocket that they used during reporting. For one handover observed with a complex patient, the checklist was used to guide the report and discussions between the transferring nurse anaesthetist, anaesthesiologist and receiving nurse. When asked about the checklist, some of the nurses reported that they used it as a reminder of the items to report, whereas others reported that they did not find it useful. Some of the transferring nurses commented that the checklist was not available during the handover.

The transferring nurses and physicians often provided patient assessments and guidance related to patient problems (i.e. pain, impaired respiration and impaired circulation) during the handover, or tasks that needed to be completed after handover (e.g. blood tests). If students in OR nursing or nurse anaesthesia were present, the transferring nurses would sometimes allow them to provide the verbal handover report. In these cases, transferring nurses would often supplement the student's verbal report to secure that important information and patient assessments were shared with receiving nurses.

The receiving nurses were observed cross-checking information from transferring team and in some cases seeking missing information (e.g. plan for surgical drains). Further if the receiving nurse reported to the transferring team that he/she had read up on the patient, fewer details were provided in the verbal report related to the patient's previous medical history and surgery. In these situations, more dialogue and discussions related to the patient's condition and plans for further care were observed within the handover team.

Not all items assessed in the PoHAT were relevant for all handovers; for instance, plan for monitoring or feeding was not relevant for otherwise healthy patients after minor procedures. Handovers were observed with receiving nurses summarising what they knew about the patient at the start of handover to signal to the transferring team that a detailed report was not necessary. For patient handovers after more routine surgical procedures, the receiving nurses would often refer to their knowledge of the usual routines (e.g. length of PACU stay and antibiotics).

TABLE 4 Qualitative themes describing patient handovers

Theme	Description	Subcategory	Narratives
Adaptation of handover	Different strategies used by the handover team to adapt activities, reporting and organising to the handover situation	Patient condition	*The nurse anaesthetist is providing her report to the receiving nurse, when the alarm on the monitor sounds. They stop reporting and go over to check the patient. After assuring that the patient is breathing, the nurse anaesthetist attaches the oxygen mask to the patient and returns to reporting (Handover 47)*
		Patient-centred team organisation	*The patient is connected to monitoring equipment and is receiving medications via syringe pumps. A team of nurse anaesthetist, OR nurse, and anaesthesiologist are transferring the patient. The patient's breathing is impaired and the nurse anaesthetist is busy tending to the patient and equipment, while the OR nurse is reporting. After the OR nurse has finished her report, the anaesthesiologist stays with the patient so that the nurse anaesthetist can focus on providing the report to the receiving nurse (Handover 56)*
		Receiver nurse preparation and workload	*The documentation system is not ready when the team arrives. The OR nurse waits for the receiving nurse to log on to the computer to assess the documentation system, before providing her report (Handover 61)* *The PACU nurse is ready to receive the anaesthesia report when she has to leave the patient with the transferring team to tend to a problem with another patient in the room. The anaesthesiologist stays with the patient and waits for her to return before starting his report (Handover 62)*
Strategies for information transfer	Different strategies used by healthcare professionals to secure transfer of patient information, intraoperative events, and plans for postoperative care	Using documentation and/or checklists	*The nurse anaesthetist says to the receiving nurse that she took over the patient towards the end of surgery and that she has not been able to read up on the perioperative documentation. She uses the electronic documentation system actively during the verbal report to confirm patient-related information, intraoperative events, and plans for postoperative care (Handover 65)* *The transferring anaesthesiologist, nurse anaesthetist, and receiving PACU nurse use the ISBAR checklist as a guide to report and discuss intraoperative events and plans for postoperative care (Handover 35)*
		Guidance and patient assessments	*A patient on mechanical ventilation and advanced monitoring has arrived in the PACU. After the OR nurse and nurse anaesthetist have provided their report, the anaesthesiologist provides his assessment of the patient's condition and repeats important items of information to the receiving nurses (Handover 87)*
		Seeking and cross-checking information	*The nurse anaesthetist is attaching the patient to the monitoring equipment and arranging the intravenous fluid bags, while the OR nurse is completing her report. The receiving nurse goes over to the bed. She takes a drain out from under the duvet and fastens it to the bed. She asks the OR nurse: "Should this drain be active or passive?" (Handover 48)* *The receiving PACU nurse has listened to the report from the transferring team. When they are finished, she asks: "So no more antibiotics then?" (Handover 66)*
Contextual and individual factors	Factors related to handover circumstances and individuals involved affecting the handover	Event-driven environment with frequent interruptions	*The nurse anaesthetist is providing her report to receiver nurse when they are interrupted by a porter who needs to transfer a different patient out of the room. Reporting is further interrupted by the nurse who is tending to the patient while they report; she has a question related to the patient. The report is further interrupted by a third nurse who has entered the room and has a question for the nurse tending to the patient (Handover 106)*
		Unstructured reporting and information omissions	*The OR nurse has completed the verbal reporting to the receiving nurse. On her way out of the room, she remembers one more item to report and goes back to report this (Handover 49)* *The patient has been handed over and the transferring team has left the PACU. One of the receiving nurses is checking on the patient, monitoring, and equipment, while the other nurse is studying the documentation. She says to her colleague: "We never did get information about blood pressure limits, here. Did we?"(Handover 66)*
		Information not perceived	*During the handover, the receiving nurse asks three times about the plan for postoperative antibiotics. Nurse anaesthetist has reported this earlier in the report (Handover 40)*
		Closeness to shifts	*The transferring team is handing over a patient who they have taken over intraoperatively. There are many events to report from surgery that has lasted all day. The nurse anaesthetist is clearly striving to remember all relevant information to report about the patient and course of surgery (Handover 78)*

Abbreviations: ISBAR, identification, situation, background, assessment, and recommendation; OR, operating room; PACU, postanaesthesia care unit.

4.2.3 | Contextual and individual factors

This theme described how the postoperative patient handover were affected by circumstances and individual factors in the current situation. The following subcategories were identified: event-driven environment with frequent interruptions, unstructured reporting and information omissions, information not perceived and closeness to shifts (Table 4).

Handovers could take place at times with few patients in the PACU, with no interruptions during the handover, and where the receiving nurse had read up on the patient. Other handovers would take place in a context with higher workload in the PACU. These handovers were more exposed to interruptions and the receiver nurse unprepared for the new patient. Interruptions observed were often initiated by the nurses involved rather than the patient handed over or other patients in the room.

Although many handover reports transferred information about surgery and anaesthesia in a structured fashion, handovers were observed with transferring nurses and/or anaesthesiologists providing unstructured reports missing relevant information. Sometimes, the missing information was revealed during the handover because the transferring team were unable to answer questions from the receiving nurses. In other cases, transferring nurses would remember something important after the handover was completed and return to report missing items. After the transferring team had left, the receiving nurse would assess the patient and check the perioperative documentation. Situations were observed with the receiving nurses commenting that documentation related to plans for the patient's postoperative care was incomplete (e.g. postoperative medications missing). Moreover, handovers were observed with receiving nurses noticing that they were missing relevant information after the handover had been completed and the transferring team had left.

The observer further noticed that in some cases receiver nurses asked about information that had been clearly communicated previously. One handover was observed with receiving nurse asking three times about antibiotics during the report, information that had been reported previously (Table 4).

Handovers also seemed to be affected by closeness to shift changes in the OR. When surgery involved crossed shifts, the team transferring the patient took over the patient's responsibility during the surgery. In these cases, the transferring clinicians sometimes had difficulty in providing a structured account of the patient, intraoperative course and plans for postoperative care.

4.3 | Integration of qualitative and quantitative data

4.3.1 | Consistency

Both data sets described variations in patient condition, information transferred and tasks performed during the handovers observed (Tables 1–4). The qualitative theme "adaptation of handover" (Table 4) describes how handover reporting and tasks performed were adapted to the patient's condition and handover circumstances (team present, PACU workload and preparation). This finding is consistent with the quantitative results showing that for handovers after surgery of longer duration or with lower patient WSS a more thorough report was provided (fewer information omissions). The finding that checklist compliance was low and the high number of information omissions in the quantitative data (median 7, range 1–13) is consistent with the subcategory "unstructured reporting and information omissions." Further, the high number of handovers subject to interruptions in the quantitative data (n = 50, 46%) is consistent with the qualitative subcategory describing the "event-driven environment with frequent interruptions."

4.3.2 | Explanations

The qualitative theme "strategies for information transfer" (Table 4) describes the different ways healthcare professionals secured transfer of information during the handover. This theme provides some explanations to the low compliance with the checklist found in the qualitative data, as transferring team members used different strategies to organise their report.

Plan for pain relief was more frequently reported for patients assessed to have pain during the handover. This finding is consistent with the qualitative subcategory "guidance and patient assessments"; for patients in pain, it was more relevant to report plan for pain relief in the verbal report.

Patient monitoring was established before handover reporting in only 67% (n = 73) of cases observed. This finding is explained by the qualitative subcategory "patient-centred team organising" when more nurses were available, the team divided duties such that the receiving nurse focused on receiving the report from the transferring team and the other available nurses helped with patient-related tasks (Table 4).

4.3.3 | Divergence

The quantitative and qualitative data are divergent in the way that several of the handovers showed a high frequency of information omissions in the quantitative data. The qualitative data showed that omissions of information in some cases were related to relevance or that the receiving nurse had read up on the patient and did not need a full report. The quantitative and qualitative data are also divergent in the way that the qualitative data describe patient-centred team organisation, dialogue within the team, providing patient assessments and guidance as factors contributing to handovers quality, while the quantitative data have not captured teamwork factors.

5 | DISCUSSION

5.1 | Handover quality in relation to patient condition and situational circumstances

To our knowledge, this is the first study to describe patient handover reporting and activities in relation to patient condition and other influencing factors using a mixed methods approach. The study has found that information transferred and activities performed during patient handovers are varied. Patient handover is a dynamic process (Manser et al., 2013), and the present study has described how the team responded and adapted to changes in patient condition and circumstances during the handovers observed. The practice of adapting handover to the patient and situation has been described in other clinical studies (Drach-Zahavy et al., 2015; Rattray et al., 2019; Reine, Rustoen, et al., 2019). These findings imply that the ability to adapt the handover to the patient's condition and circumstances is important for quality, because patients' needs, team composition, preparation and workload during handovers are variable. Adaptation describes the way healthcare practitioners cope with variability and complexity in their practice. The ability to adapt to changing circumstances is considered an integrative part of ensuring quality and safety in health care (Wiig & Fahlbruch, 2019).

On the one hand, it should be questioned whether adaptation always leads to safer care or higher quality in handover processes. If adaptations are related to "work arounds" compensating for system malfunctioning (i.e. equipment failure) or organisational issues (i.e. low staffing, high workload), they may be negative for patient safety and care quality in the long run (Wears & Hettinger, 2014). On the other hand, standardisation of postoperative handovers might impose challenges due to the complexity of the handover process (Wears, 2015).

The integration of quantitative and qualitative data showed that handover reporting was often focused on items relevant to the patient handed over. This could be one explanation for less information being transferred and shorter duration of handovers for more vitally stable and comfortable patients. Focusing the handover report on items relevant to the present patient might appear to be a sensible strategy. However, this also represents a challenge for quality because items not reported during the handover may become relevant information later in the postoperative phase. For instance, blood loss during surgery and plan for intravenous fluids were reported in 67% and 24% of handovers, respectively. If the patient's condition changes in the early postoperative phase, these items might become relevant for the PACU nurse.

The variations described in the present study show the challenges of using one tool to assess handovers in PACUs caring for different patient groups. The PoHAT was validated for larger gastroenterological and vascular surgical procedures (Nagpal et al., 2011); therefore, not all items and tasks assessed were relevant for all handovers observed. For instance, the item "plan for monitoring" might be irrelevant for a patient with no comorbidity while highly relevant for a patient with a heart condition. Further, the task of "patient receiving oxygen" was not relevant for most of the 50 (46%) patients not receiving oxygen, only one patient had a saturation level of 90% and the rest had levels that varied from 93%–100%.

5.2 | Facilitators and barriers for handover quality

The handovers observed in the present study had a high median frequency of information omissions in the verbal report according to the PoHAT; some of these omissions may be explained by relevance or that the receiving nurse had read up on the patient. However, the qualitative data described situations with unstructured reporting and receiving nurses missing information after handover was completed. The high number of information omissions in the verbal report is in line with previous research on postoperative patient handovers from populations not using checklists (Milby et al., 2014; Siddiqui et al., 2012). In the handovers using the ISBAR-based checklist, more information was transferred according to the PoHAT even though the checklist was not identical to the PoHAT. The effects of using checklists to increase information transfer during patient handovers in postoperative settings are well documented in the literature (Nagpal et al., 2013; Petrovic et al., 2015; Pucher et al., 2015; Segall et al., 2012; Weinger et al., 2015). However, maintaining compliance with checklists in healthcare settings is challenging (Russ et al., 2015). The findings of the present study support this, because the ISBAR-based checklist was used by transferring nurse anaesthetist and OR nurse in only 14 (13%) handovers. Further, the implemented checklist consisted of 32 items. This might have been a barrier to its use, as the number of items on a checklist may affect compliance (Thomassen et al., 2011). In a study on the Safe Surgery Checklist, compliance was increased when the checklist was integrated in the electronic documentation system (Gitelis et al., 2017). Interventions involving team training and education have also contributed to increased checklist compliance (Bergs et al., 2015; Papadakis et al., 2019; Weinger et al., 2015).

The previously mentioned published guidelines for postoperative handover quality involve preparation, prioritising patient tasks, standardised verbal report and allowing for questions (Agarwala et al., 2019; Pucher et al., 2015; Redley et al., 2016; Segall et al., 2012). The findings in the present study support these guidelines and further describe adaptation, patient assessments and dialogue within the team to contribute to quality. Patient handovers are also about establishing a shared understanding between transferring and receiving healthcare professionals (Manser et al., 2010). The findings in the present study described more dialogue within the team if receiving nurse had read and was prepared for the arriving patient. A previous study on handover communication-related patient assessments to quality and also highlighted that the receiving nurses had an active role in the handovers through seeking and acknowledging information (Manser et al., 2013). In handovers with complex patient conditions and/or an unprepared receiving nurse, we suggest that the transferring team allows the receiving nurse to get an overview

of the patient before starting the verbal report. This may further facilitate shared understanding, and dialogue within the team.

In the present study, the handovers observed occurred in an event-driven environment exposed to interruptions and with variable workloads for receiver nurses. The interruptions observed were often initiated by nurses involved rather than the patients. For instance, one handover was interrupted three times (Table 4). Clinical consensus guidelines recommend that efforts should be made to reduce interruptions during handovers in perioperative settings (Agarwala et al., 2019).

The qualitative data also described situations where the receiving nurses sought information clearly reported previously. Further, in the groups of handovers using the checklist (13%), information omissions according to the POHAT ranged from one omission up to as many as 10. These findings indicate some of the limitations related to the use of checklists and standardised communication tools. A checklist or communication tool may facilitate and structure the handover report. However, it does not in itself guarantee that the handover report is complete and accurate or that the receiver has understood the information transferred and what it implies (Clay-Williams & Colligan, 2015; Cohen et al., 2012; Loeb & Dekker, 2015). A study of PACU handovers found that the receiving nurse could recall approximately 50% of information provided during the handover report (Randmaa et al., 2016). These findings emphasise the importance of securing complete and accurate documentation for handover quality (Segall et al., 2012). Because it is challenging for the receiver to remember all items reported verbally, it is important to ensure that relevant information about the intraoperative course and plans for postoperative care is documented.

5.3 | Limitations and strengths

The healthcare professionals participating in the study were aware that they were being observed, and this may have affected their behaviour (Green & Thorogood, 2018). This may have been compensated for by a long data collection period. The low compliance with checklists and the different reporting styles observed indicate that behaviour was not changed due to being observed.

The response options for the different items varied from two to three categories in the PoHAT and three to four categories in the White and Song score. Inter-rater reliability was assessed by comparing if the different observers provided the same score or not (two categories) on the items assessed in the quantitative data collection. The combination of different categories in the reliability test may have affected the results (Warrens, 2015). Further, because the handover reports were not audio recorded, there is a risk that the observer did not register all the reported items. However, the reliability testing of 20 handovers (18%) showed strong to almost perfect inter-rater reliability between the two observers (McHugh, 2012).

Because the study did not collect information about the healthcare professionals involved, it was not possible for the observers to keep track of how many times individual professionals were observed. This was compensated by collecting data in two different PACUs and across two shifts (day shift and evening) on most days of data collection. However, because the individual healthcare professionals observed participated in different teams, several nurses were observed more than once. Therefore, individual reporting styles may have affected the data. In the handovers observed using qualitative and quantitative data collection, the first author took care to observe different team compositions and different healthcare professionals.

Another limitation is that the qualitative data were collected by only one observer. To reduce this effect, the observers conducting the quantitative observations read through parts of the qualitative data and provided feedback as to whether they disagreed, agreed or had noticed other aspects in the handover situations.

Because the data were collected in two waves and in two different PACUs, this may have affected the data because handover practices and patient groups may change over time and vary across units. However, no statistically significant differences were found in information omissions, patients' WSS, surgery duration or patients' ASA groups between the two data collection periods. Further, there were no differences in surgery duration, patients' WSS and information omissions between the two PACUs observed.

The qualitative analysis was conducted by authors (E.R, A.T. and R.A.) who are experienced nurse anaesthetists and employed in two out of the three units employing the nurse anaesthetists observed in the study. While this ensures knowledge of the context and the handover situation, it may also represent a bias in the data analysis. This was balanced by the author K.A. with a background as a safety scientist and knowledge of qualitative methods, reviewing the analyses and suggesting revisions where appropriate.

6 | CONCLUSIONS

The present study found that postoperative patient handover is a dynamic and complex process affected by patient condition and situational circumstances. Completeness in verbal reporting and tasks performed were variable in the handovers observed. Handovers of patients with lower WSS scores and after surgery of longer duration were associated with higher quality, compared to handovers of vitally stable and comfortable patients after surgery of shorter duration. Factors facilitating best practices and quality were related to adaptation of the handover to patient condition and current situation, structured verbal report, patient assessments and dialogue within the team. The study also identified that postoperative patient handovers occur in event-driven environments that are exposed to interruptions, and further that information provided is not always perceived correctly by the receiver.

We recommend future research to further explore how patient condition and other contextual factors affect handover quality. Because the present study did not assess the quality and completeness of perioperative documentation, we further recommend that future research explores how the documentation system can provide clinical support and contribute to handover quality.

7 | RELEVANCE TO CLINICAL PRACTICE

It is important to acknowledge that patient handover quality is related to more than transfer of information from transferring to receiving healthcare professionals. Postoperative patient handovers take place in event environments that are exposed to interruptions and disturbances. The importance of adapting the handover to patient condition and circumstances providing patient assessments and dialogue within the handover team should be acknowledged when measures are taken to improve postoperative patient handover quality.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Study design: E. R., K. A., J. R., T. R.; Data collection: E. R., A. T., R. M. A.; Data analyses: E. R., K. A., J. R., A. T., R. M. A., T. R.; Manuscript preparation: E. R., K. A., J. R., A. T., R. M. A., T. R.

DATA AVAILABILITY STATEMENT

The data from the study are not publicly available. Parts of the dataset (in Norwegian language) can be made available upon request to the corresponding author if the data protection office of the respective hospital permits

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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