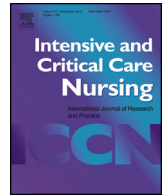




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Nurse and patient factors that influence nursing time in chest tube management early after open heart surgery: A descriptive, correlational study

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ABSTRACT

Purpose: Determine nurse characteristics and patient factors that affect nurses' time in managing chest tubes in the first 24-hours of critical-care stay.

Design: Prospective, descriptive.

Methods: Cardiovascular critical-care nurses and post-operative heart surgery patients with chest tubes were enrolled from a single center in Ohio. Nurses completed case report forms about themselves, comfort and time in managing chest tubes, chest tube placement and management factors. Analysis included correlational and comparative statistics; Bonferroni corrections were applied, as appropriate.

Results: Of 29 nurses, 86.2% were very comfortable managing chest tubes and oozing/non-secure dressings, but only 41.4% were very comfortable managing clogged chest tubes. Of 364 patients, mean age was 63.1 (± 12.3) years and 36% had previous heart surgery. Total minutes of chest tube management was higher with ≥ 3 chest tubes, tube size < 28 French, and when both mediastinal and pleural tubes were present (all $p < 0.001$). In the first 4-hours, time spent on chest tubes was higher when patients had previous cardiac surgeries ($p \leq 0.002$), heart failure ($p < 0.001$), preoperative anticoagulant medications ($p = 0.031$) and reoperation for postoperative bleeding/tamponade ($p = 0.005$).

Conclusions: Time to manage chest tubes can be anticipated by patient characteristics. Nurse comfort with chest tube-related tasks affected time spent on chest tube management.

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Implications for clinical practice

- Charge nurses and nursing management can optimize patient assignments by considering patient risk factors for excess chest tube management time and nurse comfort in chest tube management
- Nurse educators should focus on management of clogged chest tubes to improve nurses' comfort level.
- Patient factors known to increase nurse time spent in chest tube management should be included in huddle and hand-off communication.
- When patients had cardiac tamponade, nurses spent $> 50\%$ of their time in the first four hours of postoperative care managing chest tubes

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Introduction

Nursing is primarily responsible for the management of chest tubes (CTs) in patients during the early and delayed postoperative period. Interventions include, but are not limited to: measurement of drainage output, assessment of drainage characteristics, strategies to prevent CT clogging and pain management. Chest tube management can be time consuming, decreasing time nurses have for completion of other important tasks. Critical care nurses are often asked to make decisions about postoperative care priorities; however, little research literature is available on time spent in CT care.

The literature contained only eight research and two review papers on multiple CT outcomes and management themes; however, none were related to nursing time in managing chest tubes and one paper was only focused on residual pleural volumes, which was not related to time spent by nurses in managing CTs. Themes of interest were to learn how long it took to observe a decrease in volume of drainage (Wynne et al., 2007) and frequency of and resolution of complaints of pain by subjects (Aslan et al., 2009; Milgrom et al., 2004; Sensoz et al., 2011). In papers on CT clogging, researchers learned it was more likely with smaller CT size even though pain experiences could be greater (Shalli et al., 2009); however, in a Cochrane review of three reports of CT drainage after milking, stripping and manipulating, authors were unable to draw conclusions about the best approach for clot removal (Wallen et al., 2004) and reports did not include nursing efforts in unclogging CTs. Risk of bleeding or cardiac tamponade were a focus of papers, but themes were silastic versus conventional CTs (Frankel et al., 2003), vacuum-assisted versus gravity drainage (Bevilacqua et al., 2002), effects of preoperative aspirin on CT drainage (Alghandi et al., 2007), and cessation of active bleeding when fluid turned serosanguineous (Gercekoglu et al., 2003), but not nursing time or effort in managing bleeding.

Nursing time to manage CTs after heart surgery has not been studied. Although CT related pain and discomfort were described in two studies, little is known about nursing activities related to keeping CTs patent, assessing proper drainage, responding to suspicions of CTs not draining properly and communicating with health care providers (physicians and advance practice nurses). Further, nurses hypothesized that four general patient factors (anticoagulant and antiplatelet use, reoperation due to bleeding and any postoperative complication) and intraoperative blood infusions (cryoprecipitate, platelets, fresh frozen plasma and red blood cells) would be associated with increased CT output and nurses time in managing CTs. The purpose of this study was to determine nurse characteristics and patient factors that affect nurses' time in managing CTs in the first 24 hours of postoperative cardiovascular intensive care unit (ICU) care after heart surgery.

Methods

This research was guided by six questions. Does nursing management of CTs differ by nurse characteristics? What nursing care activities associated with CT management require the greatest amount of time? How much nursing time early after heart surgery is devoted solely to CT management? What patient factors are associated with time needed to care for CTs during the immediate postoperative period? Is amount of time to manage CTs associated with patient pain? Is amount of time to manage CTs associated with chest area pressure and/or discomfort postoperatively? A prospective, single-centered, descriptive design of two cohorts, nurses and heart surgery patients, were used to answer questions.

Setting

The study was conducted within a 12-bed cardiovascular ICU in a 1400-bed quaternary care medical center in Northeast Ohio. The unit treats adults after cardiac surgery; which consists primarily of open chest coronary artery bypass graft and valve repair or replacement surgical procedures.

Ethical approval

The hospital organization's institutional review board (IRB#: 11-1028) approved this research prior to implementation without written informed consent from patients as there were no interventions; only standard nursing care. The institutional review board approved nurses' participation based on review of a research information sheet that described the study; completion of data collection signified agreement to participate. The study was carried out using ethical standards set forth in the Helsinki Declaration of 1975.

Participants

Registered nurses were enrolled immediately after institutional board approval using convenience sampling, with an understanding that they would provide data about themselves immediately and collect data over time. Inclusion criteria were: worked primarily on the cardiovascular ICU, had completed hospital orientation prior to study start up and routinely managed postoperative heart surgery patients in the first 24-hours of admission. Over a 10 month period, adult patients were consecutively enrolled upon admission to the unit if they met inclusion criteria: admitted with CTs for postoperative recovery after heart surgery (coronary artery bypass graft and valve surgeries). There were no exclusion criteria for nurses or patients.

Outcomes and measures

Six outcomes were measured to answer research questions that involved clinical nurse and postoperative patients. Nurse characteristics included age, gender, nursing degree, length of time as a registered nurse and as a nurse on the unit, and length of time at the study hospital. Data were collected using an investigator-developed case report form that had checkboxes to illicit information. Five factors of nurses' general level of comfort with CTs were assessed: taking care of patients, keeping CTs patent, dealing with clogged CTs, managing CT dressings and determining if pain or discomfort were due to CTs with a 7-category Likert scale response set (1, *lowest level of comfort* and 7, *highest level of comfort*). Minutes of clinical nursing time used in postoperative patient care of CTs were assessed by studying minutes in four ways: overall, minutes used in keeping CTs patent, minutes used to assess improper CT drainage, and minutes used in communicating with physician/advanced practice nurse about patency and drainage. Minutes per each 4-hour postoperative time period were recorded using fill-in-the-blank responses. In addition, three factors associated with minutes of CT care were assessed (dressing changes and reinforcement [two questions]; CT removal [one question]; and pain, pressure or discomfort [six questions]) using a 9-item investigator-developed case report form with dichotomous (yes/no) response options and fill-in-the-blank that corresponded to six 4-hour postoperative periods, beginning with 0–4 hours.

Patient characteristics were obtained from an administrative cardiovascular surgery database used to transmit data to the Society of Thoracic Surgeons. The database has been active since 1972 and uses strict definitions, inclusion and exclusion criteria set up by the Society of Thoracic Surgeons (Ferguson et al., 2000). The

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