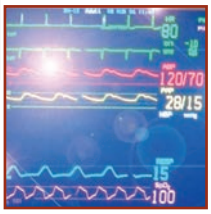


# Comparative Evaluation of Chest Tube Insertion Site Dressings: A Randomized Controlled Trial

By Michelle D. Wood, MSN, RN, AGCNS-BC, RN-BC, Jan Powers, PhD, RN, CCNS, CCRN, NE-BC, and Jennifer L. Rechter, MSN, RN-BC, AGCNS-BC

**Background** Little empirical evidence is available to guide decisions on what type of dressing to use and how often to change the dressing after placement of a thoracostomy tube.

**Objectives** This prospective randomized controlled study was conducted to compare various dressing types and procedures after placement of thoracic and mediastinal chest tubes. Outcome measures included length of time between dressing changes, skin integrity, air leak presence, and patient-reported pain.

**Methods** The study involved a convenience sample of 127 patients with 236 chest tubes from 3 intensive care units at a midwestern regional medical center. The patients were randomized to 1 of 3 groups: (1) gauze and tape dressing changed once daily, (2) gauze and tape dressing changed every 3 days, and (3) silicone foam dressing changed every 3 days.

**Results** Patients with silicone foam dressings reported less pain at the insertion site than did patients with standard gauze and tape dressings, and patients with daily dressing changes reported significantly more pain with dressing removal than did patients with dressing changes every 3 days. The silicone foam dressing was associated with better skin integrity than the gauze and tape dressing. Dressing intactness, number of days with a chest tube inserted, and patient demographic characteristics did not differ significantly among the 3 groups.

**Conclusions** Overall, the best type of dressing for promoting skin integrity and patient comfort was the silicone foam dressing. The results of this study may help identify best practices for dressing type and procedures among patients with chest tubes. (*American Journal of Critical Care.* 2019;28:415-423)

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Thoracostomy tubes (chest tubes) are used to drain abnormal collections of air or fluid in the pleural cavity. Nurses are primarily responsible for maintenance of the tube and drainage system, including the dressing placed at the insertion site. Practices regarding type of dressing used and frequency of dressing changes vary across institutions. Little empirical evidence is available to guide these decisions. Although several articles addressing best practices have been published, most of the resulting recommendations have been based on traditional practice and expert opinion.[1-3]

We found only 2 reports of studies in which the researchers compared different dressing types or frequencies of dressing changes, evaluating dry gauze, petroleum-impregnated gauze, transparent adhesive dressing, and no dressing.[4,5] Jones[4] found transparent adhesive dressing to be equivalent to dry gauze, and Gross et al[5] found that leaving the site open to air had outcomes similar to the outcomes with gauze. Our institution requires placement of a dressing for drainage absorption; therefore, a transparent dressing or no dressing would not conform to our practices.

Limited supporting evidence exists on how to manage chest tube dressings.

Given the paucity of empirical data on the topic, the current study was conducted to help identify best practices for chest tube insertion site dressings, including dressing type and optimal frequency of dressing changes, through a comparative evaluation.

## Methods

This prospective randomized controlled study was conducted in 3 intensive care units (ICUs). The ICUs were located at Parkview Regional Medical Center, a large midwestern health care facility consisting of approximately 450 beds, including 83 adult ICU beds. We compared different types and frequencies of chest tube dressings for both thoracic and mediastinal chest tubes. A secondary aim of this study was to assess nurses' perceptions of the various dressing change techniques and frequencies by means of a nursing survey. The health care facility's institutional review board evaluated and approved the study, and written informed consent was obtained from all participants.


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### Participants

The study involved a convenience sample of patients from the cardiovascular ICU (CVICU), surgical and trauma ICU (STICU), and medical ICU (MICU) (see Figure). The final sample for analysis consisted of 127 patients—114 from the CVICU, 6 from the STICU, and 7 from the MICU—with a total of 236 chest tubes. Inclusion criteria were age of 18 years or older and placement of thoracic or mediastinal chest tubes within the past 24 hours. Patients who had planned surgeries during which chest tubes would be placed were enrolled in the study during preadmission testing. Patients with emergent chest tube placements were enrolled within 24 hours of the placement. Study participants included both male and female patients of various ethnicities. Patients were excluded if they had a chest tube in place more than 24 hours before enrollment, had a known allergy to adhesives, or had an air leak at a tube insertion site before enrollment.

### Study Procedures

We screened patients in the designated ICUs to identify those with chest tubes. For cardiovascular patients scheduled for elective surgery, an investigator described the study and obtained informed consent from the patient during preadmission testing. Patients who met the inclusion criteria were enrolled within 24 hours of tube placement. Patients were randomly assigned to 1 of 3 dressing protocol groups using a blinded envelope: (1) gauze and tape dressing changed once daily and as needed (gauze/daily), (2) gauze and tape dressing changed every 3 days and as needed (gauze/3-day), and (3) silicone foam dressing with adhesive border (Mepilex; Mölnlycke) changed every 3 days and as needed (foam/3-day).

All dressing changes followed a standard procedure. For each dressing type, first the area around the insertion site was cleansed with swab sticks impregnated with 2% chlorhexidine gluconate and 70% isopropyl alcohol. For the gauze dressing, 4 × 4-inch (10 × 10 cm) dressing sponges were folded in half and placed above and below the chest tube or tubes and covered with two 4 × 4-inch (10 × 10 cm) pieces

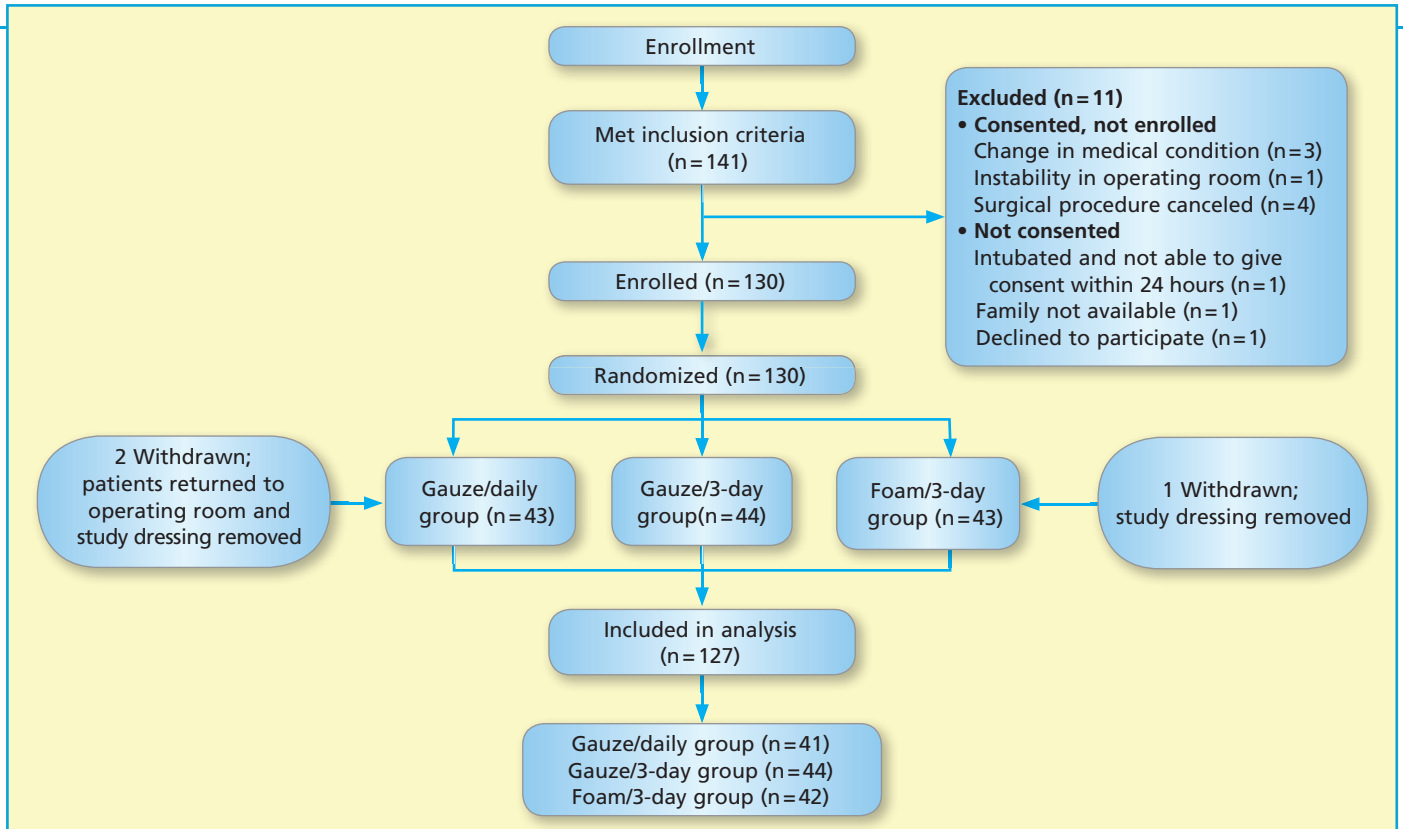


**Figure** CONSORT (Consolidated Standards of Reporting Trials) flow diagram showing selection of patients for the study.

of gauze for a single chest tube or an abdominal pad for 2 or more chest tubes; dressings were secured with soft cloth surgical tape. For foam dressings, a silicone-backed foam dressing with an adhesive border was cut with sterile scissors to fit around the chest tube or tubes. All chest tubes distal to the dressing were secured with tape on the patient's chest. Last, a color-coded sticker specifying patient group and indicating the date and time of the current dressing change and the next scheduled dressing change was placed on the dressing.

We evaluated each patient daily for dressing appearance, patient-reported pain, and other variables (Table 1). Outcome measures included dressing intactness, skin integrity at and around the insertion site, amount of drainage on the dressing, presence of air leak, pain at the chest tube insertion site, pain with dressing removal, and length of time between dressing changes. We were unable to find measurement tools for assessment of insertion sites that had been determined to be valid and reliable. Skin integrity was evaluated using a tool developed by Wynne et al.[6] For other variables and outcomes for which no established tool was available, we used assessment criteria that we developed ourselves to ensure objectivity (Table 1).

Demographic information collected for all study participants included age, sex, race, diagnosis, and number of days with a chest tube (up to 10 days).

**Table 1**
**Definitions of variables**

| Variable | Measurement |
|---|---|
| Dressing intact | Yes or no<br>If no: % of dressing loose (one side=25%) |
| Skin integrity near insertion site | Normal (pink, no redness)<br>Inflamed (redness, heat)<br>Macerated (within 2.5-cm border of insertion site) |
| Skin integrity at adhesive site | N=normal<br>E=redness<br>ST=skin tears<br>DNA=did not assess<br>NA=not applicable (ie, patient is in group with dressing changed every 3 days or as needed and dressing is not due to be changed) |
| Drainage on dressing | None<br>Small amount (<size of a quarter)<br>Moderate amount (> size of a quarter, soaking up to ½ dressing)<br>Large amount (¾ of dressing to all dressing soaked)<br>Copious (dressing saturated with fluid leaking from dressing) |
| Air leak present | Yes or no<br>Yes=from condition, at tubing connection, at insertion site |
| Pain/comfort with dressing intact | 0-10 scale |
| Pain with removal of dressing | 0-10 scale |
| Tube dislodgment | Yes or no |
| Other complications | Yes or no<br>Specify complication if yes |

**Table 2**
**Characteristics of patients in the study**

| Characteristic | No. (%) of patients[a] | | | |
|---|---|---|---|---|
| | Total | Gauze/daily (n = 41) | Gauze/3-day (n = 44) | Foam/3-day (n = 42) |
| Age, mean (range), y | 63.7 (24-91) | 64.1 (24-91) | 65.2 (28-84) | 61.9 (30-78) |
| Sex | | | | |
| Female | 44 (35) | 18 (44) | 10 (23) | 16 (38) |
| Male | 83 (65) | 23 (56) | 34 (77) | 26 (62) |
| Race | | | | |
| African American | 3 (2) | 1 (2) | 1 (2) | 1 (2) |
| White | 122 (96) | 40 (98) | 43 (98) | 39 (93) |
| Hispanic | 2 (2) | 0 (0) | 0 (0) | 2 (5) |
| Setting of insertion | | | | |
| Emergency department | 4 (3) | 3 (7) | 1 (2) | 0 (0) |
| Surgical intensive care unit | 3 (2) | 2 (5) | 1 (2) | 0 (0) |
| Interventional radiology | 2 (2) | 0 (0) | 1 (2) | 1 (2) |
| Medical intensive care unit | 2 (2) | 1 (2) | 1 (2) | 0 (0) |
| Operating room | 116 (91) | 35 (85) | 40 (91) | 41 (98) |
| No. of chest tubes | | | | |
| 1 | 32 (25) | 14 (34) | 9 (20) | 9 (21) |
| 2 | 83 (65) | 24 (59) | 32 (73) | 27 (64) |
| 3 | 11 (9) | 3 (7) | 2 (5) | 6 (14) |
| 4 | 1 (1) | 0 (0) | 1 (2) | 0 (0) |
| Jackson-Pratt drain | | | | |
| 0 | 77 (61) | 28 (68) | 25 (57) | 24 (57) |
| 1 | 49 (39) | 13 (32) | 18 (41) | 18 (43) |
| Missing | 1 (1) | 0 (0) | 1 (2) | 0 (0) |
| Elastomeric pain relief ball | | | | |
| No | 111 (87) | 38 (93) | 37 (84) | 36 (86) |
| Yes | 16 (13) | 3 (7) | 7 (16) | 6 (14) |
| Intensive care unit | | | | |
| Cardiovascular | 111 (87) | 33 (80) | 39 (89) | 39 (93) |
| Medical | 7 (6) | 3 (7) | 3 (7) | 1 (2) |
| Surgical/trauma | 8 (6) | 4 (10) | 2 (5) | 2 (5) |
| Missing | 1 (1) | 1 (2) | 0 (0) | 0 (0) |

[a] All values are number (percentage) of patients except for Age, as indicated in the first column.

Statistical analysis of data included comparisons between groups for differences in outcomes using Pearson $\chi^2$, Mantel-Haenszel $\chi^2$, and Kruskal-Wallis tests for differences among the 3 groups and Wilcoxon rank sum tests for differences between each pair of groups.

## Results

The final study sample for analysis consisted of 127 patients with a total of 236 chest tubes, resulting in 724 observations. The gauze/daily group consisted of 41 patients, the gauze/3-day group had 44 patients, and the foam/3-day group had 42 patients.

### Statistical Analysis of Data

No statistically significant differences were found between groups for the patient characteristics of age, sex, ICU type, setting of insertion, number of chest tubes, and presence of drains (Jackson-Pratt or elastomeric pain pump; Table 2). The mean length of time that chest tubes were in place was 4.5 days (range, 1.2-10 days) in the gauze/daily group, 5.1 days (range, 1.9-10 days) in the gauze/3-day group, and 3.9 days (range, 1.6-10 days) in the foam/3-day group.

The total number of dressing changes was significantly higher in the gauze/daily group than in the gauze/3-day group ($P = .001$) and the foam/3-day group ($P < .001$), but the 3-day groups did not differ significantly from each other in this outcome ($P = .18$). The dressing change frequency was every 24 hours in the gauze/daily group and every 3 days in the gauze/3-day group and the foam/3-day group, with no documentation of additional dressing changes between the scheduled times during the study. No significant differences were found between groups for any day in assessed intactness of the dressing.

Pain assessment included pain at the insertion site and pain with removal of the dressing. Pain scores were compared between groups using repeated-measures analysis of variance, with fixed effects for group, day, and the group-by-day interaction, allowing for a different variance each day but a common correlation among all days. This analysis was performed using the ranks of the data because the pain

**Table 3**
**Pain assessment**

| Assessment | Mean (SE) score on scale of 0-10 | | | *P* |
|---|---|---|---|---|
| | Gauze/daily (n = 41) | Gauze/3-day (n = 44) | Foam/3-day (n = 42) | |
| **Pain at insertion site** | n = 40 | | | |
| Average across all days | 1.0 (0.2) | 0.7 (0.2) | 0.5 (0.2) | .72, overall |
| Maximum across all days | 1.5 (0.4) | 2.2 (0.5) | 1.1 (0.3) | .19, overall |
| **Pain with dressing removal** | n = 39 | n = 38 | n = 37 | |
| Average across all days | 0.9 (0.2) | 0.2 (0.2) | 0.2 (0.2) | <.001, overall<br>.001, gauze/daily vs gauze/3-day<br>.001, gauze/daily vs foam/3-day<br>.99, gauze/3-day vs foam/3-day |
| Maximum across all days | 1.6 (0.4) | 0.4 (0.2) | 0.3 (0.1) | .006, overall<br>.01, gauze/daily vs gauze/3-day<br>.006, gauze/daily vs foam/3-day<br>.78, gauze/3-day vs foam/3-day |

scores were not normally distributed. The average and maximum pain scores across all follow-up days were compared between groups using the Kruskal-Wallis and Wilcoxon rank sum tests. Pain at the insertion site did not differ significantly among groups ($P = .72$). Pain with dressing removal was significantly greater for the gauze/daily group than for the gauze/3-day and foam/3-day groups ($P = .001$), but the 3-day groups did not differ significantly from each other ($P > .99$) (Table 3).

Assessment of skin near the insertion site revealed no statistically significant differences between groups for any day. However, some differences were found in skin integrity with adhesive removal. On day 9, the gauze/daily group had significantly worse skin integrity than the gauze/3-day group ($P = .02$) and worse integrity than the foam/3-day group, although the latter difference was not statistically significant ($P = .14$). No significant differences were found between groups for the other days (Table 4). Assessment of the amount of drainage on dressings showed that the foam/3-day group had more drainage than the other 2 groups; however, this increased drainage did not require more frequent dressing changes.

No significant differences were found between groups for any day in air leak presence or tube dislodgment. A total of 3 of 127 patients (2.4%) had chest tube dislodgments: 2 in the gauze/daily group (at 1 day and 5 days) and 1 in the gauze/3-day group (at 5 days).

### Nurse Survey

In addition to the statistical analysis comparing the chest tube dressing groups, a survey was performed to evaluate nurses' experience with the dressings (N = 17; Table 5). Most of the nurses reported that the silicone foam dressing maintained the best skin integrity for both the mediastinal and thoracotomy chest tubes. In terms of ease of dressing application, nurses reported that the gauze and tape dressing was easier to apply than the silicone foam dressing for both mediastinal and thoracotomy chest tubes; however, more than 70% of the respondents felt that the silicone foam dressing was easier to remove. For mediastinal tubes, 53% of the nurses reported that the silicone foam dressing remained intact the best; however, for patients with thoracotomy chest tubes, 56% of nurses reported that the gauze and tape dressing remained intact better than the silicone foam dressing. Sixty-three percent of the nurses reported that the silicone foam dressing absorbed drainage better than the gauze and tape dressing for both mediastinal and pleural chest tubes. Overall, the silicone foam dressing was preferred.

## Discussion

This study revealed some significant differences among dressings used for chest tube insertion sites. Our findings indicate that a silicone foam dressing may be a better option than a gauze and tape dressing in terms of drainage management, reduced pain, and improved skin integrity. Overall, a longer interval between dressing changes resulted in less pain and improved skin integrity.

> Clinically significant differences were found when standard gauze and tape was compared with a silicone foam dressing that has an adhesive border.

Previous studies indicated that a transparent adhesive dressing was equivalent to dry gauze[4] and that reported pain was greater with a petroleum-saturated gauze and foam tape dressing than with a dry sterile dressing or no dressing.[5] Jones[4] reported on 79 patients and compared standard gauze with a

**Table 4**
**Skin integrity with adhesive removal**

| Day | Response | No. (%) of responses: All responses: Gauze/daily[a] | All responses: Gauze/3-day | All responses: Foam/3-day[a] | Evaluable responses: Gauze/daily | Evaluable responses: Gauze/3-day | Evaluable responses: Foam/3-day | Overall *P* |
|---|---|---|---|---|---|---|---|---|
| 0 | E | 1 (2) | 0 (0) | 0 (0) | 1 (4) | 0 (0) | 0 (0) | .43 |
| | N | 22 (51) | 15 (33) | 23 (53) | 22 (96) | 15 (100) | 23 (100) | |
| | DNA | 1 (2) | 0 (0) | 1 (2) | | | | |
| | NA | 19 (44) | 29 (66) | 19 (44) | | | | |
| 1 | E | 4 (9) | 1 (2) | 0 (0) | 4 (10) | 1 (5) | 0 (0) | .21 |
| | N | 36 (84) | 20 (45) | 28 (65) | 36 (90) | 20 (95) | 28 (100) | |
| | DNA | 0 (0) | 2 (5) | 1 (2) | | | | |
| | NA | 3 (7) | 21 (48) | 13 (30) | | | | |
| | UTA | 0 (0) | 0 (0) | 1 (2) | | | | |
| 2 | E | 1 (2) | 1 (2) | 0 (0) | 1 (3) | 1 (4) | 0 (0) | .57 |
| | N | 38 (90) | 22 (50) | 28 (67) | 38 (97) | 22 (96) | 28 (100) | |
| | DNA | 2 (5) | 0 (0) | 1 (2) | | | | |
| | NA | 1 (2) | 21 (48) | 13 (31) | | | | |
| 3 | ST | 0 (0) | 2 (5) | 0 (0) | 0 (0) | 2 (7) | 0 (0) | .15 |
| | E | 2 (6) | 1 (3) | 0 (0) | 2 (6) | 1 (4) | 0 (0) | |
| | N | 32 (91) | 25 (64) | 26 (84) | 32 (94) | 25 (89) | 26 (100) | |
| | DNA | 1 (3) | 4 (10) | 0 (0) | | | | |
| | NA | 0 (0) | 6 (15) | 5 (16) | | | | |
| | UTA | 0 (0) | 1 (3) | 0 (0) | | | | |
| 4 | ST | 0 (0) | 1 (4) | 0 (0) | 0 (0) | 1 (6) | 0 (0) | .56 |
| | E | 3 (13) | 2 (7) | 1 (6) | 3 (15) | 2 (11) | 1 (7) | |
| | N | 17 (71) | 15 (56) | 14 (78) | 17 (85) | 15 (83) | 14 (93) | |
| | DNA | 4 (17) | 1 (4) | 1 (6) | | | | |
| | NA | 0 (0) | 7 (26) | 2 (11) | | | | |
| | UTA | 0 (0) | 1 (4) | 0 (0) | | | | |
| 5 | E | 1 (6) | 1 (5) | 2 (22) | 1 (6) | 1 (8) | 2 (22) | .44 |
| | N | 15 (94) | 11 (52) | 7 (78) | 15 (94) | 11 (92) | 7 (78) | |
| | DNA | 0 (0) | 1 (5) | 0 (0) | | | | |
| | NA | 0 (0) | 7 (33) | 0 (0) | | | | |
| | UTA | 0 (0) | 1 (5) | 0 (0) | | | | |
| 6 | E | 2 (18) | 2 (12) | 2 (22) | 2 (18) | 2 (14) | 2 (25) | .82 |
| | N | 9 (82) | 12 (71) | 6 (67) | 9 (82) | 12 (86) | 6 (75) | |
| | NA | 0 (0) | 2 (12) | 1 (11) | | | | |
| | UTA | 0 (0) | 1 (6) | 0 (0) | | | | |
| 7 | E | 1 (14) | 0 (0) | 1 (20) | 1 (14) | 0 (0) | 1 (20) | .50 |
| | N | 6 (86) | 7 (58) | 4 (80) | 6 (86) | 7 (100) | 4 (80) | |
| | DNA | 0 (0) | 1 (8) | 0 (0) | | | | |
| | NA | 0 (0) | 4 (33) | 0 (0) | | | | |
| 8 | E | 1 (20) | 0 (0) | 0 (0) | 1 (25) | 0 (0) | 0 (0) | .23 |
| | N | 3 (60) | 7 (64) | 4 (100) | 3 (75) | 7 (100) | 4 (100) | |
| | DNA | 1 (20) | 2 (18) | 0 (0) | | | | |
| | NA | 0 (0) | 2 (18) | 0 (0) | | | | |
| 9 | E | 2 (67) | 0 (0) | 0 (0) | 2 (67) | 0 (0) | 0 (0) | .04 |
| | N | 1 (33) | 6 (86) | 2 (100) | 1 (33) | 6 (100) | 2 (100) | |
| | NA | 0 (0) | 1 (14) | 0 (0) | | | | |
| 10 | E | 1 (33) | 1 (17) | 0 (0) | 1 (33) | 1 (25) | 0 (0) | .80 |
| | N | 2 (67) | 3 (50) | 1 (100) | 2 (67) | 3 (75) | 1 (100) | |
| | DNA | 0 (0) | 2 (33) | 0 (0) | | | | |
| Worst | ST | 0 (0) | 2 (5) | 0 (0) | 0 (0) | 2 (5) | 0 (0) | .15 |
| | E | 10 (23) | 5 (11) | 3 (7) | 10 (23) | 5 (11) | 3 (7) | |
| | N | 33 (77) | 37 (84) | 40 (93) | 33 (77) | 37 (84) | 40 (93) | |

Abbreviations: DNA, did not assess; E, reddened; N, normal; NA, not applicable (ie, patient is in group with dressing changed every 3 days or as needed and dressing is not due to be changed); ST, skin tears; UTA, unable to assess.
[a] Data for the first 2 days include data for patients who were later withdrawn from the study.

**Table 5**
**Nurse survey results**

| Question | % of Respondents[a] | | |
|---|---|---|---|
| | Gauze/daily | Gauze/3-day | Foam/3-day |
| For patients who had chest tubes following open heart surgery (mediastinal chest tubes), which dressing was easiest to apply? | 40 | 53 | 6 |
| For patients who had chest tubes following lung surgery or placed for a pneumothorax, which chest tube dressing was easiest to apply? | 47 | 47 | 6 |
| For patients who had chest tubes following open heart surgery (mediastinal chest tubes), which chest tube dressing was easiest to remove? | 21 | 0 | 79 |
| For patients who had chest tubes following lung surgery or placed for a pneumothorax, which chest tube dressing was easiest to remove? | 18 | 12 | 70 |
| For patients who had chest tubes following open heart surgery (mediastinal chest tubes), which chest tube dressing maintained best skin integrity? | 7 | 0 | 93 |
| For patients who had chest tubes following lung surgery or placed for a pneumothorax, which chest tube dressing maintained best skin integrity? | 13 | 6 | 81 |
| Based on the criteria allowed for each group, which dressing remained intact the best for patients who had chest tubes following open heart surgery (mediastinal chest tubes)? | 33 | 13 | 53 |
| Based on the criteria allowed for each group, which dressing remained intact the best for patients who had chest tubes following lung surgery or placed for a pneumothorax? | 50 | 6 | 44 |
| Overall, which chest tube dressing would you recommend for patients who had chest tubes following open heart surgery (mediastinal chest tubes)? | 40 | 20 | 40 |
| Overall, which chest tube dressing would you recommend for patients who had chest tubes following lung surgery or placed for a pneumothorax? | 24 | 29 | 47 |
| Which dressing do you feel absorbed drainage the best? | 31 | 6 | 63 |

[a] Because of rounding, percentages may not total 100.

dry dressing versus a transparent adhesive dressing and found no differences in skin irritation and skin tears. Gross et al[5] compared 3 different practices for dressing chest tube insertion sites: (1) dry sterile dressing, (2) petroleum-saturated gauze dressing, and (3) no dressing. Measured outcomes included presence of air leak, patient-reported pain with the dressing in place and with its removal, and skin integrity. Fifty-nine patients were enrolled in the study and observed for 226 days. The only statistically significant difference found was in patient-reported pain upon dressing removal, with removal of the petroleum-saturated gauze dressing secured with foam tape being more painful.

Although the study by Gross et al[5] included petroleum-saturated gauze dressing, this dressing type is no longer recommended for use, as it may be associated with loosening of sutures and maceration of skin.[7] Transparent dressings can be as effective as gauze dressings[4]; however, transparent dressings and no dressing are not good options for our patients, who typically have large amounts of drainage, especially trauma patients.

The literature on outcomes with various chest tube dressings is sparse and does not provide clear evidence to support best practices. In the current study, patients who had daily dressing changes with gauze and tape reported overall worse pain across all days than did those who had dressing changes every 3 days with either gauze and tape or the self-adhesive foam dressing. Significantly more dressing changes occurred in the gauze/daily group than in the other groups, which is expected given the difference in the dressing change schedules. Therefore, the greater pain found with daily dressing changes was expected, as the dressings were removed an average of 3 times as often compared with the other 2 types of dressings evaluated.

Daily dressing changes increase the risk of skin impairment and reduced skin integrity, especially when chest tubes are in place longer. In addition, more manipulations of the dressing result in a greater potential for tube dislodgment. Although the number of dislodgments in this study was small, more occurred in the daily dressing group than in the other groups; moreover, all dislodgments occurred in patients whose dressings used tape, indicating that the tape may also be a factor. In terms of the amount of drainage present on the dressings, the foam/3-day group had significantly more drainage

> One of the dressing groups had less pain during removal and less irritation around the chest tube insertion sites.

than the gauze groups but did not require more dressing changes as a result of the increased drainage.

Nurses reported more difficulty with application of the silicone foam dressing than with the gauze and tape dressing. This finding is most likely due to the need to cut the dressing to fit around the chest tube. The availability of a precut dressing might facilitate application.

### Nursing Implications

This study has several implications for nursing practice in the management of patients with chest tubes. Leaving dressings in place for 3 days instead of 1 day did not result in any complications but was associated with less patient discomfort and better skin integrity. Although more drainage was present on the silicone foam dressing, this dressing type had better outcomes in terms of skin integrity and patient comfort, both at the insertion site and with dressing removal. Although we did not directly measure skin irritation due to the type of adhesive used, we observed that patients with a known sensitivity to the tape used with gauze dressings had much less skin irritation with the adhesive on the foam dressing.

More than 70% of nurses responding to the survey indicated that the silicone foam dressing was easiest to remove.

### Limitations

Because most of the participants in this study were from the CVICU, where chest tubes were placed in a planned, controlled, sterile environment, the ability to generalize the study results to all critical care patients with chest tubes is limited. Patients in the STICU and MICU often have chest tubes placed urgently at the bedside. In addition, most participants in the study were white, and people from other ethnic backgrounds with different skin types may react differently to the dressings, affecting skin integrity. An additional limitation was the inability to control unplanned dressing changes due to increased drainage that may have occurred when a researcher was not present. Finally, the absorption capability of the silicone foam dressing could have been compromised by cutting the dressing to fit around the chest tubes.

### Future Research

Cardiovascular surgical patients who had chest tubes placed in a sterile, controlled environment constituted the vast majority of the participants in this study. Future research should evaluate differences in outcome measures for patients who have chest tubes placed in the emergency department or urgently at the bedside. A larger sample size would help determine the generalizability of the results.

## Conclusion

The results of this study may guide best practices for chest tube insertion site dressings, including the type of dressing and frequency of dressing changes that will best protect skin integrity and minimize patients' discomfort. Such practice improvements will lead to better outcomes and increased satisfaction among patients. In this study, silicone foam dressings changed every 3 days were superior to standard gauze and tape dressings. As a side benefit, hospitals may find that a reduced frequency of dressing changes results in lower costs in terms of supplies and nursing time.

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FINANCIAL DISCLOSURES

None reported.

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