Disposition of Elderly Patients After Head and Neck Reconstruction

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**IMPORTANCE**  A patient's needs at discharge, particularly the need for nursing facility placement, may affect hospital length of stay and health care costs. The association between age and disposition after microvascular reconstruction of the head and neck has yet to be reported in the literature.

**OBJECTIVE**  To determine whether elderly patients are more likely to be discharged to a nursing or other care facility as opposed to returning home after microvascular reconstruction of the head and neck.

**DESIGN, SETTING, AND PARTICIPANTS**  From January 1, 2001, through December 31, 2010, patients undergoing microvascular reconstruction at an academic medical center were identified and their medical records systematically reviewed. During the study period, 457 patients were identified by Current Procedural Terminology codes for microvascular free tissue transfer for a head and neck defect regardless of cause. Seven patients were excluded for inadequate data on the postoperative disposition or American Society of Anesthesiologists (ASA) score. A total of 450 were included for analysis.

**MAIN OUTCOMES AND MEASURES**  Demographic and surgical data were collected, including the patient age, ASA score, and postoperative length of stay. These variables were then compared between groups of patients discharged to different posthospitalization care facilities.

**RESULTS**  The mean age of participants was 59.1 years. Most patients (n = 386 [85.8%]) were discharged home with or without home health services. The mean age of those discharged home was 57.5 years; discharge to home was the reference for comparison and odds ratio (OR) calculation. For those discharged to a skilled nursing facility, mean age was 67.1 years (OR, 1.055; \(P < .001\)). Mean age of those discharged to a long-term acute care facility was 71.5 years (OR, 1.092; \(P = .002\)). Length of stay also affected the disposition to a skilled nursing facility (OR, 1.098), as did the ASA score (OR, 2.988).

**CONCLUSIONS AND RELEVANCE**  Elderly patients are less likely to be discharged home after free flap reconstruction. Age, ASA score, and length of stay are independent factors for discharge to a nursing or other care facility.
T he American Cancer Society reported an estimate of 40,000 new cases of head and neck cancer in 2010, and roughly 10,000 people died of these tumors. As the population in the United States ages, we are faced with questions regarding morbidity, mortality, and quality of life in the treatment of head and neck cancer in the older patient. There is some difficulty with actually defining who is “older.” Medicare eligibility begins at 65 years of age and has become a common definition of elderly people. The National Institute on Aging, National Institutes of Health, and National Cancer Institute also vary in the ages they use to describe older people.2-3

Roughly one-quarter of head and neck cancer affects those older than 70 years, making further research in this population imperative.4 With increasing age often comes an increase in comorbid conditions. However, the relative importance of a patient’s functional status compared with age alone has been emphasized in recent years; a healthy octogenarian will have a lower perioperative risk of complication than someone younger than 60 years with a history of coronary artery disease, diabetes mellitus, and chronic obstructive pulmonary disease, for example. Tobacco and alcohol use is common in patients with head and neck cancer, contributing to comorbidities. Several scales have been validated for measurement of comorbid illness, and their correlation between morbidity and mortality of head and neck cancer therapy is well supported in the literature.4-11 Most research has found that it is the patient’s functional status and presence of comorbidities that contribute to complications of therapy and not the chronological age.2,12-15 Comorbidity also predicts overall survival of elderly patients with head and neck cancer.16 Comorbidity and postoperative complications can lead to an increased hospital length of stay (LOS) postoperatively, and when combined with age, an association with worsening morbidity has been reported in elderly patients after head and neck surgical procedures.17

The safety of free tissue transfer has been extensively studied, and multiple authors have found that postoperative surgical complications are related to the complexity of comorbidities, the American Society of Anesthesiologists (ASA) score, and operative duration rather than age.3,16-20 In 2002, Blackwell et al21 found a significant increase in medical complications and cost of treatment after microvascular reconstruction in those older than 80 years, which contradicts the previously reported findings of these earlier studies. Age is also independently predictive of a prolonged intensive care unit stay22 and postoperative medical complications.35

After extensive reconstructive surgery, there are associated rehabilitation needs for recovery, including speech therapy and physical therapy. Deconditioning during a lengthy hospitalization contributes to further therapy needs aside from those intimately associated with surgery. The posthospitalization disposition of elderly patients after microvascular head and neck reconstruction has yet to be investigated and reported in the literature. A significant aspect of counseling patients preoperatively is the expected postoperative course, which should include the needs of the patient at discharge. The purpose of this study is to determine whether elderly patients are more likely to be discharged to a nursing or other care facility as opposed to returning home after microvascular reconstruction of the head and neck. Secondary outcomes are to determine the associations among age, ASA score, LOS, and disposition.

### Methods

This was a case series with planned medical record review, and the study was approved by the internal review board of Wake Forest Baptist Medical Center. The medical records for all patients undergoing microvascular reconstruction from January 1, 2001, through December 31, 2010, for a defect of the head and neck, regardless of cause, were included; these patients were identified by searching institutional databases by Current Procedural Terminology code. The medical records were reviewed, and data, including age, sex, cause of surgical defect, site of defect, type of free flap reconstruction performed, ASA score, and postoperative course, were collected. The postoperative course was reviewed to determine the hospital LOS, disposition from the hospital, complications, and survival. Posthospitalization facilities for further care in our community include home health services, skilled nursing facility (SNF), post–acute rehabilitation facility (PARF), and long-term acute care facility (LTACF). Definitions of services for each level of care are given in Table 1.

To analyze the association between age and disposition, a multinomial regression model was implemented. In this model, age, LOS, and ASA score were continuous independent variables. The disposition with 5 levels (home health care, SNF, PARF, LTACF, and deceased) was the categorical outcome variable. A similar model was also created with one categorical outcome, discharge to any nursing facility, increasing the number of patients in one category for analysis. Odds ratios (ORs) were calculated to determine the strength of association between each disposition location and the independent variables. The frequency of disposition outcomes was also associated with the ASA score, postoperative LOS, primary vs revision surgery, and site of tumor involvement. Age groups were also analyzed as categorical variables. Patients 50 years

<table>
<thead>
<tr>
<th>Disposition Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home with or without home health services</td>
<td>Patients were able to go home with the assistance of intermittent nursing visits for wound examination or even simply for equipment (eg, a suction machine or tube feedings).</td>
</tr>
<tr>
<td>Skilled nursing facility</td>
<td>Patients required assistance 24 hours daily, which was unable to be provided by a family member or other care provider at home. This may also be necessary for regular wound care or less intensive physical therapy.</td>
</tr>
<tr>
<td>Post–acute rehabilitation facility</td>
<td>Patients require 24-hour assistance, although a significant portion of their needs revolve around physical, speech, or occupational therapy. They usually participate in therapy sessions 3 hours daily.</td>
</tr>
<tr>
<td>Long-term acute care facility</td>
<td>Patients’ needs are such that a physician continues to directly guide their care and see them daily. Nursing care is more intensive and therapy services are still available.</td>
</tr>
<tr>
<td>Deceased</td>
<td>Patients died in the hospital after surgery before discharge.</td>
</tr>
</tbody>
</table>
and younger were the reference for those aged 51 through 60 years, 61 through 70 years, 71 through 80 years, and 81 years and older. The ASA score was also analyzed categorically, grouping healthier patients (ASA scores of 1 and 2) and those with more comorbidities (ASA scores of 3 and 4). Associations between the variables were analyzed using the independent sample t, χ², Fisher exact, and Kruskal-Wallis tests to determine significance. Statistical analysis was conducted using SAS statistical software, version 9.3 (SAS Institute Inc).

### Results

**Patient Characteristics**

Initial search of the medical records revealed 457 patients who had undergone microvascular free flap reconstruction for a head and neck defect from January 1, 2001, through December 31, 2010. Seven patients were excluded because of inadequate data on disposition or ASA score. Details of the patient characteristics are given in Table 2. Of the 450 patients included, more than half were men (65.8%), and the mean (SD) age was 59.1 (15.1) years, ranging from 5 to 94 years. Most patients (n = 278 [61.8%]) were younger than 65 years. Squamous cell carcinoma of the upper aerodigestive tract accounted for more than half of pathologic conditions that required reconstruction. A total of 43.8% of flaps were performed as part of the initial treatment; the remainder (n = 252) were used for secondary defects (eg, recurrent tumor after prior irradiation or surgery, fistula formation, previous flap failure, or osteoradionecrosis). Most cases involved only one anatomical region, for example, the larynx or oral cavity (n = 293 [65.1%]). The remaining 34.9% involved 2 or more sites (eg, the larynx, hypopharynx, and cervical esophagus or the oral cavity plus facial skin). The oral cavity was the most common site involved, alone or in conjunction with other sites (n = 271 [60.2%]). Most patients were considered to have severe systemic disease with an ASA score of 3 or 4 (n = 341 [75.8%]).

### Disposition of Elderly Head and Neck Reconstruction Patients

The postoperative disposition of patients is detailed in Table 3. Most patients were discharged home (n = 386 [85.8%]), although of those, more than half (n = 206 of 386) required home health services in some capacity for tracheotomy or gastrostomy tube supplies, wound care, or physical therapy. The mean age of patients discharged home was 57.5 years. Those discharged to an SNF were a mean of 67.1 years old. The OR for the effect of age on SNF disposition was 1.055 (P < .001). Controlling for the ASA score, the OR for effect of age was 1.052 and remained significant (P = .002). With each year of increasing age, the chance of requiring skilled nursing care after surgery as opposed to being discharged home is 5.5% higher and similar (5.2%) when accounting for the ASA score. The mean age of patients going to an LTACF at discharge was 71.5 years (OR, 1.092; P = .002). This remained a significant factor after controlling for the patient’s ASA score (OR, 1.090; P = .004). Discharge to a PARF was less affected by the patient age (OR, 1.051; P = .051); the OR was similar when considering the ASA score (OR, 1.059; P = .06) (Table 4).

The postoperative LOS also correlated with the patient’s disposition after hospitalization (Table 5). The mean LOS for those discharged home was 12 days. Patients who went to an SNF at discharge stayed in the hospital a mean of 27.4 days after surgery. The OR for the effect of LOS on disposition to an SNF was 1.098 (P < .001), making the likelihood of discharge to an SNF 9.8% higher than going home with each additional day in the hospital. For those discharged to a PARF, the LOS was 26.8 days (OR, 1.096; P < .001). Patients discharged to an LTACF were hospitalized longer postoperatively, with a mean of 37.7 days (OR, 1.123; P < .001).

In Table 6, the ASA scores and their effect on postoperative disposition are given. The mean ASA score for those discharged home was 2.788. The mean ASA score for those discharged to an SNF was 3.121 (OR, 2.988; P = .002), making it almost 3 times as likely for a patient to be discharged to an SNF as the ASA score increases from 1 to 4. Patients discharged to an LTACF had a mean ASA score of 3.182 (OR, 3.675; P = .02). The ASA score did not significantly affect discharge to a PARF (OR, 1.463; P = .49) or postoperative mortality (OR, 2.887; P = .09).
When all patients who were discharged to any nursing care facility (SNF, LTACF, or PARF) were compared with those discharged home, the findings were similar (Table 7). Age continued to affect disposition (OR, 1.060; \( P < .001 \)). However, patients were twice as likely to not return home after a free flap reconstruction when controlling for the ASA score (OR, 2.322; \( P = .002 \)). The OR for the effect of LOS on discharge to an nursing facility was 1.090 (\( P < .001 \)). When the ASA score was controlled for, the odds of discharge to a nursing facility was slightly lower at 8.4% for every extra day spent in the hospital (OR, 1.084; \( P < .001 \)). The effect of ASA alone on discharge to any nursing facility was 6% as it increased (OR, 1.057; \( P < .001 \)).

The categorical analysis of age revealed a large increase in the effect on disposition once patients were 71 years of age and even higher at 81 years of age. Patients 71 to 80 years old were almost 5 times as likely to require a nursing facility at discharge (OR, 4.952; \( P = .01 \)). Once older than 80 years, patients were 13 times more likely to be discharged to a nursing facility compared to those 50 years and younger (OR, 13.000; \( P < .001 \)). Generally healthy patients with an ASA score of 1 or 2 were more likely to go home after microvascular reconstruction than those with comorbidities that resulted in an ASA score of 3 or 4 (OR, 4.499; \( P = .002 \)).

Insignificant factors that affect the disposition included reconstruction at the time of primary therapy vs revision or secondary reconstruction (\( P = .80 \)). The number of surgical sites involved in the reconstruction was used to estimate the size of the surgical defect. Despite the assumption that a larger defect might result in a more complicated postoperative course and thus have more postoperative needs, no correlation was found (\( P = .86 \)).

### Table 3. Postoperative Disposition of the Study Patients

<table>
<thead>
<tr>
<th>Disposition</th>
<th>Patients, No. (%)</th>
<th>Mean Age, y</th>
<th>Mean LOS, d</th>
<th>Mean ASA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home health services</td>
<td>386 (85.8)</td>
<td>57.5</td>
<td>12.0</td>
<td>2.788</td>
</tr>
<tr>
<td>Skilled nursing facility</td>
<td>33 (7.3)</td>
<td>67.1</td>
<td>27.4</td>
<td>3.121</td>
</tr>
<tr>
<td>Post-acute rehabilitation facility</td>
<td>11 (2.4)</td>
<td>66.5</td>
<td>26.8</td>
<td>2.909</td>
</tr>
<tr>
<td>Long-term acute care facility</td>
<td>11 (2.4)</td>
<td>71.5</td>
<td>37.7</td>
<td>3.182</td>
</tr>
<tr>
<td>Deceased</td>
<td>9 (2.0)</td>
<td>71.4</td>
<td>10.8</td>
<td>3.111</td>
</tr>
</tbody>
</table>

### Table 4. Effect of Age on Disposition

<table>
<thead>
<tr>
<th>Disposition</th>
<th>OR (95% CI)</th>
<th>( P ) Value</th>
<th>OR Controlling for ASA Score (95% CI)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled nursing facility</td>
<td>1.055 (1.024-1.088)</td>
<td>&lt;.001</td>
<td>1.052 (1.019-1.085)</td>
<td>.002</td>
</tr>
<tr>
<td>Post-acute rehabilitation facility</td>
<td>1.051 (1.000-1.105)</td>
<td>.051</td>
<td>1.050 (0.998-1.104)</td>
<td>.06</td>
</tr>
<tr>
<td>Long-term acute care facility</td>
<td>1.092 (1.032-1.156)</td>
<td>.002</td>
<td>1.090 (1.028-1.155)</td>
<td>.004</td>
</tr>
<tr>
<td>Deceased</td>
<td>1.092 (1.026-1.163)</td>
<td>.006</td>
<td>1.090 (1.023-1.162)</td>
<td>.008</td>
</tr>
</tbody>
</table>

### Table 5. Effect of Length of Stay on Disposition

<table>
<thead>
<tr>
<th>Disposition</th>
<th>OR (95% CI)</th>
<th>( P ) Value</th>
<th>OR Controlling for ASA Score (95% CI)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled nursing facility</td>
<td>1.098 (1.067-1.129)</td>
<td>&lt;.001</td>
<td>1.092 (1.060-1.124)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Post-acute rehabilitation facility</td>
<td>1.096 (1.056-1.138)</td>
<td>&lt;.001</td>
<td>1.098 (1.056-1.143)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Long-term acute care facility</td>
<td>1.123 (1.183-1.165)</td>
<td>&lt;.001</td>
<td>1.119 (1.076-1.164)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Deceased</td>
<td>0.971 (0.865-1.090)</td>
<td>.62</td>
<td>0.956 (0.848-1.079)</td>
<td>.46</td>
</tr>
</tbody>
</table>

### Table 6. Effect of ASA Score on Disposition

<table>
<thead>
<tr>
<th>Disposition</th>
<th>OR (95% CI)</th>
<th>( P ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled nursing facility</td>
<td>2.988 (1.519-5.881)</td>
<td>.002</td>
</tr>
<tr>
<td>Post-acute rehabilitation facility</td>
<td>1.461 (0.496-4.309)</td>
<td>.49</td>
</tr>
<tr>
<td>Long-term acute care facility</td>
<td>3.675 (1.196-11.293)</td>
<td>.02</td>
</tr>
<tr>
<td>Deceased</td>
<td>2.887 (0.842-9.900)</td>
<td>.09</td>
</tr>
</tbody>
</table>

**Discussion**

As our population ages, there has been an increase in research focusing on outcomes of cancer treatment in elderly populations. Most studies have demonstrated that it is not age that determines complications but rather the coexisting medical conditions. This has been studied in both medical and surgical treatments for head and neck cancer. Despite some conflicting data, most authors have found that age alone is not predictive of postoperative complication, but rather it is the patients' medical comorbidities and functional status that contribute to the morbidity and mortality associated with head and neck oncologic procedures. In an effort to standardize the effect that comorbidities have on treatment, clinical severity staging systems have been developed, and known comorbidity indexes have been studied in older patients. Comorbidity indexes, such as the Kaplan-Feinstein Classification, the Charlson Index, and the Adult Co-

When all patients who were discharged to any nursing care facility (SNF, LTACF, or PARF) were compared with those discharged home, the findings were similar (Table 7). Age continued to affect disposition (OR, 1.060; \( P < .001 \)). However, patients were twice as likely to not return home after a free flap reconstruction when controlling for the ASA score (OR, 2.322; \( P = .002 \)). The OR for the effect of LOS on discharge to a nursing facility was 1.090 (\( P < .001 \)). When the ASA score was controlled for, the odds of discharge to a nursing facility was slightly lower at 8.4% for every extra day spent in the hospital (OR, 1.084; \( P < .001 \)). The effect of ASA alone on discharge to any nursing facility was 6% as it increased (OR, 1.057; \( P < .001 \)).

The categorical analysis of age revealed a large increase in the effect on disposition once patients were 71 years of age and even higher at 81 years of age. Patients 71 to 80 years old were almost 5 times as likely to require a nursing facility at discharge (OR, 4.952; \( P = .01 \)). Once older than 80 years, patients were 13 times more likely to be discharged to a nursing facility compared to those 50 years and younger (OR, 13.000; \( P < .001 \)). Generally healthy patients with an ASA score of 1 or 2 were more likely to go home after microvascular reconstruction than those with comorbidities that resulted in an ASA score of 3 or 4 (OR, 4.499; \( P = .002 \)).

Insignificant factors that affect the disposition included reconstruction at the time of primary therapy vs revision or secondary reconstruction (\( P = .80 \)). The number of surgical sites involved in the reconstruction was used to estimate the size of the surgical defect. Despite the assumption that a larger defect might result in a more complicated postoperative course and thus have more postoperative needs, no correlation was found (\( P = .86 \)).
morbidity Evaluation 27 index, have been integrated with tumor stage and grade to better estimate survival in those with oropharyngeal cancer, and a head and neck cancer–specific comorbidity index has also been developed. 7, 36 Amidst the overwhelming data in support of equivalent treatment recommendations, there has yet to be research regarding the posthospitalization needs of the older patient.

This study found that older patients are at an increased risk of being discharged to a nursing or other care facility as opposed to returning home after microvascular reconstruction of head and neck defects. Of our population, 14.1% were unable to return home after surgery. Looking at age continuously, with each year a patient ages, he or she is more than 5% more likely to be discharged to an SNF than to go home. This increases to 9% for LTACFs. When the ages were grouped by decade, we found that patients were 5 times as likely to be unable to return home at discharge once they were 71 years old and 13 times as likely once they were 81 years old. A similar relationship was found between the postoperative LOS and disposition. Both of these relationships were still observed when controlling for patients’ comorbidities by integrating the ASA score. Earlier studies 2, 3, 16-21, 37 have defined age by decade or other increments, all of which are variable.

Using the ASA score to represent the overall health of the patient or the medical comorbidities, we analyzed the ASA score separately for its effect on the disposition of patients after microvascular reconstruction. Although age and LOS affected the disposition, medical comorbidities caused a more notable effect; patients were 3 times as likely to not return home at discharge as the ASA score increases. This finding is consistent with previous research indicating that worsening health and the presence of medical comorbidities result in a more complicated postoperative course. The ASA score is a widely used measure of comorbidities, although given its large effect on disposition as seen in this study, future research could be improved by examining specific comorbidities, such as heart disease and diabetes.

Limitations of this study include the inherent bias of its retrospective design. The oldest and sickest patients may have had alternative methods of reconstruction chosen, or surgery may have been avoided altogether. In addition, although a 10-year period of review allows for a breadth of case type, there have also been changes in our practice over time, such as type of flap chosen for reconstruction and the LOS. The LOS has shortened during the last few years by improving discharge planning and starting rehabilitation and physical therapy and arranging home health services at an earlier point after surgery. It was also not possible to determine which patients were discharged to home with the need for supplies only as opposed to those who required nursing visits, physical therapy, or 24-hour assistance from a family member. If these needs cannot be met at home, then patients qualify for an SNF. Many patients in this study may have undergone tracheostomy or gastrostomy before surgery, particularly those who underwent reconstruction for recurrent tumors. Thus, any home health needs would have been in place before their reconstruction. However, for those who did not have these supportive devices before surgery, the care involved could have been a deciding factor for family members to seek nursing facility placement as opposed to returning home. We have made a policy that all patients undergoing microvascular head and neck reconstruction and their families are counseled in the preoperative setting about the need for rehabilitation, wound care, and possible nursing care after their hospitalization. This is especially imperative in elderly patients and those with significant comorbidities. Another limitation is the lack of data available for the patients’ preoperative living situation (eg, at home alone, with family, or in an assisted living or nursing facility) and for their insurance status because of the 10-year period of review and consequent lack of available information. It is recognized that the postoperative LOS can be determined in part by funding as opposed to medical need while a patient awaits approval for facility placement or equipment delivery.

Treatment modalities are often multidisciplinary, including surgery, chemotherapy, and radiotherapy, particularly with advanced tumors. Life expectancy outside a cancer diagnosis is an initial consideration before offering treatment. If life expectancy is greater than cancer survival, conclusions of earlier studies 2, 12, 14-16, 28-29 suggest that the older patient should be offered the same treatment modalities as those who are younger. Previous research has found that elderly patients are just as likely to survive a major surgical procedure, such as head and neck reconstruction, as those younger than 65 years. 28-37 However, this study demonstrates that older patients are less likely to be discharged home at the end of the hospitalization. Age and LOS, independent of comorbidities as measured by the ASA score, are risk factors for discharge to a nursing or other care facility as opposed to home after microvascular reconstruction.

**Table 7. Discharge to Any Care Facility as Opposed to Home**

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>P Value</th>
<th>OR Controlling for ASA Score (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.060 (1.036-1.085)</td>
<td>&lt;.001</td>
<td>2.322 (1.365-3.948)</td>
<td>.002</td>
</tr>
<tr>
<td>Length of stay</td>
<td>1.090 (1.064-1.116)</td>
<td>&lt;.001</td>
<td>1.084 (1.058-1.111)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>ASA score</td>
<td>1.057 (1.033-1.083)</td>
<td>&lt;.001</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: ASA, American Society of Anesthesiologists; NA, not applicable; OR, odds ratio.

**Article Information**

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Author Contributions: Dr Hatcher had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Hatcher, Browne, Waltonen.

Acquisition of data: All authors.
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Analysis and interpretation of data: Hatchter, Waltonen.

Drafting of the manuscript: Hatchter, Bell, Waltonen.

Critical revision of the manuscript for important intellectual content: Hatchter, Browne, Waltonen.

Statistical analysis: Bell.

Administrative, technical, and material support: Browne, Waltonen.

Study supervision: Browne, Waltonen.

Conflict of Interest Disclosures: None reported.

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REFERENCES


