Clinical Care Pathway for Head and Neck Cancer

A Valuable Tool for Decreasing Resource Utilization

Kristin M. Gendron, MD; Stephen Y. Lai, MD, PhD; Gregory S. Weinstein, MD; Ara A. Chalian, MD; Julian M. Husbands, MD; Patricia F. Wolf, BS; Liesje DiDonato, BS; Randal S. Weber, MD

Objective: To evaluate the durability over time of the reduction of resource utilization after implementing a clinical care pathway (CCP) for head and neck cancer surgery.

Design: Cohort study.

Setting: A tertiary care academic medical center.

Patients: We studied control subjects from 1995 (pre-CCP) (n=87), a cohort from July 1, 1996, through July 31, 1997 (the first year after CCP implementation) (n=43), and a cohort from 1999 (n=82) after major resection and tracheostomy for upper aerodigestive tract cancer.

Interventions: Starting July 1, 1996, all patients undergoing major resection for head and neck cancer were treated using a CCP, which delineates daily interventions and goals.

Main Outcome Measures: Length of stay (LOS), readmission and complication rates, and hospital charges.

Results: Median total LOS and LOS exclusive of the intensive care unit decreased in the first year and remained stable at 3 years (from 13.0 to 8.0 days and from 10.5 to 6.4 days, respectively). The intensive care unit LOS decreased across 3 years from 2.2 to 1.1 days ($P=0.001$). Median total charges declined from $105,410 pre-CCP to $65,919 at 3 years. Incidence of postoperative pneumonia decreased from 12% to 1% ($P=0.02$), and readmission rate decreased from 18% to 11% ($P=0.37$) across 3 years.

Conclusions: The CCP for head and neck cancer maintained the improvement in LOS and charges seen in the first year of implementation and continues to decrease resource utilization while enhancing quality of care.

Arch Otolaryngol Head Neck Surg. 2002;128:258-262

IN THE present medical climate, health care expenses are rising rapidly because of advancing technology and an aging population. In an effort to decelerate this process, physicians are under great pressure to decrease costs. During the 1980s, amid growing health care expenditures and decreasing reimbursement, clinical care pathways (CCPs) emerged as a tool for decreasing costs.1 The CCPs are structured patient health care plans that organize daily interventions and goals for a specific diagnosis or procedure along a time line. By explicitly outlining a daily care plan and providing a structure for documentation of the patients’ progress, CCPs standardize patient care and define the steps necessary to limit length of stay (LOS) in the hospital.2 The greatest potential for CCPs to significantly decrease health care expenditures and optimize patient care is in the context of high-volume procedures, eg, total joint replacement and carotid endarterectomy, and those requiring complex care. Major resections for head and neck cancer are well suited for a CCP, because subsequent postoperative care requires the coordination of multiple services, including physical, occupational, respiratory, and speech therapy; nutrition; and social work.3,4

At the Hospital of the University of Pennsylvania, Philadelphia, a CCP for patients undergoing major resection for upper aerodigestive tract cancer was implemented in July 1996. This pathway outlines daily interventions and goals, with the ultimate objective of discharging patients undergoing laryngectomy on postoperative day 5 or 6 and patients undergoing microvascular free- or pectoralis-flap reconstruction on postoperative day 8. Through a process of reviewing deviations, or variances, from the pathway and input from members of the health care team, the CCP is continuously evaluated and has been formally revised several times.
PATIENTS AND METHODS

The CCP was developed and continues to be modified by a multidisciplinary team that includes surgeons, nurses, and allied health care representatives. Eligibility is determined by procedure, including total or partial laryngectomy, major intraoral resection, and composite resection with or without reconstruction. Patients are also included if they may require a tracheostomy and/or a feeding tube. Because we used the diagnosis related group code for tracheostomy to search for the control cohort, all patients included in the current study underwent a tracheostomy. The format for the CCP is a 1-page table containing a list of goals and interventions for each postoperative day, followed by a page for each day on which accomplishments are recorded. When goals are not met, the variances are recorded in detail on the flow sheet.

The 1999 study by Husbands et al compared outcomes experienced by 2 cohorts of patients undergoing major resections for upper aerodigestive tract cancer. Group 1 was treated from January 1 to December 31, 1995, the year before the CCP was implemented, and group 2 was treated in the year after implementation, from July 1, 1996, through July 1, 1997. Group 1 was identified by searching all surgical patients from 1995 using the diagnosis related group code for tracheostomy. The resulting list was then limited to those patients meeting criteria for the head and neck cancer CCP, ultimately creating a control group of 87 patients. Group 2 included 43 patients from the first year after CCP implementation. The present study introduces group 3, which included 82 patients in the CCP treated from January 1 through December 31, 1999, 3 years after implementation. One additional patient was excluded because the medical chart was inaccessible. All patients in the study underwent tracheostomy and 1 or more of the following procedures: head and neck free-flap reconstruction, total or partial laryngectomy, major intraoral resection, composite resection, or neck dissection. All eligible patients were enrolled in the CCP.

The inpatient medical chart and the complete charge summary for each patient were reviewed. Data were organized according to demographics (age, sex, alcohol and tobacco use, and comorbidities), primary tumor site, TNM stage, and procedure. We evaluated total LOS, intensive care unit (ICU) LOS, complication and readmission rates, and median charge per patient as the primary outcomes. The charge summary was divided into the following 6 categories: total, hospital room, pharmacy, operating room, laboratory, and other charges. Professional fees were not included. An increase in charge rates of approximately 25% occurred from 1997 to 1999. No adjustments were made to the data to adjust for this rate change.

We compared variables for 2 groups using the Mann-Whitney test, and for 3 groups at once using the Kruskal Wallis 1-way analysis of variance. We analyzed the categoric variables using the Pearson χ² test with Yates correction where applicable.

Table 1. Demographic Data*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>P</th>
<th>Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median age, y</td>
<td>65</td>
<td>61</td>
<td>60</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>Sex, female</td>
<td>25 (29)</td>
<td>9 (21)</td>
<td>22 (27)</td>
<td>.92</td>
<td></td>
</tr>
<tr>
<td>Smoking, yes‡</td>
<td>78 (96)</td>
<td>36 (90)</td>
<td>73 (90)</td>
<td>.21</td>
<td></td>
</tr>
<tr>
<td>Alcohol use, yes§</td>
<td>61 (75)</td>
<td>30 (73)</td>
<td>38 (54)</td>
<td>.002</td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>5 (6)</td>
<td>2 (5)</td>
<td>9 (11)</td>
<td>.30</td>
<td></td>
</tr>
<tr>
<td>CAD</td>
<td>14 (16)</td>
<td>7 (16)</td>
<td>8 (10)</td>
<td>.32</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>11 (13)</td>
<td>9 (21)</td>
<td>16 (20)</td>
<td>.31</td>
<td></td>
</tr>
<tr>
<td>Renal disease</td>
<td>1 (1)</td>
<td>1 (2)</td>
<td>2 (2)</td>
<td>.51</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>20 (23)</td>
<td>10 (23)</td>
<td>36 (44)</td>
<td>.007</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>47 (54)</td>
<td>23 (54)</td>
<td>50 (61)</td>
<td>.45</td>
<td></td>
</tr>
</tbody>
</table>

*Data are given as number (percentage) unless otherwise indicated. CAD indicates coronary artery disease; COPD, chronic obstructive pulmonary disease. Groups are described in the “Patients and Methods” section.
†Comparisons are between groups 1 and 3. All except for median age are based on χ² test. P value for median age is based on nonparametric Mann-Whitney test.
‡After excluding patients for whom a smoking history could not be attained, for group 1, n = 81; group 2, n = 40; and group 3, n = 81.
§After excluding patients for whom an alcohol use history could not be attained, for group 1, n = 81; group 2, n = 41; and group 3, n = 70.

In 1999, Husbands et al published a study showing that, in the first year of implementation of the head and neck cancer CCP, total LOS and charges decreased. The purpose of the present study is to evaluate the durability of the progress seen in the first year after CCP implementation and to assess how 3 years of development has continued to affect outcome measures.

RESULTS

As demonstrated in Table 1, the recorded demographic variables were similar across the 3 groups, with the exception of alcohol consumption and the proportion of patients with hypertension. Although most patients in all 3 groups smoked tobacco and consumed alcohol on a regular basis, group 3 had a higher percentage of those who did not drink alcohol (for patients with a complete social history in each group, 32 [46%] of 70 patients vs 20 [25%] of 81 patients). The comorbidities varied somewhat from group to group, with a higher incidence of diabetes and hypertension and a lower incidence of coronary artery disease in group 3 compared with the 2 previous groups. However, only the increase in hypertension, from 20 patients (23%) in group 1 to 36 (44%) in group 3, is statistically significant (P = .007). The most recent data indicated that the variation in LOS relative to comorbid conditions decreased, with a median LOS of 8.0 days for all comorbidity categories except renal disease (median, 10.0 days) (Table 2). The median LOS for patients undergoing reconstruction decreased from 15.0 days in group 1 to 8.0 days in group 3.

The site and stage of the primary cancer varied minimally among groups (Table 3). In all 3 groups, oral cavity and laryngeal cancer were the 2 most common types, with oral cavity cancer leading in groups 1 and 2 and laryngeal cancer leading in group 3. The greatest proportion of patients undergoing major resection for upper aero-
digestive tract cancer had T4 cancers, and roughly half of these were stage N0. The percentage of patients undergoing reconstruction decreased from 48 patients (55%) and 26 (60%) in groups 1 and 2, respectively, to 38 (46%) in group 3.

Overall, the median total LOS, ICU LOS, and total costs all decreased since implementation of the CCP (Table 4 and Figure 1). The median total LOS (decrease, 13.0 to 8.0 days; *P* < .001) and non-ICU LOS (decrease, 10.5 to 6.4 days; *P* < .001) in group 3 equaled the improvements seen in group 2. Moreover, the decrease in ICU LOS became significant, down from 2.2 days in group 1 to 1.1 days in group 3 (*P* = .001). The median total charges also steadily declined from $105,410 in group 1 to $78,930 in group 2 and to $65,919 in group 3 (Figure 1).

To evaluate quality of care, complication and re-admission rates were observed. As shown in Figure 2, complication rates remained stable after implementation of the CCP, and the incidence of pneumonia decreased significantly, dropping from 10 patients (11%)...
in group 1 to 1 (1%) in group 3 (P = .02). The 30-day readmission rate declined from 16 patients (18%) in group 1 to 9 (11%) in group 3, but was not statistically significant (Table 4).

An increasing number of patients received visiting nursing care at home—increasing to 70 patients (85%) in group 3 from 29 (33%) in group 1—and more had tracheostomy tubes (increase, 40 patients [46%] to 66 [80%]) at the time of discharge (Table 5).

In the current era of diminishing reimbursements for costly health care, CCPs serve as a tool to decrease resource utilization. Pathways are particularly useful for high-volume diagnoses and those requiring a complex treatment plan. Resections for head and neck cancer are an ideal target for CCPs, because they require well-coordinated, multidisciplinary postoperative care, including specialists in nutrition, speech therapy, social work, physical therapy, respiratory services, and other areas. Successful, expedient discharges depend on good communication among these services and the family, patient education, and timely rehabilitation therapy. A CCP helps the process by placing the necessary interventions and daily goals on a time line. Pathways also help to prevent costly and unnecessary variations in medications and laboratory tests by delineating a standardized care plan.

The head and neck cancer CCP in this study was designed to provide steps toward reaching specific discharge criteria by postoperative day 8. Discharge criteria include evidence of wound healing; independence in tube feedings, tracheostomy care, and flap care; a functional communication system; an understanding of a home exercise regimen; a stable airway; and the arrangement of adequate home health care and follow-up. To reach these goals, they are expressed to the patient and the patient’s family early during and throughout the hospitalization, and daily objectives are clearly defined. Keeping all of the non-ICU patients on a single ward increases the nursing staff’s familiarity with the CCP and with aspects of patient care specific to resections for head and neck cancer. This effect is similar to the otolaryngology care units designated at some hospitals. Patients are admitted on the same day as their procedure, and medical staff for nutrition support, physical therapy, speech therapy, and respiratory therapy are all consulted on the operative day. Most patients are out of bed on the first postoperative day, and patient education and discharge planning are initiated in the first 2 postoperative days. Patient education and rehabilitation are pursued aggressively to optimize functional status, and visiting nurses are frequently involved to help with tube feeding and tracheostomy and wound care in the period immediately after discharge. As the LOS has decreased, the number of patients discharged with a tracheostomy tube has risen. Although a tracheostomy tube is viewed by some as a barrier to discharge, the readmission rate in this series decreased despite an increased frequency of discharge with tracheostomy tubes in place. Intensive patient education on tracheostomy care and increasing use of visiting nursing care after discharge helped to ensure that these patients received adequate care.

The CCPs are dynamic, and modifications at regular intervals continue to shape the CCPs and improve their effectiveness. Several changes have been made to the head and neck cancer CCP over time, especially in the interest of decreasing time in the ICU. The fluid nature of the CCP is reflected in continuously changing and improving outcomes. For example, the median LOS, which decreased from group 1 to group 2, has been stable over time as demonstrated by group 3. However, median ICU LOS, median total charges, and the rate of postoperative pneumonia continued to decrease.

Several arguments have been made against the use of CCPs. A primary concern is that CCPs encourage “cookbook medicine” because the physician is not required to consider the details of each patient’s care. At our institution, regularly scheduled treatment plan meetings between the chief resident of the head and neck surgery service and representatives from the nursing staff ensure individualized care. In addition, recording variances and responding to them with alterations in the treatment plan further customize patient care.

Another critique of CCPs was published by Falconer et al7 who conducted a randomized clinical trial of a critical path method (CPM) used for stroke rehabilitation and found that it did not improve outcome or decrease LOS or charges. In that case, a CPM was introduced into a situation in which the treatment plan for a diagnosis was already relatively standardized. The stroke CPM also faced the challenge of being split between the conflicting goals of maximizing the functional benefit of rehabilitation while minimizing LOS. These issues are most problematic in the setting of rehabilitation, but they remind us that the most important step in creating a useful CCP is that of choosing a procedure and setting that can most benefit from the regimen.

The concern expressed by Falconer et al7 that external regulation has dramatically influenced practice, and that the effects are indistinguishable from those due to

Table 5. Discharge Data*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group 1 No. (%)</th>
<th>Group 2 No. (%)</th>
<th>Group 3 No. (%)</th>
<th>ValueP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destination at discharge‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>43 (49)</td>
<td>24 (56)</td>
<td>2 (2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>SNF</td>
<td>10 (11)</td>
<td>4 (9)</td>
<td>9 (11)</td>
<td></td>
</tr>
<tr>
<td>VNA</td>
<td>29 (33)</td>
<td>15 (35)</td>
<td>70 (85)</td>
<td></td>
</tr>
<tr>
<td>Condition at discharge§</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tracheostomy</td>
<td>40 (46)</td>
<td>23 (53)</td>
<td>66 (80)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>G tube</td>
<td>59 (68)</td>
<td>13 (30)</td>
<td>48 (59)</td>
<td>.28</td>
</tr>
<tr>
<td>NG tube</td>
<td>3 (3)</td>
<td>10 (23)</td>
<td>20 (24)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*SNF indicates skilled nursing facility; VNA, visiting nursing assistance; tracheostomy, tracheostomy tube or laryngeal tube; G tube, gastric feeding tube; and NG tube, nasogastric feeding tube. Groups are described in the “Patients and Methods” section.
‡Based on χ² test comparing groups 1 and 3.
§Death before discharge: 2 (2%) in group 1, 0 in groups 2 and 3. Transfer to another facility: 1 (1%) in group 3, 0 in groups 1 and 2. Not stated: 3 (3%) in group 1, 0 in groups 2 and 3. Patients could have more than 1 condition at discharge.
the CPM, is most relevant to the head and neck cancer CCP. As the use of utilization review committees by insurance companies rises in popularity, and as more hospital days are denied, physicians are changing their practice with or without CCPs. To expect a CCP to decrease resource utilization when it has already been maximally controlled may also be unreasonable. Although these problems undoubtedly confound the study of a CCP’s effectiveness, they do not necessarily diminish the importance of a CCP as a means to accomplish a necessary goal. Physicians across the country are discharging their patients after shorter hospital stays, but CCPs offer a method for standardizing treatment plans, minimizing unnecessary variations in patient care, and decreasing LOS and charges while optimizing therapeutic outcomes.

The present study suggests that a CCP is an effective tool for decreasing LOS, ICU LOS, and hospital charges without compromising quality of care. Overall, complication rates did not rise, and the incidence of postoperative pneumonia decreased. Limiting the occurrence of postoperative pneumonia is particularly important because it is the most common complication seen after head and neck surgical procedures (3.26%) and is associated with a mortality rate of 10.94%. Readmission rates also dropped from 16 patients (18%) to 9 (11%), although this was not statistically significant.

Although these results are encouraging, this review has some limitations. Follow-up data, eg, readmission to outside hospitals, the number of home visits nurses made for each patient, and the expenses related to both of these services, are not recorded in the inpatient chart. The organization of charge summaries changed somewhat since 1997 and may have affected the categorization of charges.

Having a dynamic CCP can continuously improve patient care, but it does not substitute for well-controlled studies on various aspects of care. A consensus on an appropriate plan for postoperative care reached by a multidisciplinary team does not mean that the care plan is scientifically supported. New data should be generated to optimize patient treatment and to incorporate new findings into the CCP.

In the 3 years after implementation of a CCP for patients undergoing major resection for head and neck cancer, a decrease in resource utilization has been paralleled by improvements in quality of care. In particular, the incidence of pneumonia, the most common major complication seen after head and neck surgery, has decreased significantly. These changes have been made by tightly coordinating the multiple services providing patient care, diminishing unnecessary variability in clinical practice, and aggressively pursuing patient education and independence throughout the hospital stay. The dynamic nature of a CCP allows for continuing improvement based on a review of variants. Modifications to the CCP have expedited transfer out of ICUs and continue to lower ICU LOS and total charges. Overall, the pathway has been a beneficial tool for patients and health care professionals alike.

Accepted for publication September 12, 2001.

This study was presented at the annual meeting of the American Head and Neck Society, Palm Desert, Calif, May 15, 2001.

We thank Barbara Pryor for her work on identifying patients for the study and clarifying the details of the CCP.

Corresponding author and reprints: Randal S. Weber, MD, Department of Otorhinolaryngology—Head and Neck Surgery, 3400 Spruce St, 5 Ravdin, Philadelphia, PA 19104 (e-mail: weberRa@uphs.upenn.edu).

REFERENCES