



Unplanned Hospital Readmission and Visit to the Emergency Room in the First Thirty Days after Head and Neck Surgery: A Prospective, Single-center Study

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Abstract

Introduction Head and neck surgery remains a complex field; the patients can suffer important functional or life-threatening complications after treatment that need unplanned readmissions, increasing the cost related to the treatment.

Objective To evaluate the incidence risk factors and causes associated with 30-day unplanned hospital readmission and visit to the emergency room (ER) after surgery for head and neck cancer.

Methods Prospective, longitudinal, nonrandomized study.

Results A total of 834 patients were included, 726 in the major surgery group and 108 in the minor surgery group. The 30-day readmission rate for all causes was of 7,9% for the patients treated by a major surgery and of 0% for the patients treated in the outpatient clinic for minor procedures, to a total readmission rate of 6,8%. The rate of visit to the emergency room for all causes in the first 30 days was of 14% for the patients treated by a major surgery and of 2,7% for the patients treated in the outpatient clinic.

Conclusion Major surgery, the American Society of Anesthesiologists (ASA) status and type of wound are conditions related to unplanned readmission or visit to the ER in the first 30 day after discharge. The most commonly associated causes are infections or wound complications. An evidence-based risk stratification of the patients can be important to improve decision-making and resource utilization. An educational strategy can provide possible ways to improve the rate of readmission and reduce the amount of money expended by healthcare systems.

Keywords

- ▶ head
- ▶ neck
- ▶ surgery
- ▶ complications

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Introduction

Head and neck surgery remains a complex field; patients with these kinds of pathologies can suffer significant functional or life-threatening complications after treatment that need unplanned readmissions increasing the cost related to the treatment. In 2014, the United States Healthcare system spent US\$3 trillion and, to try to decrease this, a hospital readmissions reduction program was applied to evaluate the quality of care and the financial implications.¹

The causes of 30-day readmission for surgical patients differ from those of medical patients; nonetheless, readmissions after surgical procedures can also be secondary to a medical condition or to complications or comorbidity exacerbated by the procedure itself.²⁻⁴

Prior studies performed in North American otorhinolaryngology - head and neck surgery departments seeking to identify risk factors for unplanned hospital readmission among patients undergoing otolaryngology procedures reported rates of hospital readmission ranging from 3.1 to 7.3%.^{2,4-9} These studies identified a strong association between the occurrence of postoperative complications and unplanned 30-day readmissions.^{2,10} In another study that included 1,058 patients undergoing ear, nose, and throat (ENT) surgery, Graboyes et al. found that patients who experienced a complication during or after their index hospitalization were 11.9 times more likely to be readmitted to the hospital within 30 days than patients without complications.² Regarding the reported 30-day readmission rates for head and neck surgery, it ranges from 3.2 to 26.5%, depending on the subsite, on the complexity of the surgery, and on a variety of factors.^{2,3,7-9,11,12}

There is no data reported from European otorhinolaryngology - head and neck surgery departments about unplanned hospital readmission after head and neck surgery. Moreover, further understanding is needed about the risk factors associated with this. For that reason, the objective of the present study was to evaluate prospectively the incidence risk factors and causes associated with 30-day unplanned hospital readmission and visit to the emergency room (ER) after surgery for head and neck tumors.

Materials and Methods

A prospective, longitudinal, nonrandomized study was performed with the approval of the Ethics Committee of our Center (CCH-071719). Patients diagnosed with benign or malignant head and neck pathology, ≥ 18 years old, undergoing inpatient or outpatient head and neck surgery in a tertiary university hospital between July of 2016 and July 2019 were included consecutively, excluding patients undergoing thyroid surgery (which is performed by general surgeons at our institution). Unplanned readmission was defined as "any unplanned readmission to the same or another hospital for a postoperative occurrence likely related to the principal surgical procedure within 30 days of the procedure".⁹ Thus, hospital readmissions that occurred within 30 days of surgery and were planned or unrelated

to the first surgical procedure were excluded. To achieve this, a follow-up protocol was conducted during the first 30 days after patient discharge to identify and classify any additional episodes of a visit to the emergency room or the need of readmission.

The demographic data (age, sex), comorbidities, diagnosis, stage in case of malignancy, imaging (computed tomography [CT], magnetic resonance imaging [MRI], ultrasound), the American Society of Anesthesiologists (ASA) classification, type of surgery, complications, outcomes after surgery, among others, were obtained during data collection. Readmission and the emergency room visit analysis was performed on this data.

Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, NY, USA). Quantitative variables are expressed as media \pm standard deviation (SD). Bivariate analysis using chi-squared and *t*-tests were used to analyze categorical and continuous variables, respectively. Univariate and multivariate logistic regression analysis was used to identify factors associated with 30-day readmission. Odds ratios (OR) and 95% confidence intervals (95% CIs) were calculated for the strength of association. All tests were 2-sided, and a *p*-value < 0.05 was considered statistically significant.

Results

A total of 834 patients, which represent 13.6% of the annual volume of patients of our department (2,096 surgeries per year and 6,288 surgeries in 3 years) met the inclusion criteria, 726 in the group of major surgery and 108 in the group of minor surgery. Of these, 573 (68.7%) were male and 261 (31.3%) were female. The age average was 59 years old (SD = 14.80; minimum 18; maximum 90). All demographic data are presented in **Table 1**. The patients had undergone a primary surgery of the head and neck region due to benign or malignant tumors, with a 30-day readmission rate for all causes of 7.9% for patients treated by a major surgery and of 0% for patients treated in the outpatient clinic for minor procedures, to a total rate of readmission of 6.8%. The rate of a visit to the emergency room for all causes in the first 30 days was of 14% for patients treated by major surgery and of 2.7% for patients treated in the outpatient clinic (**Table 2**).

In the group of major surgery, 42 (10.9%) patients treated for benign tumors and 63 (18.4%) patients treated for malignant tumors presented to the emergency room in the first 30 days after discharge (*p* = 0.130). Moreover, 18 (4.6%) patients treated for benign tumors and 39 (11.4%) treated for malignant tumors needed to be readmitted at the hospital to treat some complication in first 30 days after discharge (*p* = 0.054). The most common subsites were the larynx (*n* = 271), followed by parotid gland surgery (*n* = 127), skin cancer (*n* = 44), oral tongue (*n* = 32), and the oropharynx (*n* = 31).

In our patient population, 7.9% had unplanned hospital readmission, and 14.5% needed to visit the emergency room. When we evaluated the variables in the univariate and multivariate analysis, we only found statistical significance

Table 1 Demographic data and univariate analysis comparing parameters between patients who needed to be readmitted or visited the emergency room in the first 30 days after hospital discharge

	n	%	Patients not readmitted	Patients readmitted	30-day readmission p-value	Patients who did not visit the ER	Patients who needed to visit the ER	30-day visit to the ER p-value
Number of patients	834							
Age	59 years old ± 14.80 (Min. 18/Max. 90)							
Sex								
Male	573	68.7	531	42	0.682	492	81	0.546
Female	261	31.3	246	15		231	30	
Type of surgery								
- Major Surgery	726	87	669	57	0.001	621	105	0.001
- Minor Surgery (Outpatient Clinic)	108	13	108	0		105	3	
Smoking								
Yes	435	52.1	393	42	0.728	360	75	0.498
No	399	47.9	384	15		363	36	
N° Packs per year	25.37 ± 26.1 (Min: 8/Max: 100)							
Alcohol (> 70 gr/day)								
Yes	303	36.3	276	27	0.721	258	45	0.074
No	531	63.7	501	30		465	66	
HTA								
Yes	327	35.6	300	27	0.950	273	54	0.663
No	507	64.4	477	30		450	57	
DM								
Yes	117	14	102	15	0.162	99	18	0.141
No	717	86	669	42		618	99	
Malnutrition (BMI < 18.5)								
Yes	39	4.67	27	12	0.070	21	18	0.248
No	183	21.9	165	18	0.082	156	27	0.043
Obesity								
Yes	87	10.4	81	6	0.770	78	9	0.279
No	144	17.2	129	15	0.966	117	27	0.354
Cardiopathy								
I	60	8.3	54	6	0.006	48	12	0.002
II	444	61.2	417	27		384	60	
III	213	29.3	189	24		180	33	
IV	3	0.4	3	0		3	0	
Neoadjuvant treatment (RT/CRT)								
Yes	56/726	7.7	53	3	0.256	52	4	0.301
No	63/726	8.6	54	9	0.232	45	18	0.151
Length of stay								
Length of stay > 7 days	6.43 ± 9.2 (Min: 1/Max: 74)							
Length of stay ≤ 7 days	150/726	20.7	129	21	0.123	108	42	0.204
Wound class								
I	366	43.8	339	27	0.002	315	51	0.001
II	138	16.5	117	21		105	33	
III	330	39.6	321	9		303	27	
IV								
Type of histology (*)								
Benign	384	52.89	366	18	0.054	342	42	0.130
Malignant	342	47.11	303	39		279	63	

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; CRT, chemoradiotherapy; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ER, emergency room; HTA, arterial hypertension; RT, radiotherapy.

Table 2 Multivariate analysis of variables associated with readmission or visit to the emergency room

	30-day Readmission	30-day visit to the ER
Age	0.430 (95%CI: - 0.651–1.579)	0.218 (95%CI: - 0.651–1.579)
Sex Male Female	0.858 (95%CI: - 0.308-- 0.181)	0.639 (95%CI: - 0.249-- 0.111)
Type of surgery - Major Surgery - Minor Surgery (Outpatient Clin95%CI)	0.001 (95%CI: - 0.784-- 0.677)	0.001 (95%CI: - 0.724-- 0.607)
Smoking N° Packs per year	0.181 (95%CI: - 0.455-- 0.301)	0.385(95%CI: - 0.496-- 0.193)
Alcohol (> 70 gr–day)	0.463 (95%CI: - 0.358-- 0.232)	0.187 (95%CI: - 0.405–0.801)
HTA	0.483 (95%CI: - 0.388-- 0.260)	0.537 (95%CI: - 0.323–0.169)
DM	0.676 (95%CI: - 0.147–0.154)	0.663 (95%CI: - 0.084–0.221)
Malnutrition (BMI < 18.5)	0.009 (95%CI: - 0.015–0.065)	0.021 (95%CI: - 0.323-- 0.270)
Obesity	0.720 (95%CI: - 0.237-- 0.110)	0.980(95%CI: - 0.178-- 0.037)
COPD	0.585 (95%CI: - 0.091–0.005)	0.353 (95%CI: - 0.034-- 0.077)
Chronic cardiac disease	0.550 (95%CI: -0.156-- 0.052)	0.776 (95%CI: - 0.097–0.018)
ASA I II III IV	0.001 (95%CI: 0.216–0.384)	0.008 (95%CI: 0.280–0.454)
Flap:	0.571 (95%CI: 0.340–0.769)	0.613 (95%CI: - 0.707-- 0.270)
Neoadjuvant treatment (RT–CRT)	0.345 (95%CI: 0.179–0.467)	0.412 (95%CI: 0.123–0.671)
Length of stay >7 days	0.067 (95%CI: 0.776–0.851)	0.055 (95%CI: 0.840–0.919)
Wound class - Clean - Clean/contaminated - Contaminated	0.008 (95%CI: 0.071–0.237)	0.006 (95%CI: - 0.022–0.202)
Type of histology Benign Malignant	0.083 (95%CI: - 0.255-- 0.111)	0.184(95%CI: - 0.392-- 0.083)

Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; CRT, chemoradiotherapy; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ER, emergency room; HTA, arterial hypertension; RT, radiotherapy.

related to need the rate of readmission or visit to the emergency room according to the type of surgery (major versus minor procedures), ASA classification, or wound class. However, when we compared the results between the patients in the major surgery group who needed to be readmitted or who needed to visit the emergency room in the first 30 days after discharge and those who did not need, malignant histology ($p=0.006$), ASA ($p=0.001$), malnutrition ($p=0.002$), and length of hospitalization > 7 days ($p=0.016$) were related to a major risk of readmission, while ASA ($p=0.001$), malnutrition ($p=0.002$) and length of hospitalization > 7 days ($p=0.016$) were related to a major risk of visit to the emergency room in the first 30 days after discharge (► **Table 3**). In contrast, other factors, such as the need of neoadjuvant treatment with radiotherapy or chemoradiotherapy, were not related with an increased risk of readmission ($p=0.256$) or with visit to the emergency room ($p=0.301$). Data about the type of major surgery

performed, the cause of a visit to the emergency room, the most common cause of readmission or reintervention, and the type of reintervention can be seen on ► **Tables 4, 5, ►supplementary Table S1, S2** and ► **supplementary Fig S1** (online only).

Discussion

Readmissions are often indicative of ineffective patient management, raising questions regarding the quality of care provided and generating significant costs for the health-care system.¹³ Although some readmissions are unavoidable as a result of patient frailty or inevitable disease progression, others are preventable if patients receive the right care at the right time, reducing unnecessary readmissions.

Previous studies on head and neck cancer patients demonstrate the complex subset of these patients, who tend to be more frequently readmitted. Evaluating 155 total

Table 3 Comparisons of factors between patients who needed to be readmitted or visited the emergency room in the major surgery group

Variable	Need of readmission (p)	Need of visit to the ER (p)
Gender	0.113	0.679
Smoking	0.195	0.234
Alcohol	0.427	0.618
Histology: malignant-versus benign	0.006	0.195
ASA	0.001	0.001
Malnutrition (BMI < 18.5)	0.002	0.001
Obesity	0.516	0.790
DM	0.513	0.856
HTA	0.391	0.278
COPD	0.729	0.361
Cardiopathy	0.401	0.643
Neoadjuvant treatment RT/CRT	0.163	0.413
Length of hospitalization > 7 days	0.016	0.002

Abbreviations: CRT, chemoradiotherapy; DM, diabetes mellitus; HTA, arterial hypertension; COPD, chronic obstructive pulmonary disease; RT, Radiotherapy.

laryngectomy patients treated at one institution, Graboyes et al. found a 26.5% 30-day readmission rate.¹¹ Chaudhary et al. examined 1,518 elderly patients with oropharyngeal and laryngeal cancer from Medicare data in the USA and found that 14.1% of them were readmitted within the first 30 days of hospital discharge.¹⁴ Chen et al. performed a retrospective cohort study of head and neck cancer patients based on the Nationwide Readmissions Database from the USA and reported a 16.1% overall readmission rate, with the highest readmission rates for patients with laryngeal (21.8%) and hypopharyngeal (29.6%) cancer.¹⁵ Moreover, Bur et al. performed a retrospective analysis including data from the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database looking for clinical risk factors and complications related to unplanned hospital readmission, reporting a rate of 5.1% of unplanned readmission in 2 years.¹⁶ More recently, Baskin et al. highlighted the risk of return to the emergency room 30 days after surgery among patients who underwent head and neck surgery who needed to go to the intensive care unit.⁷ In another study, Goel et al. demonstrated a higher rate of readmission in patients who underwent head and neck reconstruction after ablative surgery.⁸ And Wu et al. in a study performed in Canada including patients who underwent head and neck surgery for benign and malignant disease, reported a rate of 3.2% of unplanned readmissions and of 8.4% of emergency room visits in the first 30 days after surgery.⁹ Similarly, our study reports a 7.9% overall readmission rate for patients

treated for benign or malignant pathology, and of 11.4% for patients treated by malignant disease, with the highest readmission rates for patients with laryngeal cancer (31.5%).

According to our data, the rate of unplanned readmission or the need to visit the emergency room during the first 30 days after hospital discharge was associated with major surgery, ASA classification status, and the type of wound, like in previous studies.¹⁶ Malignant histology, ASA classification status, malnutrition, and length of hospitalization > 7 days were the factors related to an increased risk of readmission. The ASA classification status, malnutrition, and length of hospitalization > 7 days were related to an increased risk of visit to the emergency room in the first 30 days after discharge. Previous data reported by Bur et al. demonstrated that the most common cause of unplanned readmissions after head and neck surgery were infectious, including wound infection or breakdown (24%) and pneumonia (6.4%). However, this study has some limitations because it examined readmissions starting from 30 days of the surgical date instead of the discharge date, which may underestimate the readmissions in the first 30 days after discharge for complex head and neck patients with prolonged hospital stays.¹⁶ Meanwhile, in our cohort, surgical site infection (2.87%), wound seroma (1.07%), pain (2.15%), salivary fistula (1.07%), or dysphagia (1.07%) were the most common causes of unplanned readmission or visit to the emergency room for all patients treated by benign or malignant disease of the head and neck.

Chen et al. evaluated patient comorbidities and showed that valvular heart disease, rheumatoid arthritis or collagen vascular disease, liver disease, and hypothyroidism were independently associated with readmission. They hypothesize that most readmissions are due to infectious and wound healing issues and, for that reason, these comorbidities become particularly important. They suggest that rheumatoid arthritis and collagen vascular disease are markers of long-term steroid use and chronic immunosuppression, and that these comorbidities can be related to unplanned readmission.¹⁵ Similarly, Graboyes et al., in a previous study, found that long-term steroid use was associated with readmission in laryngectomy patients.¹¹ Furthermore, hypothyroidism and liver disease can contribute to difficulties in wound healing.^{17,18} In our cohort, comorbidities such as diabetes, hypertension, obesity, COPD, or chronic cardiac disease were not associated with readmission. However, due to previously reported data, the need for an evidence-based risk stratification of the patients can be essential to improve decision-making and resource utilization. In this way, further investigation is needed to understand risk factors for unplanned hospital readmission after head and neck surgery. Strategies in future research need to include and report tools like the Charlson Comorbidity Index¹⁹ and to classify the patients routinely according to the Clavien and Dindo Classification.²⁰

Another critical issue related to unplanned readmission is the cost to the healthcare system. Chen et al. report 30-day readmission costs of US\$14,895 (€16,860) on average for all payers in the USA,¹⁵ similarly to prior data reported by Chaudhary et al. on Medicare patients, which demonstrated that oropharyngeal and laryngeal cancer patients who were

Table 4 Cases according to major or minor Surgery, 30-day readmission rate, 30-Day visit to the emergency room, type of histology, hospital readmission length of stay, and need of reintervention

Variables	n	%
Major surgery	726	87
30-day readmission rate	57	7.9
30-day visit to the ER	102	14
Minor surgery	108	13
30-day readmission rate	0	0
30-day visit to the ER	3	2.7
Visit to the ER according to histology		
Benign	42/384	10.9
Malignant	60/342	17.5
Readmission according to histology		
Benign	18/384	4.6
Malignant	39/342	11.4
Hospital readmission length of stay	2 ± 1.6 (Min: 1/Max: 17)	
Need of reintervention by cause		
Infection/abscess	11	
Fistula	4	
Intestinal perforation	3	
Wound/skin dehiscence	3	
Haemoptysis/oral bleeding	3	
Total	24	2.8%
Cause	Procedure	
Infection/abscess	Surgical drainage in all cases	
Fistula	Pectoralis major flap in 3 cases, supraclavicular flap in 1 case.	
Intestinal perforation	Surgical revision by general surgeons.	
Wound/skin dehiscence	Skin suture in all cases.	
Haemoptysis/oral bleeding	Surgical revision and hemostasis.	

readmitted had mean costs that were US\$15,123 (€17,120) higher than those who were not readmitted.¹⁴ Across European countries, healthcare providers are almost public, being necessary for the otorhinolaryngology-head and neck departments to evaluate their results and make some interventions aimed to improve them and to improve their savings, if necessary.

According to our data, the majority of readmissions are related to minor problems requiring only short hospital stays, and the significant financial impact over departments suggests that this is an area where some strategies can produce potential savings. In this way, avoiding preventable complication needs to be the primary objective in the postoperative period, translating this into a direct impact on the quality of life of our patients after discharge. Intervention over the risk of deep-vein thrombosis or venous thromboembolism, the correct use of antibiotics, implementation of protocols to assess the risk of dysphagia or silent aspiration aimed to prevent aspiration pneumonia, the cor-

rect dosage of nonsteroid anti-inflammatory drugs or corticosteroids and the use of proton pump inhibitors needs to be implemented. Moreover, as proposed by Danino et al. some possible ways to improve the rate of readmission can be a better patient or caregiver education related to possible complications, which can be done using written information describing postoperative symptoms and alarm signs, giving contact information to solve doubts, providing adequate analgesia to improve the quality of patient care, administering antibiotics in cases in which they may be needed, including a postoperative follow-up telephone call, and improving the training of emergency doctors in postoperative care of head and neck tumor patients to manage nonemergency complication, preventing the need for reattendance or potential readmission.⁵

Finally, a limitation in our study can be the small sample size compared with previous retrospective studies and the lack of cost-related analysis. For that reason, we decide to expand the duration of our study to evaluate and report more

Table 5 Types of surgery performed and the rate of visit to the ER or of readmission in the first 30 days

Major Surgery	Visit to the ER	Need of Readmission	Minor Surgery	Visit to the ER	Need of Readmission
Laser surgery of the larynx without neck dissection	12/184	6/184	Adenectomy	2/36	0/36
Laser surgery of the supraglottis with neck dissection	12/38	9/38	Tracheostomy closure	0/15	0/15
Laser surgery of the hypopharynx	6/25	6/25	Sebaceous cyst resection	0/12	0/12
Cricopharyngeal laser miotomy	0/1	0/1	Oral leucoplakia biopsy	0/12	0/12
Total laryngectomy	10/49	5/49	Oral papilloma resection	0/12	0/12
Oropharyngectomy	6/31	3/31	Facial palsy outpatient surgery	1/9	0/9
Oral tongue cancer	2/32	1/32	Oral angioma resection	0/6	0/6
Lip cancer resection	1/14	0/14	Vermellectomy	0/6	0/6
Tumor of the cheek mucosa	0/5	0/5	Small cervical lipoma	0/3	0/3
Floor of the mouth tumor	1/10	1/10			
Tumor of the infrastructure of the maxilla	1/3	0/3			
Salvage neck dissection	9/24	6/24			
Branquial cyst surgery	2/30	2/30			
Thyroglossal duct cyst resection	3/24	2/24			
Cervical dermoid cyst	1/10	0/10			
Big cervical lipoma	1/10	1/10			
Submaxilectomy for benign tumors or lithiasis	6/22	6/22			
Submaxilectomy for malignant tumors	1/3	1/3			
Parotidectomy for benign tumors	24/106	4/106			
Parotidectomy for malignant tumors	2/21	1/21			
Skin cancer surgery	2/44	1/44			
Rhinectomy	0/1	0/1			
Microsurgery of the larynx	1/26	1/26			
Secondary provox	2/6	2/6			
Panendoscopy	0/8	0/8			

Abbreviation: ER, emergency room.

extensive data in the future to try to define strategies to avoid readmission for head and neck cancer surgery patients and perform a cost-related analysis.

Conclusion

Major surgery, ASA status and the type of wound are conditions related to unplanned readmission or visit to the emergency room in the first 30 days after discharge. The most common associated

causes are infections or wound complications. In this way, an evidence-based risk stratification of the patients can be an essential tool to improve decision-making and resource utilization, and some educational strategies can provide ways to improve the rate of readmission, reducing the amount of money expended by healthcare systems.

Conflict of Interests

The authors have no conflict of interests to declare.

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