

1 **Title**

2 **English title: Impact of COVID-19 Pandemic on Italian Otolaryngology Units: A**
3 **Nationwide Study**

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5 **Italian title:** Impatto della pandemia COVID-19 sulle Unità Operative di
6 Otorinolaringoiatria in Italia: uno studio nazionale.

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8 **Running title: Geographic distribution and changes in the workload**
9 **management**

10
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69 **Abstract (English)**

70 **Objective.** The aim of this study was to provide an accurate picture of the
71 changes which have occurred during the COVID-19 pandemic, and the contributions
72 given by Italian Otolaryngology Units.

73 **Methods.** A 29-item questionnaire was completed and returned by 154
74 Otorhinolaryngology Units across Italy. This investigated their geographic
75 distribution involvement, the main changes which occurred in workload management
76 and in clinical and surgical activities, and the screening procedures for COVID-19 in
77 healthcare personnel and patients.

78 **Results.** Nearly half of the Otolaryngology Units that responded to the
79 questionnaire were merged with other units, while 22% were converted into COVID-
80 19 units or temporarily closed. A reduction of 8.55% in the number of team members
81 was reported, and about 50% of the units applied uniform work shifts for all staff.
82 Elective activities were uniformly stopped or delayed, passing from 30,295 (pre-
83 COVID data) to 5,684 (COVID data) weekly procedures, with a mean decrease of
84 81.24% ($p < 0.001$).

85 **Conclusions.** Most of the elective otolaryngology activities were suspended
86 during the pandemic; the only procedures were for oncology and emergency patients.
87 Italian Otolaryngologists have demonstrated a high availability to collaborate with
88 non-surgery colleagues.

89

90 **Keywords**

91 COVID-19; Otolaryngology; SARS-CoV-2; Pandemic;

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93 **Riassunto in Italiano** (*for Italian authors only*)

94 **Obiettivo.** Fornire un quadro accurato dei cambiamenti che si sono verificati e
95 dei contributi forniti dalle Unità di Otorinolaringoiatria italiane durante la pandemia
96 COVID-19.

97 **Metodi.** Un questionario di 29 domande è stato completato da 154 unità. Sono
98 stati investigati la distribuzione geografica del loro coinvolgimento, i cambiamenti di
99 gestione del carico di lavoro e delle attività clinico-chirurgiche e le procedure di
100 screening applicate su personale sanitario e pazienti.

101 **Risultati.** Quasi la metà delle Unità che hanno risposto sono state fuse con
102 altre unità operative, mentre il 22% è stato convertito in unità COVID-19 o

103 temporaneamente chiuso. È stata segnalata una riduzione dell'8.55% nel numero dei
104 membri del gruppo di lavoro e circa il 50% dei dipartimenti ha applicato turni di
105 lavoro per tutto il personale. Tutte le attività elettive sono state uniformemente
106 interrotte o ritardate, passando da 30,295 (dati pre-COVID) a 5,684 (dati COVID)
107 procedure settimanali, con una diminuzione media dell'81.24% ($p < 0.001$).

108 **Conclusioni.** La maggior parte delle attività elettive in otorinolaringoiatria, a
109 parte le procedure oncologiche e di emergenza, sono state sospese. Gli
110 otorinolaringoiatri italiani hanno dimostrato un'alta disponibilità a collaborare con i
111 reparti di medicina.

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113 **Parole chiave**

114 COVID-19; Otolaringoiatria; SARS-CoV-2; Pandemia;

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137 **Introduction**

138 The ongoing pandemic of Severe Acute Respiratory Syndrome CoronaVirus-2
139 (SARS-CoV-2) disease, also known as COVID-19, has spread rapidly worldwide
140 since the first cases in Wuhan, China¹. The first cases in Italy were diagnosed in
141 Rome on January 29, 2020, when two Chinese tourists tested positive for the virus
142 and were hospitalized and isolated at the Spallanzani Hospital. On January 31st, the
143 Italian government declared national emergency.

144 Since the first case of an Italian patient affected by COVID-19 in the town of
145 Lodi, Lombardy, the number of patients and related deaths in Italy have progressively
146 increased². In fact, despite attempts to limit the outbreak at the primary cluster of
147 infections by quarantining citizens and isolating the area, similar cases were
148 progressively diagnosed in other cities and neighboring regions, such as Veneto and
149 Emilia-Romagna, without evidence of any epidemiologic correlation to the first case.
150 Since then, the COVID-19 infection has spread across the country despite the
151 containment measures applied by the Italian government, thus making Italy one of the
152 worst hit countries with more than 214,457 confirmed cases and 29,684 deaths
153 reported up to May 7, 2020³. On March 11, 2020, the Director-General of the World
154 Health Organization (WHO) declared COVID-19 a pandemic⁴.

155 In the last 2 months, the Italian National Healthcare System has undergone
156 multiple changes to face the pandemic, with closure or conversion of many units and
157 hospitals into units solely dedicated to the treatment of COVID-19 positive patients⁵.
158 Most elective outpatient clinical and surgical procedures have been delayed or
159 suspended, allowing the confluence of most of the resources towards Emergency
160 Departments, Infectious Diseases Units, Respiratory Disease Units, and Intensive
161 Care Units (ICUs)^{6,7}.

162 In this setting, although Otolaryngology-Head and Neck surgeons were not in
163 the frontline of action, they were asked to contribute to managing patients with upper
164 airway impairment, provide basic assistance, perform screening procedures (i.e. upper
165 airway swab) and perform temporary tracheotomies in ICUs. This new arrangement
166 implied a significant change in otolaryngology activities across the country⁸.

167 The aim of this nationwide study, in accordance with the Italian Society of
168 Otolaryngology Head and Neck Surgery (SIOeChCF), was to provide a picture of the
169 changes and contributions of otolaryngologist specialists during the COVID-19
170 pandemic over the last 2 months through a questionnaire administered to Italian

171 Otolaryngology Units.

172

173 **Materials and methods**

174 This study was performed by the COVID-19 Task Force of the Italian Young
175 Otorhinolaryngologists (GOS). On April 16, 2020, a 29-item questionnaire was sent
176 by e-mail to all Otolaryngology Units in Italy (n = 296); each unit was asked to
177 respond within 4 days and the final compilation deadline was set as April 22, 2020.
178 Data were subsequently collected and compiled anonymously in a unified dataset.
179 Duplicates, when present, were removed.

180 The questionnaire investigated three major aspects of Italian Otolaryngology
181 Units during the pandemic:

- 182 1. the geographic distribution of respondent units;
- 183 2. the main changes in workload management and distribution in terms of
184 outpatient and inpatient procedure volume;
- 185 3. COVID-19 screening procedures for patients and healthcare workers.

186 According to the Italian Istituto Superiore di Sanità (ISS) data⁹, Italian regions were
187 divided into five zones based on the total number of cases as follows: 1) >20,000
188 (Lombardia, Emilia-Romagna); 2) 10,000–20,000 (Piemonte, Veneto); 3) 3000–
189 10,000 (Toscana, Marche, Lazio, Provincia Autonoma di Trento, Campania, Puglia,
190 Liguria); 4) 1000–3000 (Abruzzo, Friuli Venezia Giulia, Umbria, Provincia
191 Autonoma di Bolzano, Sicilia, Valle D'Aosta, Sardegna); 5) <1000 (Molise, Calabria,
192 Basilicata).

193

194 *Statistical Analysis*

195 Descriptive analysis was used to define the main clinical and demographic
196 characteristics based on the responses to the questionnaire. Unpaired T test was used
197 to evaluate differences for numeric values. A p-value less than 0.05 was considered
198 the cutoff for statistical significance. Prism Software version 8.3.1 (GraphPad
199 Software LLC) was used to perform statistical analysis.

200

201 **Results**

202 One-hundred fifty-four Otolaryngology Units (52%) completed the
203 questionnaire; 134 (87%) units were public and 20 (13%) were private and/or
204 affiliated health facilities.

205

206 *1. Geographic distribution of respondent Italian Otolaryngology Units*

207 Lombardy represented the region with the highest number of Otolaryngology
208 Units that replied to the questionnaire, while the lowest response rates were registered
209 in Trentino Alto Adige, Valle d'Aosta, and Molise. Figure 1 reports the geographic
210 distribution of respondent units. Figure 2 shows the division of zones and the number
211 of responses received from each zone. Thirty-eight responses were received from
212 units in zone 1, 27 from units in zone 2, 60 from zone 3, 21 from zone 4, and 8 from
213 units in zone 5.

214 Based on the responses received, the majority of units (45.5%) were merged
215 with other units, and 10.4% were temporarily closed. Interestingly, no changes were
216 reported by 10.4% of the units while 11.6% were converted into COVID-19 wards. A
217 significant reduction in hospital beds has been reported by the remaining percentage
218 of units (22.1%). Table I summarizes the activity changes sorted by zone.

219 A reduction in the number of team members was reported, and its percentage
220 change during the pandemic was compared to the pre-COVID-19 setting. A decrease
221 of 6.07% was recorded in the total number of otolaryngology specialists belonging to
222 the 154 units, which declared a pre-COVID staff number of 1,136 specialists which
223 was reduced to 1,067 during the state of emergency. The difference was not
224 statistically significant ($p = 0.364$). In addition, the number of residents on duty was
225 reduced from 465 to 397 (percentage reduction: 14.6%; $p = 0.054$). The reduction in
226 each unit was proportional to work shift changes applied by each zone (Table II).

227 Interestingly, nearly 70% (107/154) of the respondents declared a reallocation
228 of staff members to Internal Medicine COVID-19 Units (52/107 – 48.6%), emergency
229 departments (20/107 – 18.7%), ICUs (9/107 – 8.4%), respiratory disease units (7/107
230 – 6.5%), other services (7/107 – 6.5%), Internal Medicine non-COVID-19 Units
231 (5/107 – 4.7%), infectious disease wards (5/107 – 4.7%), and basic assistance services
232 (2/107 – 1.9%) (Figure 3).

233 The highest percentage of reallocated colleagues was present in zone 1
234 (46.7%), and these showed a progressive reduction passing from 20.5% in zone 2 and
235 23.4% in zone 3, to less than 10% in zones 4 and 5 (6.5% and 2.9%, respectively).

236 In this setting, 48% and 50% of reallocation changes to Internal Medicine
237 COVID-19 Units and Emergency Departments, respectively, occurred in zone 1,

238 while units in zone 2 reported the majority of reallocations to Internal Medicine non-
239 COVID-19 Units (Table III).

240

241 *2. Main changes in workload management and distribution in terms of*
242 *outpatient and inpatient procedure volumes*

243 Questionnaire results showed a significant decrease in otolaryngology
244 activities across the country during the pandemic with no substantial differences
245 among the five identified zones. Outpatient visits showed a significant decrease in
246 number of procedures per week (80.54%; $p < 0.0001$), passing from a pool of 26,035
247 evaluations usually performed during the pre-COVID-19 period to 5,067 registered
248 outpatient procedures during the COVID-19 pandemic. A similar reduction (89.91%;
249 $p < 0.0001$) was recorded for outpatient surgical procedures (i.e. surgical procedures
250 under local anesthesia) and for inpatient surgical procedures that decreased from
251 2,823/week to 472/week, a reduction of 83.28% ($p < 0.0001$). A detailed summary of
252 procedures performed per week in each zone and the corresponding percentage
253 reduction is shown in Figure 4 and described by Table IV.

254 Among the different types of surgery, only a small percentage of respondent
255 units declared a reduction in their head and neck and emergency surgical procedures
256 (10.74% and 3.54%, respectively). On the other hand, the vast majority declared a
257 drastic reduction in endoscopic sinonasal procedures (98.53%), pediatric
258 otolaryngology surgery (97.59%), and ear surgery (94.90%). All elective surgical
259 procedures (100%) were suspended uniformly across the country (Table V).

260 In this setting, upper airway management and tracheostomy procedures were
261 performed by 42.86% of the units, while the remaining 57.14% declared that they
262 were not involved in airway management procedures for COVID-19 patients. The
263 vast majority of the units (70.94%) declared that the percutaneous tracheostomy
264 technique was predominant over the surgical one in their hospitals. When asked about
265 the timing of tracheostomy procedures, the majority of Otolaryngology Units
266 performed this after more than 14 days of endotracheal intubation (38.5%), followed
267 by 11–14 days (27.7%), 7–10 days (26.1%), and 3–6 days (7.7%) (Figure 5).

268

269 *3. COVID-19 screening procedures for patients and healthcare workers*

270 In total, 35.71% of the respondent units declared that a HUB hospital was
271 identified in their region to treat non-COVID-19 patients. In detail, 68.42% of HUBs

272 were located in zone 1, while zones 2, 3 and 4 declared significantly smaller
273 percentages in their regions (22.22%, 33.33% and 4.76%, respectively). Interestingly,
274 zone 5 recorded the highest percentage of HUBs (75%) although this data may be
275 biased by the low number of respondents from this zone.

276 The majority of the units (72.73%) declared that COVID-19 screening
277 procedures were performed for both patients and healthcare workers, and all of the
278 departments performed screening procedures for inpatients scheduled for surgery.

279 About 20% of the otolaryngology specialists in the respondent units tested
280 positive at COVID-19 screening tests; the highest percentages of cases were recorded
281 in zones 1 and 2 (34.21% and 29.63%, respectively).

282

283

284 **Discussion**

285 Since the outbreak of the COVID-19 pandemic, the Italian National
286 Healthcare System has abruptly reduced elective services to redirect resources to the
287 units most affected by the pandemic. This has translated into a significant
288 reorganization of the system which required immediate efforts by all workers
289 throughout the country.

290 The results of this study confirm that clinical and surgical activities have
291 radically changed in Otolaryngology Units across the country. According to the
292 responses to our questionnaire, more than one-fifth (22%) of the units were converted
293 or temporary closed, with a progressive and significant reduction according to the
294 zone passing from 39.5% in zone 1, to 18.5% in zone 2, 15% in zone 3, 14% in zone 4
295 and 25% in zone 5.

296 The consequent marked reduction in outpatient and surgical services per week
297 (81.24%) confirms that a significant response to the crisis was provided by
298 Otolaryngology Units; however, this also meant a reduction of nearly 80,000
299 outpatient visits and almost 10,000 surgical procedures per month. This might have
300 dangerous consequences for the health status of the population and a difficult-to-
301 manage workload in the near future^{10,11}.

302 The activities that were guaranteed during the pandemic were oncology and
303 emergency procedures. In this scenario, it would be fair to assume an increase in
304 overall numbers of these procedures. Nonetheless, results revealed that even these
305 procedures decreased by nearly 10% across the country. The reduction of emergency

306 procedures may be explained by the total lockdown that kept the majority of people at
307 home thus reducing risk factors for otolaryngology emergencies (abscess, bleeding,
308 nasal bone fractures, laryngeal edema). On the other hand, head and neck cancer
309 cannot be influenced by the lockdown, and some recent articles suggest continuing
310 treating cancer as before but including some safety measures for healthcare workers
311 and patients¹²⁻¹⁴. The reduction observed may be due to the reduced number of beds
312 and personnel in Otolaryngology Units, and might result in more advanced-stage
313 oncology cases in the near future.

314 Despite the five zones identified according to the total number of COVID-19
315 cases, a homogenous distribution of changes was recorded with a superimposable
316 percentage reduction in staff members. On the other hand, specialist reallocations to
317 other units were mainly recorded in zone 1, demonstrating the greater reorganization
318 made in the Lombardy and Emilia-Romagna regions¹⁵.

319 COVID-19 cases are not distributed homogeneously in Italy, therefore a
320 different rate of activity change was expected in Otolaryngology Units across the
321 country. Instead, we did not notice relevant differences in reductions of both
322 outpatient evaluations and surgical cases among units in different regions. This shows
323 a great sense of responsibility by the Italian National Healthcare System, which
324 stopped elective activities even in less affected areas.

325 Tracheostomy is a common procedure for patients admitted to ICUs with
326 acute respiratory distress and with difficult weaning. During the pandemic, many
327 countries published their own guidelines, including the Italian Society of
328 Otolaryngology and Head & Neck Surgery (SIOeChCF)¹⁶. Nonetheless, guidelines
329 about timing and technical procedures for tracheostomy are still lacking. Indications
330 and experiences have been published so far by Italian groups^{17,18}, but many questions
331 remain about which technique should be preferred (surgical or percutaneous) and the
332 correct timing to perform tracheostomies in COVID-19 patients. Experiences gained
333 from previous severe acute respiratory syndrome coronaviruses (SARS-CoV and
334 MERS-CoV) and from SARS-CoV-2 demonstrated that nurses and physicians who
335 deal with infected patients are at high risk of infection; among physicians,
336 otolaryngologists have been identified as having the highest risk of contracting
337 COVID-19¹⁹. Tracheostomy has been demonstrated not to change the course of the
338 disease and is among the most dangerous procedures for surgeons. For these reasons,
339 many authors suggest performing tracheostomy after a longer intubation time. So far,

340 the surgical technique seems to be safer compared with the percutaneous approach
341 since airway opening is short and controlled with the cuffed tube placed caudally to
342 the trachea opening. Some modifications to the well-known percutaneous techniques
343 have been proposed to minimize the risk related to COVID-19 infection²⁰. These
344 uncertainties are reflected in Figure 5, where differences in terms of technique and
345 post-intubation day are revealed. Another consideration is related to the high volume
346 of patients admitted to ICUs in some hospitals during the first month of pandemic
347 spread; in this setting, an elevated number of tracheostomies was motivated by the
348 necessity for rapid weaning and transfer of patients to sub-intensive care units.

349 This Italian nationwide study showed that otolaryngologists have a high risk
350 of contracting SARS-CoV-2. According to our data, more than 20% of
351 Otolaryngology Units have had physicians with positive nasal swabs; this percentage
352 was as high as 34% in the more severely affected regions and some Italian
353 otolaryngologists have died.

354

355 **Conclusions**

356 Since the outbreak of COVID-19 in Lombardy and the following WHO
357 declaration of a global pandemic, the Italian National Healthcare System has
358 struggled to cope with the unpredictable load of affected patients. Otolaryngology
359 Units have been involved in treating patients who need tracheostomy and
360 guaranteeing diagnosis and treatment for oncology and emergency patients. This
361 nationwide study showed how prominently phase 1 of the pandemic changed the
362 organization and activity of Otolaryngology Units across the country. Italy is now
363 starting phase 2 with many questions on the strategies to adopt in the near future to
364 treat patients and protect healthcare personnel²¹.

365

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374 this investigation.

375

376 **Conflict of Interest**

377 All authors participated sufficiently in the intellectual content, analysis of data
378 and writing of the article, as defined by the criteria for authorship by the International
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380 author certifies that the definitive version of the manuscript has been approved by all
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388

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472 TABLES

473 Table I. Activity changes in Otolaryngology Units sorted by zone

Zone	Changes in clinical practice in the 154 units					Total
	No change	Reduction in beds	Merged with other units	Converted into COVID-wards	Temporarily closed	
1	1	5	17	10	5	38 (24.7%)
2	4	9	9	4	1	27 (17.5%)
3	6	16	29	3	6	60 (39%)
4	5	3	10	1	2	21 (13.6%)
5	0	1	5	0	2	8 (5.2%)
Total	16 (10.4%)	34 (22.1%)	70 (45.5%)	18 (11.6%)	16 (10.4%)	154 (100%)

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476 Table 2. Number of staff members sorted by zone and work shift changes

Zone	Number of specialists and residents				Work shifts during COVID-19				
	Pre-COVID	During COVID	Difference (%)	p	Not applied	Applied for all of the members	Applied for specialists only	Applied for residents only	Total
1	419	378	9.79%	0.645	16	21	0	1	38
2	330	309	6.36%	0.096	10	13	2	2	27
3	587	540	8.01%	0.217	20	28	9	3	60
4	227	203	10.57%	0.984	6	11	2	2	21
5	38	34	10.53%	0.677	4	3	1	0	8
Total	1601	1464	8.55%	0.069	56 (36.4%)	76 (49.4%)	14 (9%)	8 (5.2%)	100%

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479 Table 3. Reallocation of physicians sorted by zone

Zone	Reallocation to different departments								Total
	Internal Medicine COVID	Internal Medicine non-COVID	Emergency Department	Intensive Care Units	Infectious Disease Units	Respiratory Disease Units	Basic assistance	Others	
1	25	0	10	6	3	3	1	2	50 (46.7%)
2	10	4	2	2	0	2	1	1	22 (20.5%)
3	11	1	6	1	1	2	0	3	25 (23.4%)
4	5	0	0	0	1	0	0	1	7 (6.5%)

5	1	0	2	0	0	0	0	0	0	3 (2.9%)
Total	52 (48.6%)	5 (4.7%)	20 (18.7%)	9 (8.4%)	5 (4.7%)	7 (6.5%)	2 (1.8%)	7 (6.6%)	107 (100%)	

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481 **Table 4. Otolaryngology procedures before and during COVID-19 pandemic**

Zone	Otolaryngology procedures (difference %)									Total (difference %)		
	Outpatient visits before COVID	Outpatient visits during COVID	p	Outpatient surgery before COVID	Outpatient surgery during COVID	p	Inpatient surgery before COVID	Inpatient surgery during COVID	p	Procedures before COVID	Procedures during COVID	p
1	7702	1341 (82.6%)	<0.0001	375	34 (90.9%)	<0.0001	841	123 (85.4%)	<0.0001	8918	1498 (83.2%)	<0.0001
2	5912	1272 (78.5%)	<0.0001	303	31 (89.8%)	<0.0001	573	111 (80.6%)	<0.0001	6788	1414 (79.2%)	<0.0001
3	8470	1734 (79.5%)	<0.0001	506	42 (91.7%)	<0.0001	1011	164 (83.8%)	<0.0001	9987	1940 (80.6%)	<0.0001
4	3147	620 (80.3%)	<0.0001	192	33 (82.8%)	0.0013	317	69 (78.2%)	<0.0001	3656	722 (80.2%)	0.0002
5	805	100 (87.6%)	0.0006	61	5 (91.8%)	0.081	81	5 (93.8%)	0.003	947	110 (88.4%)	0.0203
Total	26036	5067 (80.5%)	<0.0001	1437	145 (89.9%)	<0.0001	2823	472 (83.3%)	<0.0001	30296	5684 (81.2%)	<0.0001

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484 **Table 5. Percentage of variation in different type of surgical procedures during**
485 **the COVID-period in comparison to pre-COVID period.**

Period	Head and Neck oncology surgery	Emergency procedures	Sinonasal surgery	Pediatric otolaryngology surgery	Ear surgery	Basic otolaryngology surgery
Pre-COVID	121	113	136	83	98	141
During COVID	108	109	2	2	5	0
Percentage reduction (%)	10.74%	3.54%	98.53%	97.59%	94.90%	100%

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492 **FIGURES**

493 **Figure 1.** Representation of the response rate to our questionnaire sorted by region.

494 The total number of responses is reported on the abscissa axis, while the ordinate axis
495 indicates the 20 Italian regions.

496 **Figure 2.** Graphical representation of A) the distribution of COVID-19 positive cases
497 in Italian regions (ISS, April 16, 2020) and B) the response rate to our questionnaire
498 sorted by the five zones identified according to the total number of cases.

499 **Figure 3.** Reallocation of otolaryngology team members to other departments during
500 the pandemic.

501 **Figure 4.** Number of outpatient visits, outpatient surgical procedures, and inpatient
502 surgical procedures comparing pre-COVID and during-COVID variation.

503 **Figure 5.** A) Surgical and percutaneous tracheostomies, and B) timing of surgical
504 tracheostomies (days after intubation).