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A Study on the Influencing Factor of Unplanned Endotracheal Extubation in ICUs

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Abstract

Background: The purpose of this study was to investigate the incidence of unplanned endotracheal extubation and to identify the influencing factor of unplanned extubation in ICUs for providing baseline data in developing prevention strategies and administrative standards.

Methods: The 942 intubated ICU patients information from March, 2000 to February, 2001 in a tertiary university hospital was used as a source of data from

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the medical records and hospital information system. In order to analyze factors related to unplanned extubation, the subjects of this study were divided by unplanned extubation group and planned extubation group and were matched by its sex, age, and disease groups in a ratio of one to two. The data were analyzed by descriptive statistics, χ^2 -test, t-test, Fisher's exact test, and logistic regression analysis with SPSSWIN 10.0 program.

Result : 1) Forty - seven(4.99%) of 942 intubated patients experienced unplanned extubation 65 times during the twelve - month period. Thirty - four(72.34%) of 47 unplanned extubated patients required reintubation, whereas thirteen patients(27.66%) did not. 2) About half of unplanned extubation(46.8%) occurred during the night shift. 3) As for the nursing activity, respiratory nursing activity score($P=.0.06$) and total nursing activity score($P=.011$) showed statistically significant differences between unplanned extubation group and planned extubation group. 4) As for the patient status, unplanned extubation group showed more lower consciousness level($P=.000$), more irritable or agitated behavior($P=.000$), and had more applied physical restraints($P=.000$) than planned extubation group. 5) As for the intubation related variables, unplanned extubation group revealed more intubated with respiratory failure($P=.000$), more dependent on mechanical ventilation($P=.015$) than planned extubation group. 6) Factors affecting unplanned extubations in intensive care unit patients were irritable or agitated behavior(odds ratio=13.757), night shift(odds ratio=7.166), and mechanical ventilation(odds ratio=6.257) from conditional logistic regression analysis.

Conclusion : The most affecting factor of unplanned extubation was agitated or irritable behavior. Therefore the results of this study could be helpful to ICU nurses for meticulous care, decision making, timely intervention, and development of intervention strategies for preventing unplanned extubation.

Key Words : Intratracheal intubation, Intensive care unit

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가 89.4%

48.43±62.26

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가 68.1%

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Table 1. General characteristics of unplanned extubation group and planned extubation group.

Variables	Category	UE [†] Group, No.(%)	PE [‡] Group, No.(%)	²	P-value
Sex	Male	32(68.1)	64(68.1)	.000	1.000
	Female	15(31.9)	30(31.9)		
Age (years)	30 39	6(12.8)	12(12.8)	.000	1.000
	40 49	5(10.6)	10(10.6)		
	50 59	11(23.4)	22(23.4)		
	60 69	10(21.3)	20(21.3)		
	over 70	15(31.9)	30(31.9)		
	mean±SD	60.04 ± 15.57	59.04±14.07		
Group of diagnosis*	nervous sysytem	4(8.5)	8(8.5)	.000	1.000
	circulatory system	11(23.4)	22(23.4)		
	respiratory system	14(29.8)	28(29.8)		
	digestive system	5(10.6)	10(10.6)		
	neoplasm	11(23.4)	22(23.4)		
	infection, sepsis	2(4.3)	4(4.3)		
ICU admission route	ward	12(25.5)	10(10.6)	13.429	.004**
	operating room	21(44.7)	70(74.5)		
	ER or other hospital	14(29.8)	14(14.9)		
Discharge place from ICU	ward	34(72.3)	82(87.2)	7.023	.039*
	other hospital	5(10.7)	3(3.2)		
	death	8(17.0)	9(9.6)		
ICU length of stay (days)	under 9	17(36.2)	62(66.0)	17.600	.001**
	10 19	25(53.2)	26(27.6)		
	over 20	5(10.6)	6(6.4)		
Hospital length of stay(days)	under 9	1(2.1)	6(6.4)	6.809	.072
	10 19	7(14.9)	26(27.6)		
	20 29	7(14.9)	20(21.3)		
	over 30	32(68.1)	42(44.7)		
Total		47(100.0)	94(100.0)		

* classified by ICD-10(International Classification of Disease)

† UE : Unplanned Extubation

‡ PE : Planned Extubation

*P<.05, **P<.01

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 411 1,626 , , .
 942 , 47
 65 1)
 1 가 55.4%, 2 가 가 (46.8%)
 21.5%, 3 가 9.2%, 4 가 가 (31.9%),
 6.2%, 5 가 7.7% . 65 가 (P=.000).
 67.0% 가 ,
 4.83%, 6.69%, 14.9% 가 .
 4.02%
 49.9 (2). 1000 가 , (P=.000)
 가 , (P=.061),
 (P=.059) 가 (3-1).

Table 2. Incidence of unplanned extubation in ICUs.

Category	ICU [†]	MICU	SICU	RICU	Total (%)
No. of UE patients		17	14	16	47
Episodes of UE (case)	1	14	11	11	36 (55.4)
	2	3	1	3	14 (21.5)
	3	0	2	0	6 (9.2)
	4	0	0	1	4 (6.2)
	5	0	0	1	5 (7.7)
	total	20	19	26	65 (100.0)
No. of Intubated patients		254	290	398	942
No. of ICU admitted patients		851	364	411	1,626
Incidence of UE [‡] (%)		6.69	4.83	4.02	4.99

* No. : Number,

† ICU : Intensive Care Unit(MICU : Medical ICU, SICU : Surgical ICU, RICU : Respiratory ICU),

‡ Incidence of UE = $\frac{\text{No. of UE patients}(2000.3.1-2001.2.28)}{\text{No. of intubated patients}(2000.3.1-2001.2.28)} \times 100$

Table 3-1. Comparison of extubation time of day between unplanned extubation group and planned extubation group.

Variables	Category	UE Group, No.(%)	PE Group, No.(%)	² P-value	Post-hoc comparison
Extubation time of day	Night (10PM- 7AM)	22(46.8)	14(14.9)	19.647 .000***	night : day (P=.000)
	Day (7AM- 3PM)	15(31.9)	63(67.0)		
	Evening(3PM-10PM)	10(21.3)	17(18.1)		
Total		47(100.0)	94(100.0)		

*** P < .001

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(P=.011) (P=.006) 3)

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Table 3-2. Comparison of nursing activities between unplanned extubation group and planned extubation group.

Variables	Category	UE Group, No.(%)(n=47)	PE Group, No.(%)(n=94)	t	P-value
		Mean±SD	Mean±SD		
Nursing activities (unit : score/day)	Vital Signs	11.32± 4.83	9.85± 4.15	-1.779	.079
	Monitoring	20.81± 6.94	20.38± 6.82	-.352	.725
	ADL †	31.36± 6.74	30.62± 7.00	-.597	.552
	Feeding	2.09± 3.04	2.03± 3.49	-.088	.930
	IV therapy & Medication	21.89± 8.03	19.82± 7.35	-1.530	.128
	Treatment Procedure	15.94± 9.40	13.96± 8.45	-1.260	.210
	Respiratory Care	21.19± 7.30	17.27± 8.78	-2.800	.006**
	Teaching & Emotional support	2.96± 3.71	2.24± 3.22	-1.189	.237
	Total	127.55±26.16	116.16±20.23	-2.615	.011*

* P < 0.05, ** P < 0.01

† ADL : Activities of Daily Livings

가 (P=.395). 48.9%, 18.1% 4)

가 (P=.000) 가 55.3%, 3-4 12.8% (P=.000) 가 66%

(P=.053). 가 31.9% midazolam vecuronium 가 (P=.000). PCA(Patient Controlled Analgesia) (P=.189), (P=.430) 가 가 75.53% (55.3%) (P=.015). (61.3%), 가 가

Table 3-3. Comparison of patient status between unplanned extubation group and planned extubation group.

Variables	Category	UE Group, No.(%)	PE Group, No.(%)	²	P-value
Severity of illness	4th grade	5(10.6)	16(17.0)	1.857	.395
	5th grade	34(72.4)	68(72.4)		
	6th grade	8(17.0)	10(10.6)		
Level of consciousness	oriented, alert	24(51.1)	77(81.9)	14.676	.000 ***
	disoriented, confused	23(48.9)	17(18.1)		
Patient behavior	Not agitated or irritable	21(44.7)	82(87.2)	28.820	.000 ***
	agitated or irritable	26(55.3)	12(12.8)		
Sedatives	Yes PCA	3(6.4)	25(25.6)	21.566	.053
	Other drug	22(46.8)	9(9.6)		
	No	22(46.8)	60(63.8)		
Physical Restraints	Yes	19(61.3)	8(13.8)	21.566	.000 ***
	No	12(38.7)	50(86.2)		
	missing	16	36		
Total		47(100.0)	94(100.0)		

*** P < 0.001

Table 3-4. Comparison of intubation related variables between unplanned extubation group and planned extubation group.

Variables	Category	UE Group, No.(%)	PE Group, No.(%)	²	P-value
Reason for intubation	Operative procedure	16(34.0)	64(68.1)	14.793	.000***
	respiratory failure, etc	31(66.0)	30(31.9)		
Intubation frequency	once	37(78.8)	82(87.2)	1.723	.189
	at least twice	10(21.2)	12(12.8)		
Intubation period	under 4 days	33(70.2)	70(74.5)	2.763	.430
	5 - 9 days	8(17.0)	14(14.9)		
	over 10 days	6(12.8)	10(10.6)		
Type of ventilatory support	A/C or PCV or SIMV (and/or PEEP)	21(47.7)	23(24.5)	5.963	.015*
	CPAP and/or PSV or O supply via T-piece	26(55.3)	71(75.5)		
Total		47(100.0)	94(100.0)		

* P < 0.05, *** P < 0.001

A/C : Assit/Control mode, PCV : Pressure Control Ventilation, SIMV : Synchronized Intermittent Mandatory Ventilation, PEEP : Positive End Expiratory Pressure, CPAP : Continuous Positive Airway Pressure, PSV : Pressure Support Ventilation

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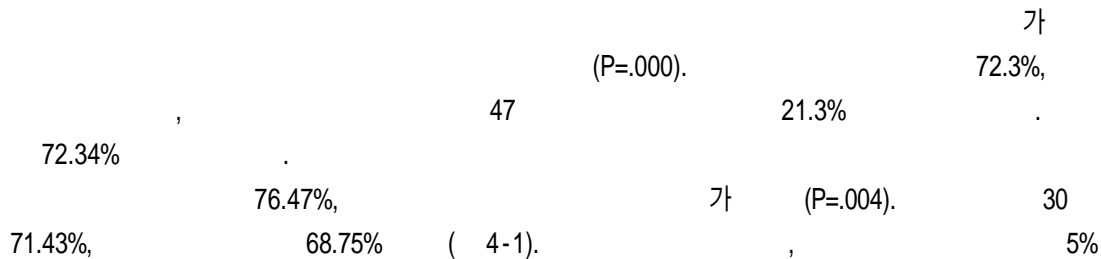


Table 4-1. Incidence of reintubation after unplanned extubation in ICUs.

Category	ICU	MICU	SICU	RICU	Total
No. of reintubated patients after UE		13	10	11	34
No. of UE patients		17	14	16	47
Incidence of reintubation after UE* (%)		76.47	71.43	68.75	72.34

* Incidence of Reintubation = $\frac{\text{No. of reintubated patients after UE (2000.3.1-2001.2.28)}}{\text{No. of UE patients (2000.3.1-2001.2.28)}} \times 100$

Table 4-2. Comparison of reintubation after extubation between unplanned extubation group and planned extubation group.

Variables	Category	UE Group, No.(%)	PE Group, No.(%)	²	P-value
Reintubation	Yes	34(72.3)	20(21.3)	34.575	.000***
	No	13(27.7)	74(78.7)		
	Total	47(100.0)	94(100.0)		
Reintubation time after extuation	under 12hrs	28(82.4)	9(45.0)	8.145	.004**
	over 12hrs	6(17.6)	11(55.0)		
	Total	34(100.0)	20(100.0)		

** P < 0.01, *** P < 0.001

, 12 55.9% 45% 82%, (4-2).

Table 5. Logistic regression results of unplanned extubation.

Variables	Category	B	S.E	P-value	Odds Ratio	95% C.I*	
						Lower	Upper
Extubation time of day	0=Day, Evening 1=Night	1.969	.876	.025	7.166	1.288	39.866
Nursing activity score (respiratory care)	74 192	.042	.063	.502	1.043	.922	1.179
Nursing activity score (total)	4 44	.041	.022	.062	1.042	.998	1.089
Level of consciousness	0=oriented, alerted 1=disoriented, confused	-1.334	.991	.178	.263	.038	1.836
Patient behavior	0=not agitated, not irritable 1=agitated, or irritable	2.622	.948	.006	13.757	2.145	88.211
Sedatives	0=No 1=Yes	1.496	1.008	.138	4.464	.619	32.184
Physical restraints	0=No 1=Yes	1.613	.980	.100	5.016	.735	34.229
Reason for intubation	0=nonprepared 1=prepared	1.985	1.017	.051	7.278	.991	53.453
Type of ventilatory support	0=CPAP/PSV or T-piece 1=A/C, PCV, SIMV	1.834	.811	.024	6.257	1.276	30.691
Constant		-10.169	2.938	.001	.000		

* C.I : Confidence Interval

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(Odds Ratio(OR)=13.757)
(OR=7.166)
(OR=6.257)

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(46.8%) 가

Grap (2)
43%가
(3) 54.4%가
Listello (15)

가

가

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Grad (16)
(nurse work index)

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가 가

가 48.9%가

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Grap

(2)

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Lamb (17)

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, 48.4%가

. Grap (2)

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 1. Barnason S, Graham J, Wild MC, Jensen LB, Rasmussen D, Schulz P et al. Comparison of two endotracheal tubes securement techniques on

unplanned extubation, oral mucosa, and facial skin integrity. Heart & Lung 1998;27(6):409-417
 2. Grap MJ, Glass C, Lindamood MO. Factors related to unplanned extubation of endotracheal tubes. Critical Care Nurse 1995;15(2):57-65
 3. , , , , , .
 1996;11(2):179
 83
 4. Betbese A, Perez M, Bak E, Rialp G, Mancebo J. A prospective study of unplanned endotracheal extubation in intensive care unit patients. Critical Care Medicine 1998;26:1180-1186
 5. Brown R, Grau P, Touleimat B. Unplanned extubations in a community hospital. (abstract). Chest 1992;102:183S
 6. Eberts M, Taggart J. Unplanned endotracheal extubation: incidence and contributing factors. (abstract). Heart & Lung 1991;20:23A
 7. Tindol GA, DiBenedetto RJ, Kosciuk L. Unplanned extubations. Chest 1994;105(6):1804-1807
 8. Ellstrom EK. Relationship of Psychoneurologic, Physiologic, and Environmental Constructs to Risk of Unplanned Extubation and Outcomes in Medical Intensive Care Unit Patients. Doctor of Philosophy in Nursing Dissertation 2000; University of California School of Nursing
 9. Coppolo DP, May JJ. Self-extubations: a 12-month experience. Chest 1990;105:165-169
 10. Chervron V, Menard J, Richard J, Girault C, Leroy J, Bonmarchand G. Unplanned extubation: Risk factors of development and predictive criteria for reintubation. Critical Care Medicine 1998;26(6):1049-1053

11. Tominaga GT, Rudzwick H, Scannell G, Waxman K. Decreasing unplanned extubations in the surgical intensive care unit. *American Journal of Surgery* 1995;170:586-590
12. 가 . 1994
13. , , , , , . APACHE . 2000;30(5):1243-1252
14. Zwillich CW, Pierson DJ, Creagh CE, Sutton FD, Scharz FD, Petty TL. Complication of assisted ventilation. *American Journal of Medicine* 1974;57:161-170
15. Listello D, Sessler CN. Unplanned extubations: clinical predictors for reintubation. *Chest* 1994; 105:1496-1503
16. Grad A, Jorgensen S. A descriptive study of the incidence and factors related to unplanned extubations in critically ill adult medical patients. (abstract). *Heart & Lung* 1990;19:306
17. Lamb B, Vogelsson M, Tack K. Incidence of unplanned extubations. (abstract). *Critical Care Medicine* 1989;17:S96
18. Brandstetter RD, Khawaja IT, Bartky E. Self-extubation [letter]. *Chest* 1991;99:1319-1320
19. Medina M, Beydoun HK, Hsu WW, Brandstetter RD. Reducing unplanned extubation: the benefit of combined chest and arm restraints with sedation [abstract]. *Chest* 1993;103:273S
20. Kapadia FN, Bajan KB, Raje KV. Airway accidents in intubated intensive care unit patients: An epidemiological study. *Critical Care Medicine* 2000;28(3):659-664
21. Sessler CN, Glass C, Grap MJ. Techniques for preventing and managing unplanned extubations. *The Journal of Critical Illness* 1994;9: 609-619
22. Jayamanne D, Nandipati R, Patel D. Self-extubation: a prospective study. (abstract). *Chest* 1988;94:3S
23. Maguire GP, DeLorenzo LJ, Moggio RA. Unplanned extubation in the intensive care unit: A quality of care concern. *Critical Care Nursing Quarterly* 1994;17(3):40-47
24. Kings DJ, Connolly MA. Precipitating factors of self-extubation by patients in a surgical intensive care unit: a descriptive study. (abstract). *Heart & Lung* 1987;16:326
25. Atkins PM, Mion LC, Mendelson W. Characteristics and outcomes of patients who self-extubate from ventilatory support: A case-control study. *Chest* 1997;112:1317-1323
26. . 1999