



Characteristics and outcomes of critically ill cancer patients admitted to Korean intensive units: multicenter study

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Background

- Trend in cancer patients
 - Change regarding to nature of cancer treatment
 - ▶ New and intensified treatment protocol with advanced supportive therapy
 - Improving of prognosis and extension of survival time
- ❖ Increasing number of disease or therapy associated complications
 - Increasing demand for intensive care



Background

- Trend in cancer patients

- Cancer patients : high risk patients of being denied ICU admission
 - Need a prolonged intensive care
 - Use of an expensive, scarce resource
 - High reported mortality (47~79%)

Ann Intern Med 125:625-633, 1996

Mayo Clin Proc 67:117-122, 1992,

- This decision presents an **ethical dilemma** to oncologists as well as intensivists



Background

- **Previous study about cancer patients admitted to the ICU**

- Several studies have reported high mortality rates for cancer patients after a long ICU stay. (especially leukopenia or required mechanical ventilation)
- Other studies, however, have highlighted reduced mortality rates in critically ill patients with cancer after advancement of critical care medicine
- Some authors advocate several preconditions to admit cancer patients to the ICU by priority as medical resources

Crit Care Med 27:633-638, 1999

J Clin Oncol 1999, 17:991-997

Chest 2008; 134: 520 –526



Background

- ❖ In the field, the decision of whether to admit a patient to the ICU
 - may then be **based on capacity and emotion** instead of evidence in emergency situations
- ❖ Relatively few data concerning the epidemiology and prognosis of cancer patients admitted to general ICUs
- ❖ Previous large studies focused on specialized oncological ICUs
 - extrapolation to general ICUs and hospitals can be difficult.



Purpose

To investigate **characteristics** and **evaluate prognosis** **according to type of cancer** in *critically ill cancer patients admitted to Korean intensive care units*

Methods

- Retrospective analysis of multi-center, prospective cohort study
- Substudy of Validation of Simplified acute physiology score 3 in Korean Intensive care unit (VSKI) study
- Study period: Jul. 2010 ~ Jan. 2011 in 15 tertiary or university-affiliated hospitals

Inclusion criteria

- All patients admitted to the 22 ICUs during the study period (medical, 14; surgical, 6; and multidisciplinary, 2)

Exclusion criteria

- < 18 old years and non cancer patients
- Uncertain the primary outcome of hospital mortality
- Two or more admissions to the ICU during the same hospital stay
- Transferred from other participating ICUs
- Admission for scheduled postoperative management

Primary outcome

- In Hospital mortality

Methods

- **Definition of cancer**

- Classification: Solid cancer, Hematologic cancer
 - Solid cancer – metastatic cancer; cancer with proven distant metastasis
 - : sarcomas, carcinomas, and melanoma
 - Hematological cancer – tumors of the hematopoietic and lymphoid tissues
 - : leukemia, lymphoma, and myeloma
- Diagnosis: before admission to the ICU
- Exclusion: patients with a prior history of cancer and with complete remission for over five years



Statistics

- Data expressed as the median with IQR or as numbers (%)
- Continuous variables: Mann-Whitney U test
- Categorical variables: Chi-square test or Fisher exact test
- Multivariate analysis : Forward stepwise logistic regression model
- The Hosmer-Lemeshow test: check the goodness-of-fit of the final logistic regression model
- All tests - 2 sided, $P < 0.05$ was considered statistically significant.
- IBM SPSS 20 (IBM, Armonk, NY, USA)

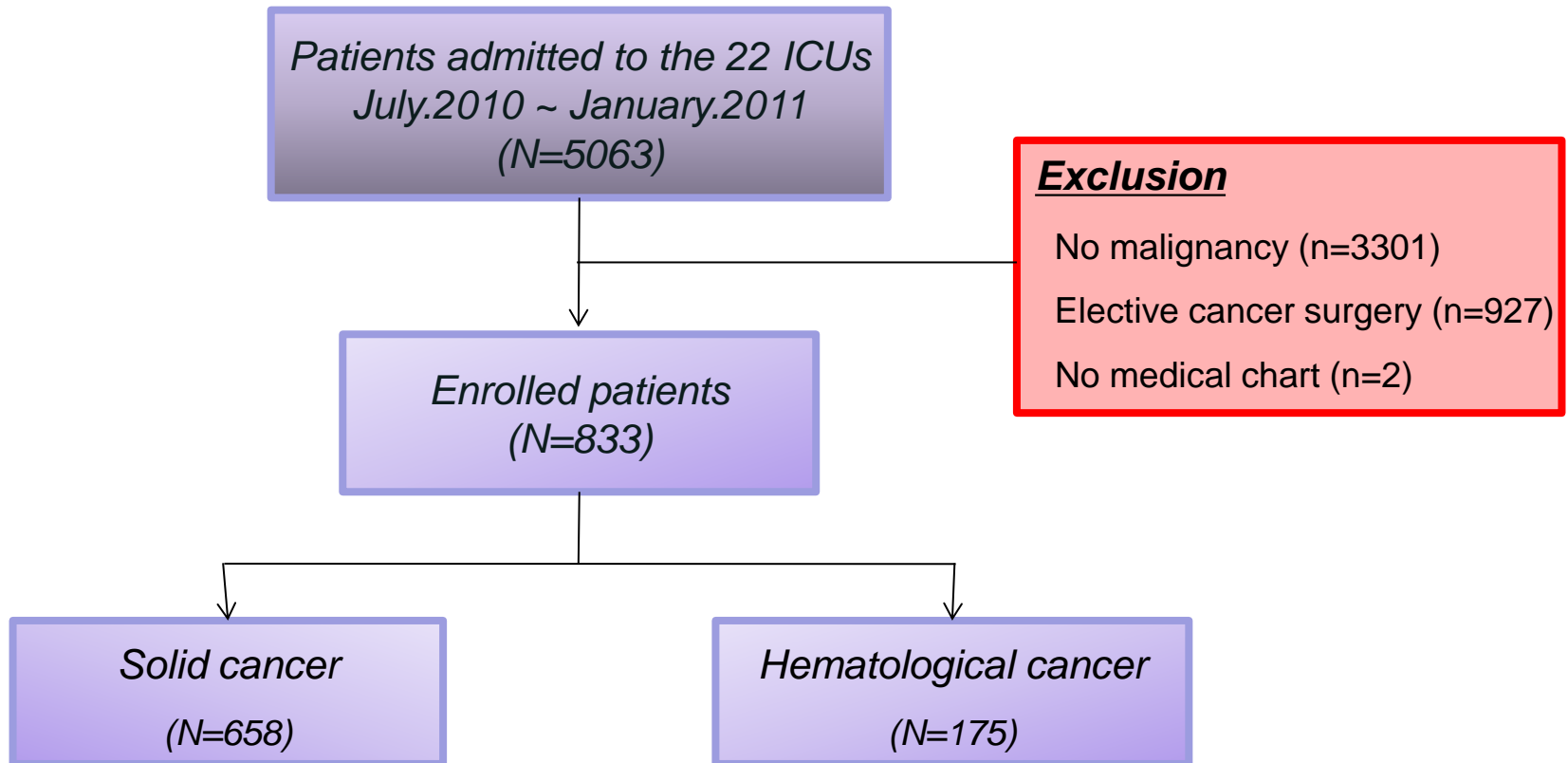
❖ Variables

- Confounding factor: P value < 0.2 on univariate analyses



Results

Patients flow chart



Baseline characteristics of cancer patients admitted to the intensive care unit

Characteristics	No. (%) of patients	
Age	63	(53-72)
Gender, male	554	(68)
Cause of admission		
Observation	228	(27)
Cardiovascular	201	(24)
Digestive	45	(5)
Hematological	5	(1)
Hepatic failure	29	(4)
Metabolic	12	(1)
Neurological	29	(4)
Renal	9	(1)
Respiratory	251	(30)
Others	21	(3)
Co-morbidities (overlapped)		
Hypertension	219	(26)
CHF	30	(4)
Stroke	35	(4)
COPD	24	(3)
Diabetes	153	(18)
CRF	42	(5)
Chronic lung disease	14	(2)
Liver cirrhosis	97	(12)
Acute infection at ICU admission	427	(51)
ICU mortality	235	(28)
In-hospital mortality	347	(42)
Overall	833	

Comparison of baseline characteristics (I)

	Solid tumors, (n = 658)	Hematological cancer, (n = 175)	P value
Age, median (IQR), y	65 (55-73)	55 (42-65)	0.01
Gender (Male), n (%)	452 (70.2)	102 (58.6)	0.01
Performance status, n(%)			0.93
0-1	271 (44.2)	78 (44.6)	
2-4	342 (55.8)	96 (54.9)	
Co-morbidities, n (%)			
Hypertension	191 (29.0)	28 (16.0)	0.001
CHF	21 (3.2)	9 (5.1)	0.25
Stroke	28 (4.3)	7 (4.0)	1.00
COPD	23 (3.5)	1 (0.6)	0.04
Diabetes	121 (18.4)	32 (18.3)	1.00
Chronic renal failure	32 (4.9)	10 (5.7)	0.70
Chronic lung disease	11 (1.7)	3 (1.7)	1.00
Liver cirrhosis	93 (14.1)	4 (2.3)	< 0.001

Comparison of baseline characteristics (II)

	Solid tumors, (n = 658)	Hematological cancer, (n = 175)	P value
Intra-hospital location before ICU admission			< 0.001
Emergency room	323 (49.1)	54 (30.9)	
General ward	314 (47.7)	115 (65.7)	
Other ICU	15 (2.3)	5 (2.9)	
Others	6 (0.9)	1 (0.6)	
Hospital days before ICU admission	0 (0-2)	0 (0-9)	0.01
Chemotherapy history	211 (32.1)	100 (57.1)	< 0.001
Radiotherapy history	91 (13.8)	14 (8.0)	0.04
Immune suppression status	48 (7.3)	31 (17.7)	<0.001
Steroid therapy	13 (2.0)	16 (9.1)	< 0.001
CPR before ICU admission	26 (4.2)	18 (10.5)	0.001
Reason for ICU admission			
Observation	190 (28.9)	38 (21.7)	0.07
Cardiovascular	140 (21.3)	61 (34.9)	< 0.001
Digestive	45 (6.8)	0 (0)	0.001

Comparison of baseline characteristics (III)

	Solid tumors, (n = 658)	Hematological cancer, (n = 175)	P value
Acute infection at ICU admission	298 (45.3)	129 (73.7)	< 0.001
Severe sepsis/septic shock	198 (32.2)	98 (57.0)	< 0.001
Surgical status			< 0.001
No surgery	566 (86.0)	170 (97.1)	
Emergency	92 (14.0)	5 (2.9)	
SOFA	8 (4-12)	12 (8-15)	< 0.001
SAPS 3	69.0 (60.0-78.8)	71.0 (63.0-82.0)	< 0.001
ICU length of stay	5.0 (3.0-10.0)	6.0 (3.0-11.0)	0.16
ICU mortality	162 (24.6)	73 (41.7)	< 0.001
Hospital length of stay	19.0 (11.0-37.0)	28.0 (13.5-50.0)	0.001
Hospital mortality	254 (38.6)	93 (53.1)	0.002

Hemodynamic and physiologic variables (I)

	Solid tumors, (n = 658)	Hematological cancer, (n = 175)	P value
Initial physiologic measurements			
MAP (mmHg) , median (IQR)	78 (65-90)	75 (64-88)	0.08
Heart rate, /min	111 (96-129)	121 (107-136)	< 0.001
Body temperature, °C	36.9 (36.4-37.6)	37.4 (36.6-38.2)	< 0.001
Physiologic measurement within 24 h			
MAP (mmHg) , median (IQR)	62 (52-73)	65 (57-76)	0.003
Heart rate, /min	135 (118-149)	122 (106-141)	< 0.001
Body temperature, °C	38.3 (37.4-38.9)	37.6 (37.1-38.2)	< 0.001
Mechanical ventilation	219 (33.3)	82 (46.9)	0.001
ALI/ARDS	72 (11.9)	29 (17.0)	0.09
P/F ratio			
PaO2/FiO2 ratio within 1 h	165 (98-279)	171 (113-252)	0.88
PaO2/FiO2 ratio within 24 h	234 (127-356)	162 (104-264)	< 0.001

Hemodynamic and physiologic variables (II)

	Solid tumors, (n = 658)	Hematological cancer, (n = 175)	P value
Initial laboratory finding, median (IQR)			
White blood cell, /mm ³	9,750 (5,320-15,460)	3,640 (250-9,850)	< 0.001
Total bilirubin, µmol/l	0.9 (0.6-2.1)	1.1 (0.7-2.3)	0.30
Creatinine, µmol/l	1.0 (0.7-1.6)	1.1 (0.7-1.8)	0.38
PH	7.39 (7.30-7.45)	7.40 (7.30-7.46)	0.16
Lactate	2.90 (1.70-5.40)	2.65 (1.50-5.23)	0.47
CRP	12.3 (4.3-21.3)	14.5 (6.3-24.3)	0.08
Procalcitonin	3.64 (0.65-22.87)	8.12 (0.19-27.12)	0.99
NT-BNP	681 (161-3039)	965 (315-6070)	0.02
Vasopressors use (overlapped)			
Norepinephrine within 24h	293 (44.7)	96 (54.8)	0.02
Dopamine within 24h	251 (38.4)	84 (48.8)	0.01
Dopamine within 24h	64 (10.0)	19 (11.3)	0.63
Epinephrine within 24h	5 (0.8)	2 (1.2)	0.64
Vasopressin within 24h	53 (8.3)	29 (17.2)	0.001
Dobutamine within 24h	51 (7.9)	20 (11.8)	0.11
Total fluids within 24 h (ml)	3,339(2,275-4,775)	4,039 (3,001-5,246)	< 0.001
CRRT	60 (9.5)	30 (17.6)	0.004

Prognostic factors for hospital mortality in patients with overall cancer

Variable	OR	95% CI	P value
Mechanical ventilation	2.01	1.25-3.22	0.004
Use of vasopressor	3.13	1.74-5.64	0.001
SOFA	1.22	1.13-1.32	< 0.001
SAPS 3	1.04	1.01-1.06	0.003

❖ The Hosmer & Lemeshow goodness-of-fit test: 0.958

Confound factors

- Age, sex, performance status, CRF, CPR, MV at ICU admission, Acute infection, severity, ARDS, CRRT, MV, SOFA, SAPS 3, total fluid, vasopressor, laboratory results (CRP, lactate, BUN, creatinine, total bilirubin, BNP)

Prognostic factors for hospital mortality in patients with solid cancer

Variable	OR	95% CI	P value
Age	0.963	0.934-0.994	0.02
Performance status 2-4	2.626	1.286-5.365	0.01
Mechanical ventilation	2.851	1.346-6.040	0.01
SAPS 3	1.069	1.305-1.104	< 0.001

❖ The Hosmer & Lemeshow goodness-of-fit test: 0.585

Confound factors

- Age, sex, performance status, CRF, CPR, MV at ICU admission, Acute infection, severity, ARDS, CRRT, MV, SOFA, SAPS 3, total fluid, vasopressor, laboratory results (CRP, lactate, BUN, creatinine, total bilirubin, BNP)

Prognostic factors for hospital mortality in patients with Hematological cancer

Variable	OR	95% CI	P value
Mechanical ventilation	2.41	1.05-5.55	0.04
SAPS 3	1.05	1.01-1.08	0.01

❖ The Hosmer & Lemeshow goodness-of-fit test: 0.663

Confound factors

- Age, gender, CRF, Immune suppression, reason for ICU admission
CPR at ICU admission, mechanical ventilation, SOFA, SAPS 3,
ARDS, CRRT, total fluid, vasopressor, CRP, lactate, laboratory result
(platelet, BUN, Cr, total bilirubin, PH, HCO₃)

Limitations

- ✓ No specific information about the characteristics of the cancer, including type, stage, histological findings, or anticancer treatments.
- ✓ No investigation about infection source and type of bacteria or fungi in culture.
- ✓ Decisions to limit therapy, and particularly 'do not resuscitate' orders, were not recorded.

Conclusion

- Patients with **hematological cancers** were **more severely ill and had higher ICU and hospital mortality** rate than patients with solid cancer.
- **The predictors** of in-hospital mortality in patients with **solid cancer** are age, performance status 2-4, mechanical ventilation and SAPS 3.
- **The predictor** of in-hospital mortality in patients with **hematological cancer** are mechanical ventilation and SAPS 3.
- Our findings suggest that **SAPS 3** might be enough **as prognostic factors** in patients with cancer as well as those without cancer admitted to general ICU.



*Thank you
for your attention~*

Any Question ???

