

ICU Admission and Triage Criteria

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متخصص بیهوشی و

فوق تخصص مراقبتهای ویژه

پاییز 1400

ICU Admission, Discharge, and Triage Guidelines: A Framework to Enhance Clinical Operations, Development of Institutional Policies, and Further Research

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Types of ICU's

- Open ICU model—patient admitted under care of an internist, family practitioner, surgeon, or specialist with an *elective critical care consultation*
- Intensivist co-management—open ICU with *mandatory critical care consultation*
- Closed ICU—patients transferred to care of intensivist after evaluation/approval
- Mixed ICU model—overlap of above
- OUR MEDICAL ICU IS A CLOSED ICU MODEL

We suggest that patients with invasive mechanical ventilation or complex life-threatening conditions, including those with sepsis, be treated in an ICU. Patients should not be weaned from mechanical ventilation on the general ward unless the ward is a high-dependency/intermediate unit	2C
We suggest that critically ill patients in the emergency department or on the general ward be transferred to a higher level of care, such as the ICU, in an expeditious manner	2D
We suggest avoiding admitting to a specialized ICU patients with a primary diagnosis not associated with that specialty (i.e., boarding)	2C
We suggest the admission of neurocritically ill patients to a neuro-ICU, especially those with a diagnosis of intracerebral hemorrhage or head injury	2C
We recommend a high-intensity ICU model, characterized by the intensivist being responsible for day-to-day management of the patient, either in a "closed ICU" setting (in which the intensivist serves as the primary physician) or through a hospital protocol for mandatory intensivist consultation	1B
We do not recommend a 24-hr/7-d intensivist model if the ICU has a high-intensity staffing model (vide supra) during the day or night	1A
We suggest optimizing ICU nursing resources and nursing ratios, taking into consideration available nursing resources (e.g., levels of education, support personnel, specific workloads), patients' needs, and patients' medical complexity	2D
Because of current constraints on the availability and cost of 24-hr intensivist coverage, further studies are needed to address the efficacy of coverage with critical care–trained advance practice providers, including nurse practitioners and physician assistants, and critical care telemedicine	Ungraded
We suggest that patients receive ICU treatment if their prognosis for recovery and quality of life is acceptable regardless of their length of ICU stay. However, factors such as age, comorbidities, prognosis, underlying diagnosis, and treatment modalities that can influence survival should be taken into account	Ungraded

TABLE 2. Summary of Evidence-Based Recommendations and Best Practices

Recommendations	Grade
ICU admission	
We suggest that individual institutions and their ICU leaders develop policies to meet their specific population needs (e.g., trauma, burns, and neurological), taking into consideration their institutional limitations such as ICU size and therapeutic capabilities	Ungraded
To optimize resource use while improving outcomes, we suggest guiding ICU admissions on the basis of a combination of	2D
<ul style="list-style-type: none">• Specific patient needs that can be only addressed in the ICU environment, such as life-supportive therapies• Available clinical expertise• Prioritization according to the patient's condition• Diagnosis• Bed availability• Objective parameters at the time of referral, such as respiratory rate• Potential for the patient to benefit from interventions• Prognosis	
We suggest using the following tools for bed allocation during the admission and triage processes	Ungraded
<ul style="list-style-type: none">• Guide to resource allocation of intensive monitoring and care (Table 3)• ICU admission prioritization framework (Table 4)	
We suggest patients needing life-sustaining interventions who have a higher probability of recovery and would accept cardiopulmonary resuscitation receive a higher priority for ICU admission than those with a significantly lower probability of recovery who choose not to receive cardiopulmonary resuscitation (Table 4)	2D

TABLE 3. Guide to Resource Allocation of Intensive Monitoring and Care

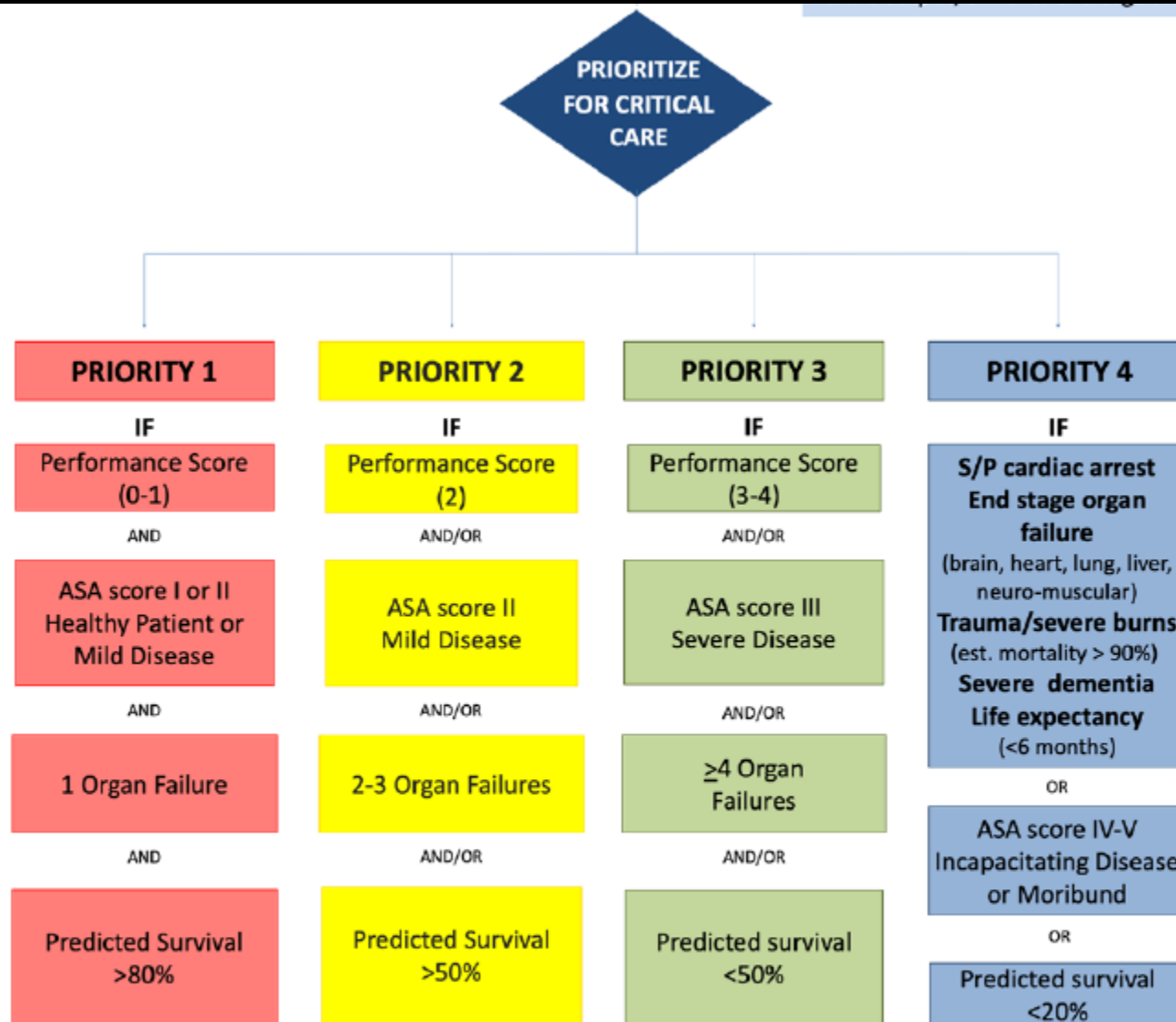
Level	Type of Patients	Nursing-to-Patient Ratios	Interventions
ICU (very high) or level 3	Critically ill patients who need hourly and/or invasive monitoring, such as continuous blood pressure monitoring via an arterial cannula	1:1 to \leq 1:2	Invasive interventions not provided anywhere else in the institution, such as cerebrospinal fluid drainage for elevated intracranial pressure management, invasive mechanical ventilation, vasopressors, extracorporeal membrane oxygenation, intraaortic balloon pump, left ventricular assist device, or continuous renal replacement therapy
Intermediate medical unit (high-medium) or level 2 ^a	Unstable patients who need nursing interventions, laboratory workup, and/or monitoring every 2–4 hr	\leq 1:3	Interventions such as noninvasive ventilation, IV infusions, or titration of vasodilators or antiarrhythmic substances
Telemetry (medium-low) or level 1 ^a	Stable patients who need close electrocardiographic monitoring for nonmalignant arrhythmias or laboratory work every 2–4 hr. This type of unit or ward service is mainly for monitoring purposes.	\leq 1:4	IV infusions and titration of medications such as vasodilators or antiarrhythmics
Ward (low) or level 0	Stable patients who need testing and monitoring not more frequently than every 4 hr	\leq 1:5	IV antibiotics, IV chemotherapy, laboratory and radiographic work, etc

TABLE 4. ICU Admission Prioritization Framework

Level of Care	Priority	Type of Patient
ICU	Priority 1	Critically ill patients who require life support for organ failure, intensive monitoring, and therapies only provided in the ICU environment. Life support includes invasive ventilation, continuous renal replacement therapies, invasive hemodynamic monitoring to direct aggressive hemodynamic interventions, extracorporeal membrane oxygenation, intraaortic balloon pumps, and other situations requiring critical care (e.g., patients with severe hypoxemia or in shock)
	Priority 2	Patients, as described above, with significantly lower probability of recovery and who would like to receive intensive care therapies but not cardiopulmonary resuscitation in case of cardiac arrest (e.g., patients with metastatic cancer and respiratory failure secondary to pneumonia or in septic shock requiring vasopressors)
IMU	Priority 3	Patients with organ dysfunction who require intensive monitoring and/or therapies (e.g., noninvasive ventilation), or who, in the clinical opinion of the triaging physician, could be managed at a lower level of care than the ICU (e.g., postoperative patients who require close monitoring for risk of deterioration or require intense postoperative care, patients with respiratory insufficiency tolerating intermittent noninvasive ventilation). These patients may need to be admitted to the ICU if early management fails to prevent deterioration or there is no IMU capability in the hospital
	Priority 4	Patients, as described above but with lower probability of recovery/survival (e.g., patients with underlying metastatic disease) who do not want to be intubated or resuscitated. As above, if the hospital does not have IMU capability, these patients could be considered for ICU in special circumstances
Palliative care	Priority 5	Terminal or moribund patients with no possibility of recovery; such patients are in general not appropriate for ICU admission (unless they are potential organ donors). In cases in which individuals have unequivocally declined intensive care therapies or have irreversible processes such as metastatic cancer with no additional chemotherapy or radiation therapy options, palliative care should be initially offered

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THEN

1. Tie-breaking- A. Allocation by incremental ICU benefit- saving the most life-years
B. If still tie- first come, first served
2. Re-assess priority every 24h for patients waiting for ICU admission.
3. Re-assess patients at day 10-14 or earlier if significant deterioration.

Triage points

- Triage decisions will never be 100% accurate
- Better to be wrong about a soft admission who leaves ICU within 24 hours rather than the borderline patient who is transferred from wards to ICU within 48 hours
- Propensity scores can sometimes help, but they will never replace clinical judgment of physician at the bedside
 - Pneumonia Severity Index
 - Rockall Score (GI bleed)
 - APACHE score
 - Severe sepsis criteria

Requests for ICU Beds

- *excellent care*
- *abundant resources*
 - *high nurse-patient ratios*
 - *pharmacists, nutritionist, RT's, etc*
 - *high tech equipment*
- *signs of deterioration quickly identified*
- *“give them a chance”*
- *discomfort with death*
- *convenience*
- **Demand frequently exceeds supply**

The “Expensive” Care Unit

- Canada
 - 8% of total inpatient cost
 - 0.2 % of GNP
 - \$1500 per day
- USA
 - 20 - 28 % of total inpatient cost
 - 0.8 to 1 % of the GNP
- 1 ICU day = 3 to 6 times non-ICU day
- Higher costs in non-survivors
- ICU resources are finite

ICU Admission Criteria

- A service for patients with *potentially recoverable* conditions who can *benefit* from more detailed observation and invasive treatment than can be safely provided in general wards or high dependency areas

ICU Triage

- admission criteria remain poorly defined
- identification of patients who can benefit from ICU care is extremely difficult
- demand for ICU services exceeds supply
- rationing of ICU beds is common

Prioritization Model



- **Priority 1**
 - critically ill, unstable
 - require intensive treatment and monitoring that cannot be provided elsewhere
 - ventilator support
 - continuous vasoactive infusions
 - mechanical circulatory support
 - no limits placed on therapy
 - high likelihood of benefit

Prioritization Model



- **Priority 2**
 - **Require intensive monitoring**
 - **May potentially need immediate intervention**
 - **No therapeutic limits**
 - **Chronic co-morbid conditions with acute severe illness**

Prioritization Model

- Priority 3

- Critically ill
- Reduced likelihood of recovery
- Severe underlying disease
- Severe acute illness
- Limits to therapies may be set
 - no intubation, no CPR
- Metastatic malignancy complicated by infection, tamponade, or airway obstruction

Prioritization Model

- **Priority 4**
 - Generally not appropriate for ICU
 - May admit on individual basis if unusual circumstances
 - Too well for ICU
 - mild CHF, stable DKA, conscious drug overdose, peripheral vascular surgery
 - Too sick for ICU (terminal, irreversible)
 - irreversible brain damage, irreversible multisystem failure, metastatic cancer unresponsive to chemotherapy

Diagnosis Model

- **Uses specific conditions or diseases to determine appropriateness of ICU admission**
- **48 diagnosis/ 8 organ systems**
 - **Acute MI with complications**
 - **cardiogenic shock**
 - **complex arrhythmias**
 - **acute respiratory failure**
 - **status epilepticus, SAH**

Objectives Parameters *Model*



- Vital signs
 - HR < 40 or > 150
 - SBP < 80
 - MAP < 60
 - DBP > 120
 - RR > 35

Objectives Parameters Model

- Laboratory values

- Sodium < 110 or > 170
- Potassium < 2.0 or > 7.0
- PaO₂ < 50
- pH < 7.1 or > 7.7
- Glucose > 800 mg/dL
- Calcium > 15 mg/dL
- toxic drug level with compromise

Objectives Parameters Model

- **Radiologic**
 - ICH, SAH, contusion with AMS or focal neuro signs
 - Ruptured viscera, bladder, liver, uterus with hemodynamic instability
 - Dissecting aorta

Diagnosis model for triage

Cardiac System

1. Acute myocardial infarction with complications
2. Cardiogenic shock
3. Complex arrhythmias requiring close monitoring and intervention
4. Acute congestive heart failure with respiratory failure and/or requiring hemodynamic support
5. Hypertensive emergencies
6. Unstable angina, particularly with dysrhythmias, hemodynamic instability, or persistent chest pain
7. S/P cardiac arrest
8. Cardiac tamponade or constriction with hemodynamic instability
9. Dissecting aortic aneurysms
10. Complete heart block

Pulmonary System

1. Acute respiratory failure requiring ventilatory support
2. Pulmonary emboli with hemodynamic instability
3. Patients in an intermediate care unit who are demonstrating respiratory deterioration
4. Need for nursing/respiratory care not available in lesser care areas such as floor or intermediate care unit
5. Massive hemoptysis
6. Respiratory failure with imminent intubation

Objective parameters model

Vital Signs

- * Pulse < 40 or > 150 beats/minute
- * Systolic arterial pressure < 80 mm Hg or 20 mm Hg below the patient's usual pressure
- * Mean arterial pressure < 60 mm Hg
- * Diastolic arterial pressure > 120 mm Hg
- * Respiratory rate > 35 breaths/minute

Laboratory Values (newly discovered)

- * Serum sodium < 110 mEq/L or > 170 mEq/L
- * Serum potassium < 2.0 mEq/L or > 7.0 mEq/L
- * PaO₂ < 50 mm Hg
- * pH < 7.1 or > 7.7
- * Serum glucose > 800 mg/dl
- * Serum calcium > 15 mg/dl
- * Toxic level of drug or other chemical substance in a hemodynamically or neurologically compromised patient

Radiography/Ultrasonography/Tomography (newly discovered)

- * Cerebral vascular hemorrhage, contusion or subarachnoid hemorrhage with altered mental status or focal neurological signs
- * Ruptured viscera, bladder, liver, esophageal varices or uterus with hemodynamic instability
- * Dissecting aortic aneurysm

Electrocardiogram

- * Myocardial infarction with complex arrhythmias, hemodynamic instability or congestive heart failure
- * Sustained ventricular tachycardia or ventricular fibrillation
- * Complete heart block with hemodynamic instability

Physical Findings (acute onset)

- * Unequal pupils in an unconscious patient
- * Burns covering > 10% BSA
- * Anuria
- * Airway obstruction
- * Coma
- * Continuous seizures
- * Cyanosis
- * Cardiac tamponade

Objectives Parameters Model

- **EKG**
 - acute MI with complex arrhythmias, hemodynamic instability, or CHF
 - sustained VT or VF
 - complete heart block with instability

Objectives Parameters Model

- **Physical findings (acute onset)**
 - unequal pupils with LOC
 - burns > 10%BSA
 - anuria
 - airway obstruction
 - coma
 - continuous seizures
 - cyanosis
 - cardiac tamponade

ICU Admission Criteria

- **Potential or established organ failure**
- **Factors to be considered**
 - **Diagnosis**
 - **Severity of illness**
 - **Age and functional status**
 - **Co-existing disease**
 - **Physiological reserve**
 - **Prognosis**
 - **Availability of suitable treatment**
 - **Response to treatment to date**
 - **Recent cardiopulmonary arrest**
 - **Anticipated quality of life**
 - **The patient's wishes**

Discharge Criteria

- **physiologic status has stabilized**
 - need for ICU monitoring and care no longer necessary
- **physiologic status has deteriorated**
 - active interventions no longer planned

Intermediate Care Units

- **monitoring and care of patients with moderate or potentially severe physiologic instability**
- **require technical support**
- **frequent monitoring of vital signs**
- **frequent nursing interventions**
- **not necessarily artificial life support**
- **do not require invasive monitoring**
- **require less care than ICU**
- **require more care than general ward**

Intermediate Care Units

- **22% of ICU bed days**
- **6180/17440 admissions with less than a 10% risk of requiring active treatment based on this monitoring**
- **reduced costs with ICU demonstrated**
- **increased patient satisfaction**

Intermediate Care Units



- **reduces costs**
- **reduces ICU LOS**
- **no negative impact on outcome**
- **improves patient/family satisfaction**

ICU Outcome Studies

- **no difference ICU vs. Ward for CEA**
- **femoral bypass**
- **GI bleeds**
- **drug overdose**
- **bone marrow transplants**
- **closed units**
- **AAA**

ICU Triage



- **Patients should be admitted if they can benefit with decreased risk of death**
- **patients with reversible medical conditions who have a “reasonable” prospect of substantial recovery**
 - **NIH Consensus conference**

ICU Triage



- good prognosis over poor
- likelihood of benefit
- life expectancy due to disease
- anticipated quality of life
- wishes of patient or surrogate
- obligations to current patients outweigh new patients

ICU Triage



- “Too well to benefit”
 - Possibility of being detrimental by providing overly aggressive care
 - Procedure complications
 - Increased chance of multi-resistant infections
 - Patients who will survive anyway should not be admitted for anticipatory monitoring

ICU Triage



- “Too sick to benefit”
 - Hopelessly ill patients should not be admitted to an ICU

ICU Triage



- age
- diagnosis - good or bad
- number of ICU beds available
- patients refused admission had higher APACHE scores
- Sprung et al, CCM 1999;27:1073-1079

ICU Triage

- **Intensive therapy not available elsewhere**
 - **reasonable survival with, death without**
- **Monitored patients at high risk of complications**
- **Comatose with poor quality of life expected**
- **Little likelihood of survival**
- **Monitored patients at low risk for complications**

KARNOFSKY PERFORMANCE STATUS SCALE DEFINITIONS RATING (%)

CRITERIA

Able to carry on normal activity and to work; no special care needed.	100	Normal no complaints; no evidence of disease.
	90	Able to carry on normal activity; minor signs or symptoms of disease.
	80	Normal activity with effort; some signs or symptoms of disease.
Unable to work; able to live at home and care for most personal needs; varying amount of assistance needed.	70	Cares for self; unable to carry on normal activity or to do active work.
	60	Requires occasional assistance, but is able to care for most of his personal needs.
	50	Requires considerable assistance and frequent medical care.
Unable to care for self; requires equivalent of institutional or hospital care; disease may be progressing rapidly.	40	Disabled; requires special care and assistance.
	30	Severely disabled; hospital admission is indicated although death not imminent.
	20	Very sick; hospital admission necessary; active supportive treatment necessary.
	10	Moribund; fatal processes progressing rapidly.
	0	Dead

CLINICAL FRAILITY SCALE

	1	VERY FIT	People who are robust, active, energetic and motivated. They tend to exercise regularly and are among the fittest for their age.
	2	FIT	People who have no active disease symptoms but are less fit than category 1. Often, they exercise or are very active occasionally, e.g., seasonally.
	3	MANAGING WELL	People whose medical problems are well controlled, even if occasionally symptomatic, but often are not regularly active beyond routine walking.
	4	LIVING WITH VERY MILD FRAILITY	Previously "vulnerable," this category marks early transition from complete independence. While not dependent on others for daily help, often symptoms limit activities . A common complaint is being "slowed up" and/or being tired during the day.
	5	LIVING WITH MILD FRAILITY	People who often have more evident slowing , and need help with high order instrumental activities of daily living (finances, transportation, heavy housework). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation, medications and begins to restrict light housework.

	6	LIVING WITH MODERATE FRAILITY	People who need help with all outside activities and with keeping house . Inside, they often have problems with stairs and need help with bathing and might need minimal assistance (cuing, standby) with dressing.
	7	LIVING WITH SEVERE FRAILITY	Completely dependent for personal care , from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 months).
	8	LIVING WITH VERY SEVERE FRAILITY	Completely dependent for personal care and approaching end of life. Typically, they could not recover even from a minor illness.
	9	TERMINALLY ILL	Approaching the end of life. This category applies to people with a life expectancy <6 months , who are not otherwise living with severe frailty . (Many terminally ill people can still exercise until very close to death.)

SCORING FRAILITY IN PEOPLE WITH DEMENTIA

The degree of frailty generally corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

In **very severe dementia** they are often bedfast. Many are virtually mute.



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Clinical Frailty Scale ©2005–2020 Rockwood.
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www.geriatricmedicineresearch.ca
Rockwood K et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489–495.

Table 3.1 Revision dates for the most common internationally recognised risk-adjusted models for mortality prediction

SEVERITY OF ILLNESS MODEL	YEAR	TIMING OF SCORE	COHORT SIZE	ICU UNITS	WORLD REGIONS OF ICUS PARTICIPATING IN DEVELOPMENT OF MODEL
SAPS	1984	1st 24 h	679	8	France
SAPS II	1993	1st 24 h	13,152	137	Europe/USA
SAPS III	2005	Admission	16,784	303	Europe, Australia, South and Central America
MPM I	1987	Admission	1997	1	USA
MPM II ₀	1993	Admission	19,124	137	USA/Europe
MPM ₀ III	2007	Admission	124,855	135	USA/Canada Brazil
APACHE I	1981	1st 24 h	805	2	USA
APACHE II	1985	1st 24 h	5815	13	USA
APACHE III	1991	1st 24 h	17,440	40	USA
APACHE IV	2006	1st 24 h	110,558	104	USA
ICNARC	2007	1st 24 h	216,626	163	UK
ICNARC revised coefficients for APACHE II and ICNARC	2011 model	1st 24 h			UK