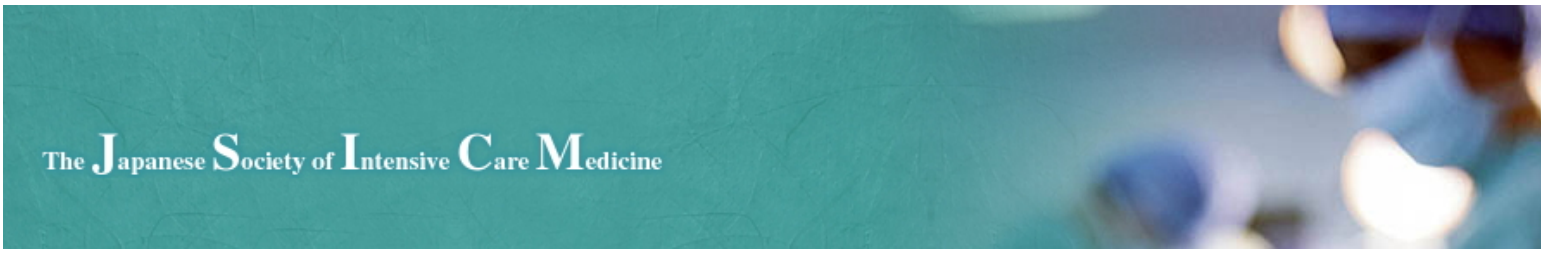

JIPAD

Japanese Intensive care PAtient Database

Annual Report 2015

The Japanese Society of Intensive Care Medicine

ICU Assessment Committee

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Foreword

We, the ICU Assessment Committee members, are delighted to deliver the 2015 Annual Report to you, as our first attempt. JIPAD started in 2014 after three years of preparation. As of February 15, 2017, over 24000 patients have been registered. We would like to express our sincere gratitude to everyone who cooperated with this database project in response to a call from the Japanese Society of Intensive Care Medicine (JSICM). JIPAD (please pronounce it as jei-ai-pad) is a newcomer that has just launched. We are aware that there are many advanced medical databases in Japan and abroad, but we believe someday we will be able to catch up with these “seniors”. The committee members promise that we will try our best to recruit all ICUs certified by JSICM (295 certified-facilities as of December 2016). If that goal is achieved, it will become one of the largest databases in this field.

The data obtained will be returned to each participating facility as a benchmark performance indicator. This makes it possible to compare your own facility with other facilities. In addition, the data can be used through application if you are a JSICM member. We are now working with statistics specialists, and preparing to create partnerships with other committees such as the CTG committee and PICU committee within JSICM, and other committees abroad. We also made an easy-to-use application process within JIPAD for the certification of intensive care specialist training programs.

We promise to make further efforts to create a more useful database system and contribute to our medical society.

Your input is always welcome.

February 15, 2017
The Japanese Society of Intensive Care Medicine
Chair of ICU Assessment Committee, Satoru Hashimoto

Organizational Structure of JIPAD

Members of the ICU Assessment Committee (as of February 15, 2017)

Chair	Satoru Hashimoto	Department of Anesthesiology and Intensive Care Medicine, Kyoto Prefectural University of Medicine
Committee member (alphabetical order)	Satoshi Fujita	Department of Emergency Medicine, Asahikawa Medical University
	Toru Kotani	Department of Anesthesiology, Showa University School of Medicine
	Takaki Naito	Emergency and Critical Care Medicine, Tokyo Bay Urayasu Ichikawa Medical Center
	Satoshi Nakagawa	Department of Critical Care Medicine, National Center for Child Health and Development
	Hiroshi Nishida	Department of Cardiovascular Surgery, Tokyo Women's Medical University
	Hiroshi Okamoto	Department of Emergency Medicine, St. Luke's International Hospital
	Takeshi Suzuki	Department of Anesthesiology, Keio University School of Medicine
	Shigehiko Uchino	Intensive Care Unit, Department of Anesthesiology, The Jikei University School of Medicine
	Hiroko Yamaguchi	Division of Nursing, Nagoya University Hospital
External committee	Hiroaki Miyata	Department of Health Policy and Management, Keio University School of Medicine
President	Masaji Nishimura	Emergency and Critical Care Medicine, Tokushima University Hospital

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History of JIPAD

Date	Event
July, 2011	Launched a working group to prepare for the creation of databases
November, 2011	Development of a business plan by the ICU Assessment Committee
July, 2012	Made an agreement with ANZICS-CORE and received information
January, 2013	Started pilot studies in 5 facilities
March, 2013	Reported study results at the general meeting of JSISM, and called for participation
December, 2013	Completed the data dictionary and opened the website
January, 2014	Completed the system (core program)
March, 2015	Officially called for participation at the general meeting and started site visits
October, 2015	Visited ANZICS-CORE
April, 2016	Visited ICNARC (British ICU database)
November, 2016	Finished the development of JIPAD2.0 and started distribution
February, 2017	Announced the 2015 Annual Report (170 facilities assert participation; 38 facilities start the registration process)

About ANZICS-CORE

ANZICS-CORE (Australian and New Zealand Intensive Care Society, Centre for Outcome and Resource Evaluation) is made up of 4 data registries:

- Adult Patient Database (APD)
- ANZICS Paediatric Intensive Care (ANZPICR) Registry
- Critical Care Resources (CCR) Registry
- Central Line Associated Bloodstream Infection (CLABSI) Registry

JIPAD has partnered with ANZICS-CORE and has used diagnostic codes mainly in common with APD. Although the two coding systems are not identical because of differences in medical care among countries, it can be said that our database is valid as a global standard for critically ill patients. Since ANZICS-CORE has international partnerships with ICNARC in the UK and other organizations in countries such as Hong Kong and Singapore, it is highly expected that they will develop further globally. For details of ANZICS-CORE please refer to their website.

URL: http://www.anzics.com.au/Pages/CORE/About-CORE.aspx

Data Input System

JIPAD Local

This is the basic element of the JIPAD database input system. This component supports manual input, CSV data imports, and secure data transmissions to the server via an SSL connection on the Internet.

JIPAD Internal

This is functionally the same as JIPAD Local, but this component is intended for use in an electronic medical record network without an Internet connection. It provides encrypted and anonymized patient data files (filename: JIPAD Bridge), and delivers the files to JIPAD Local. Also, data can be retrieved from the database directly by linking ODBC (Open Database Connectivity). Note that depending on the nature of your system, use of this component is not essential.

JIPAD Global

This server-side component receives all data except facility name, patient name, and patient ID from JIPAD Local. These data are anonymized and can be viewed by analysts only.

New features in JIPAD 2.0 (released in November, 2016)

- Customization
- PDF generation, which can create the application and renewal form for obtaining certification from JSICM as a training facility for intensive care specialists

Support status of each vendor

Many vendors support the output of the JIPAD compliant data format. Please contact us when you introduce a new patient management system in your facility or organization.

Vendors supporting CSV data outputs

- Nihon Kohden Corporation: CAP2410, Prime Gaia
- FUJIFILM Medical Co., Ltd.: Prescient
- Fukuda Denshi Co., Ltd.: Mirrel
- Fujitsu Limited: EG-MAIN GX (critically ill patients management system)
- Software Service, Inc.: E Chart

Vendors supporting ODBC data linkages

- Philips: PIMS, ACSYS

Activities to Maintain Data Accuracy

Site visits

- Objectives
  (1) To understand the current status of each facility and provide information that can reduce the local workload as much as possible
  (2) To collect defect reports or requests for the system directly from each facility
  (3) To be acquainted with each other and facilitate communication

- Specific activities
  (1) Participate in morning rounds and conferences
  (2) Audit the actual system and how it is operated
  (3) Respond to suggestions or questions regarding JIPAD operations

- Results
  (1) Visited 28 facilities as of February 15, 2017 (started in March 2015)

The query system

To minimize human errors in data collection, we have developed an interactive procedure between participating facilities and administrators (e.g. analysts) as follows:

- The participating facility uploads data in groups of ten.
- The administrator verifies the data and replies with comments such as input errors.
- The participating facility confirms the comment, and if necessary modifies the data and uploads it again.
- The participating facility inputs and uploads the next ten data, referring to previously received comments.
- Both the participating facility and the administrator continue this process until there are no input errors in all uploaded data. After that, the participating facility can upload data freely.

Memo: ANZICS and ICNARC also inspect data input (for example, ICNARC inspects all data in principle, as they have enough manpower).

In most facilities that adopted the query system, the number of rudimentary errors dramatically decreased after trying to input for 50-60 patients. If the person responsible for data input changes, we can maintain the quality of data by conducting the above procedure again in principle. Although the primary objective of the query system is to increase data accuracy, the system has identified not only human errors but also a design error in the CSV output format adopted by the facility.

Pitfalls of Data Collection

This section summarizes common mistakes in the query system as a reference for future data collection. For more detailed data input rules, please refer to the data dictionary.

ICU admission/discharge

- If the admission classification is “Elective surgery”, the admission source should be “Operating room” in almost all cases.
- If the outcome is “ICU mortality”, the time of discharge shall be matched with the time of death, i.e. it is not the time when the patient is taken from the ICU.

Diagnostic code

- “Sepsis” or “Septic shock” shall be selected only when the infectious disease (e.g. catheter infection) is not listed on the diagnostic code table, or its cause is unknown.
- “Cardiovascular - Cardiac arrest” shall have the top priority in non-operational diagnostics. For example, if a patient went into cardiac arrest due to pulmonary embolism on the ward, the diagnostic name should be specified such as “Pulmonary embolism after cardiac arrest resuscitation”, and then the diagnostic code and the diagnostic sub-code should be selected as “Cardiac arrest” and “Pulmonary embolism”, respectively.
- By referring to the diagnostic sub-code table attached to ANZICS-APD data dictionary, we can confirm which specific disease names are associated with each diagnostic code. Note that there is no need to actually select the diagnostic sub code in each case.
- Post-operative admissions for carotid endarterectomy (1205) and internal carotid artery stenting (1208*) shall not be selected by the neurological system, but the cardiovascular system. Post-operative admissions for adrenal gland and thyroid gland shall be selected as metabolic disease (2201).

  *currently there is no specific code for internal carotid artery stenting, so we classified it as other disease.
- Although we do not directly use text fields “Diagnostic name” and “Operation name” in JIPAD systems, we might be able to improve the convenience of the database in each facility by describing these fields keeping in mind to easily recall the clinical condition afterward.

Chronic disease

- “Chronic disease” field shall be answered based on existing conditions before ICU admission. For example, even if the patient was admitted to the ICU for heart failure, the answer field for heart failure shall be “No” unless the patient had classified as NYHA class

IV before the admission.

- Not all patients on steroids have to answer for immunosuppression as “Yes”. It shall be “Yes” only when the equivalent dose of prednisolone is 0.375mg/kg/day or more.

ICU Treatments

- The answer field for the tracheostomy shall be “Yes” (more strictly, “Surgical” or “Percutaneous”) only when the procedure was performed during the current ICU stay, e.g. if the patient is admitted with a tracheostomy in place (for example, a patient who underwent tracheotomy during the surgery for laryngeal cancer and was admitted to the ICU), the answer shall be “No”.
- If the patient has a mechanical ventilator before ICU admission (e.g. after surgery), “Start date and time” of the mechanical ventilator shall be matched with the ICU admission date. Likewise, if the patient is discharged from the ICU while undergoing mechanical ventilation, “End date and time” shall be matched with the ICU discharge date. We should be careful that these data often become incorrect when you perform an automatic import from the patient information system.

Adult severity score

- The answer field for acute kidney injuries shall be “Yes” only when the definition (Cr ≥ 1.5mg/dl and urine < 410ml/24h) is satisfied.
- Incorrectly recorded data in the patient information system such as an abnormal value for arterial pressure or respiratory rate remain incorrect after an automatic import, so the values should be modified manually. It is important to record all kinds of data correctly at the first input.
- Measured values of Na, K, and Glu shall be selected based on the worst result of arterial blood gas and biochemical tests. The value of hematocrit measured by a blood gas analyzer shall not be used, as it is a calculated value and not a measured one in many cases.
- If the temperature of the patient is controlled to be less than 36 degrees Celsius by equipment used for hypothermia, that measured value shall not be used.
- GCS (Glasgow Coma Scale) for the patient who received anesthesia or sedation shall be estimated as if he/she had not received medication. In this case, we can get a plausible result by referring to the condition of the patient before sedation. If the patient has drug addiction, however, the observed value of GCS shall be recorded as it is. Similar estimations should be done when the patient cannot open his/her eyes due to edema (it is highly probable that the patient is not actually in E1 condition of GCS; it is simply due to

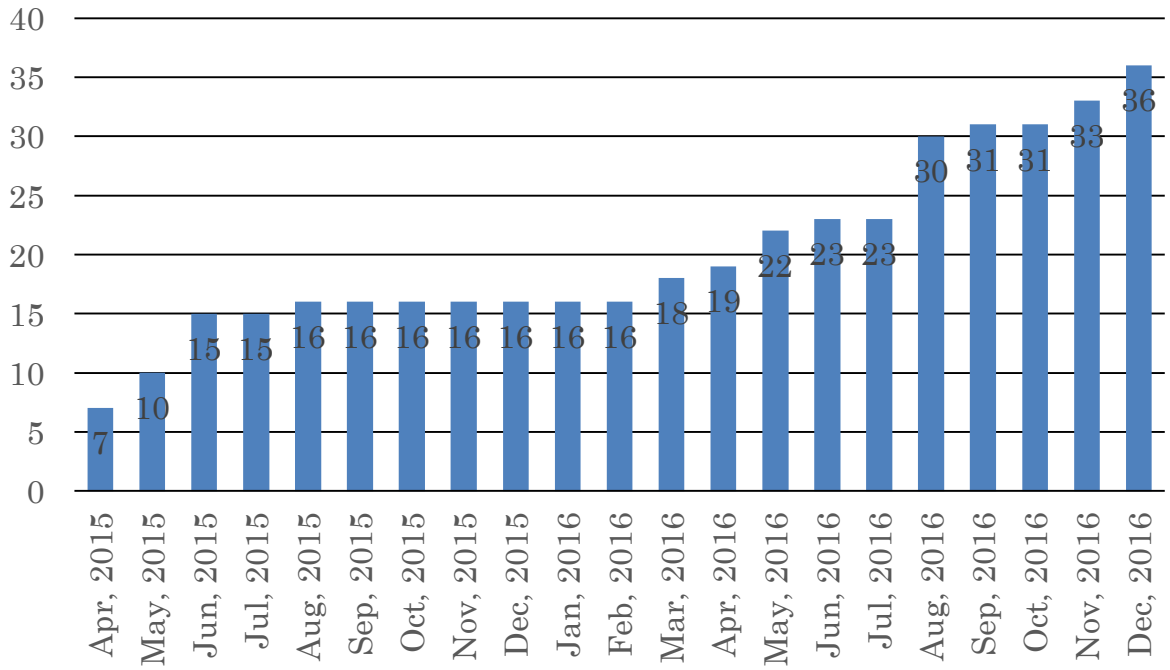
edema). In many cases, the GCS score should be “E4 V5 M6” after elective surgery.

Pediatric severity score

- Each parameter of the pediatric severity score shall be the first measurement value within 1 hour of admission, unlike the adult severity score which adopts the worst value within the last 24 hours.
- If the patient does not have any disease listed in fields “High risk diagnostic name” nor “Low risk diagnostic name”, values of these fields should be listed as “None”.

Changes in the Number of Registered Facilities and Basic Information

- 168 facilities are registered as of December 15, 2016.
- 36 facilities (32 hospitals) have started data registration.



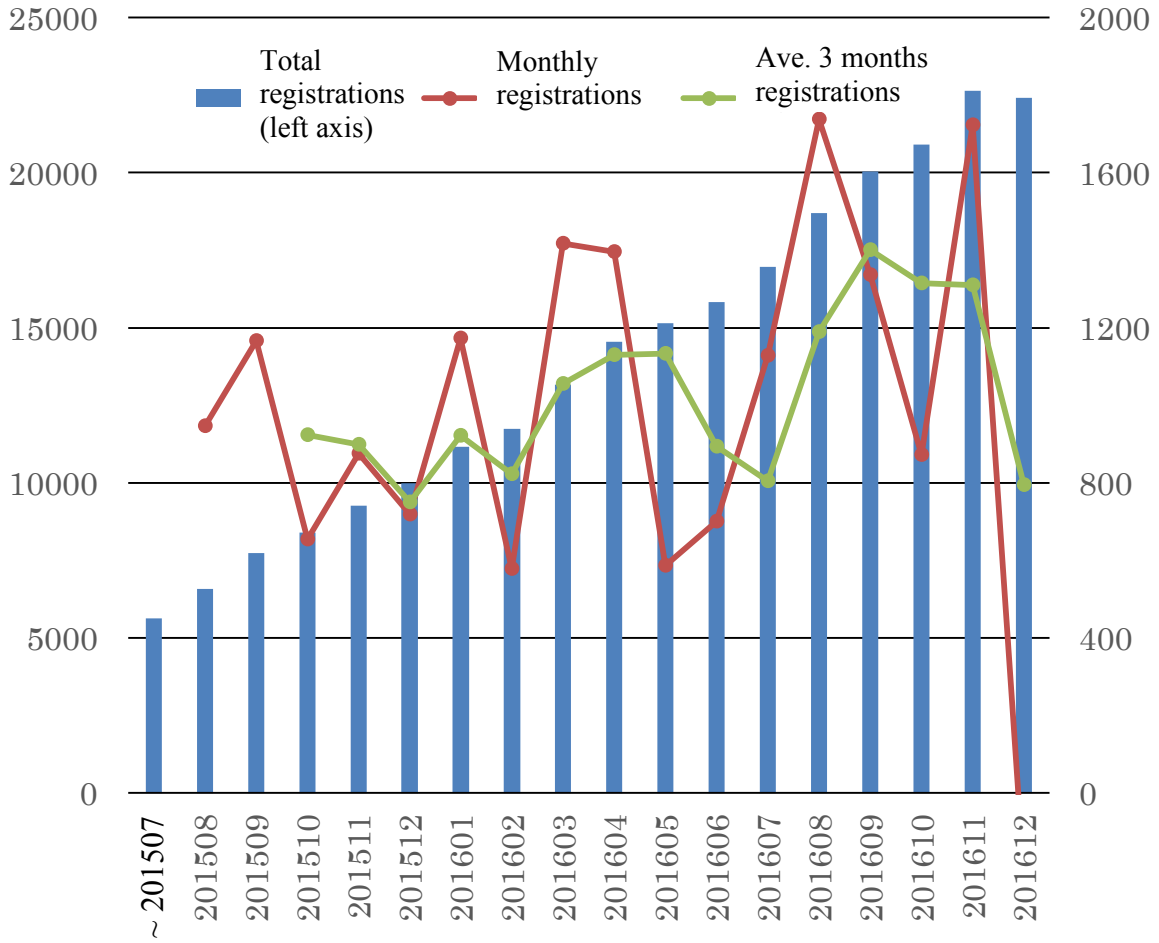
Hospital type	National university 8, Public university 4, Private university 8, National hospital 2, Municipal hospital 4, Other public hospital 5
Number of permitted beds in hospital*	701 (550-1049)
Number of ICU beds*	10 (7-14)
Number of annual ICU admissions*	909 (585-1167)
Number of annual pediatric admissions*	20 (3-67)
Number of ICU doctors*	3 (2-8)
Number of JSICM-certified specialists*	3 (2-4)
Rate of intensive care certified nurses	75.0%
Rate of emergency nursing certified nurses	8.3%
Rate of dedicated critical care nurses	22.2%
Rate of dedicated ICU clinical engineers	72.2%
Rate of dedicated ICU pharmacists	77.8%

*Median (25th - 75th)

Other public hospital: Red Cross Hospital, Rosai Hospital, Saiseikai Hospital, Social Insurance Hospital, Welfare Pension Hospital, etc.

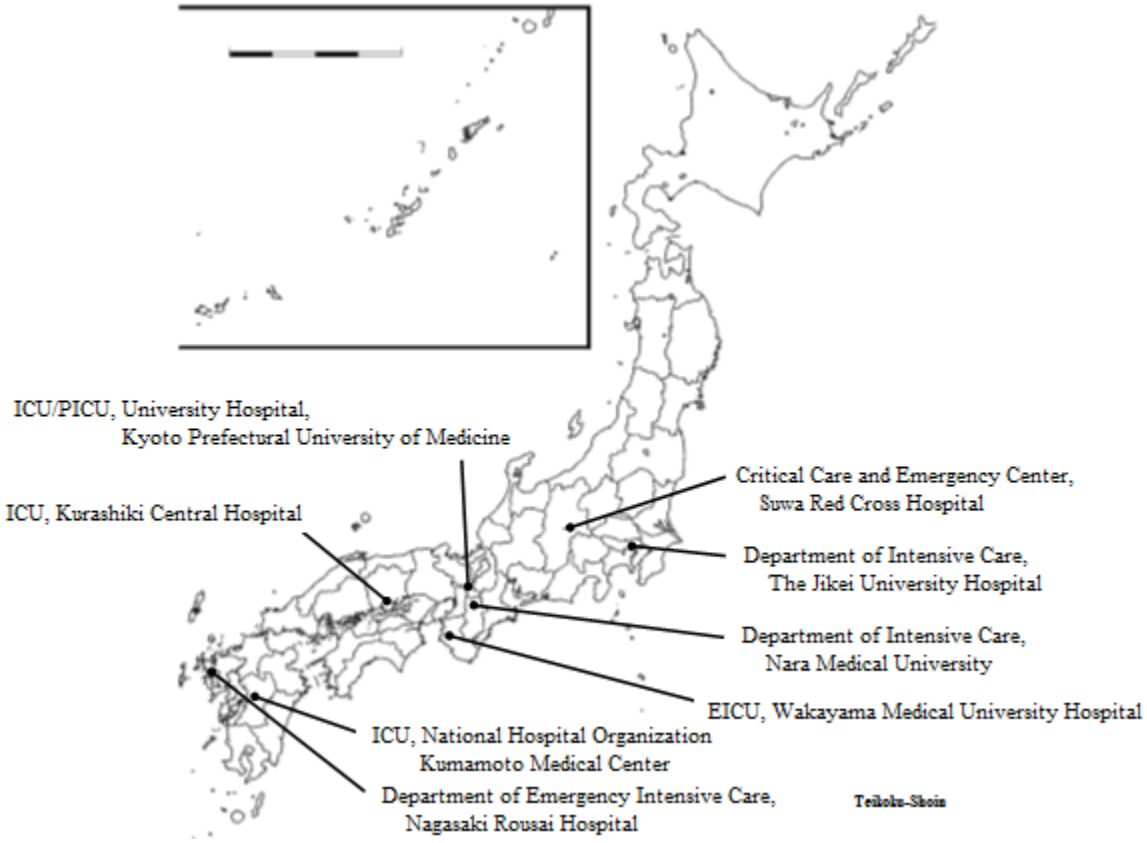
Changes in the Number of Registered Admissions

- We started tracking the number of registered admissions monthly in August 2015.
- The total number of registered admissions reached 10,000 in December 2015, and grew to over 20,000 by September 2016. Note that it transiently decreased in December 2016, because a large amount of data was removed for one facility.
- The monthly number of registrations is 1,000-2,000. Although there are variations, the average for three months had been initially about 1,000, but recently it has increased to over 1,600.



Data Analysis in Fiscal Year 2015

Analysis targets: 9 facilities (8 hospitals) from which data was continuously collected from April 2015 until March 2016



Facility name	Hospital type	ICU beds
ICU, University Hospital, Kyoto Prefectural University of Medicine	Public university	6
PICU, University Hospital, Kyoto Prefectural University of Medicine	Public university	6
Department of Intensive Care, The Jikei University Hospital	Private university	20
Department of Intensive Care, Nara Medical University	Public university	14
ICU, National Hospital Organization Kumamoto Medical Center	National hospital	6
EICU, Wakayama Medical University Hospital	Public university	10
ICU, Kurashiki Central Hospital	Private hospital	12
Department of Emergency Intensive Care, Nagasaki Rousai Hospital	Official hospital	6
Critical Care and Emergency Center, Suwa Red Cross Hospital	Official hospital	8

Patient Characteristics (1): Basic Information

- Patient classification
  - Pediatric: 15 years or younger
  - Monitoring: adult patients who entered the ICU as an elective admission or for a procedure, and discharged alive within 24 hours
  - Critically ill: adults other than those above
- The total number of targeted admissions are 5,908, and 581 (9.8%) of those are pediatric admissions.

	All patients	Critically ill	Monitoring	Pediatric
Total admissions	5908	3071	2256	581
Age (years)*	68 (53 - 77)	70 (60 - 79)	68 (58 - 76)	1 (0 - 6)
Males, %	61.0%	62.9%	59.2%	58.2%
Height (cm)*	160 (151 - 167)	161 (154 - 168)	161 (154 - 168)	80 (62 - 108)
Weight (kg)*	56 (47 - 66)	57 (49 - 66)	59 (51 - 68)	10 (6 - 18)
RRT / MET	0.6%	1.0%	0%	0.7%
Code blue	0.8%	1.4%	0%	0.2%
Hospital-ICU (days)*	3 (1 - 7)	2 (0 - 7)	3 (2 - 6)	2 (1 - 6)
Readmissions	4.6%	6%	1.4%	9.6%
After cardiac arrest resuscitation	2.2%	3.8%	0%	1.9%
Chronic disease				
Immunosuppression	5.5%	8.1%	2.9%	1.4%
Maintenance dialysis	5.0%	7.2%	3.3%	0.2%
Metastatic cancer	3.3%	4.0%	3.0%	0.3%
Respiratory failure	1.5%	1.7%	1.0%	2.6%
Liver cirrhosis	1.4%	2.1%	0.9%	0%
Heart failure	0.8%	0.8%	0.5%	1.5%
AL / MM	0.8%	1.3%	0.1%	0.5%
Lymphoma	0.7%	1.3%	0.2%	0%
Liver failure	0.5%	1.0%	0%	0%
AIDS	0.1%	0.1%	0%	0%

*Median (25th - 75th)

RRT: rapid response team, MET: medical emergency team, Hospital-ICU: period from hospital admission to ICU admission, AL / MM: acute leukemia / multiple myeloma.

Patient Characteristics (2): Classification, Type, and Source of ICU Admissions

- Three quarters of all patients are admitted from the operating room, and two thirds of all admissions undergo elective surgery.
- For critically ill adults, 40% of patients are admitted from places other than the operating rooms, and two thirds are admitted emergently.
- "ICU procedure" includes central venous catheter insertion and cardioversion for atrial fibrillation.

	All patients	Critically ill	Monitoring	Pediatric
Total admissions	5908	3071	2256	581
Admission classification				
Elective surgery	65.9%	40.3%	98.9%	73.0%
Emergency surgery	12.8%	23.3%	0%	6.7%
Non-operative	21.3%	36.4%	1.1%	20.3%
Admission type				
Elective	64.2%	36.3%	99.4%	74.9%
Emergency	35.6%	63.7%	0%	25.1%
ICU procedure	0.2%	0%	0.6%	0%
Admission source				
Operating room	75.9%	58.7%	99.0%	77.3%
Emergency department	12.0%	21.5%	0%	7.9%
Ward	10.7%	17.9%	1.0%	10.2%
Other ICUs	0.2%	0.3%	0%	0%
CCU	0.3%	0.5%	0%	0%
HCU	0.2%	0.4%	0%	0%
NICU	0.1%	0%	0%	1.0%
Directly transferred	0.7%	0.7%	0%	3.6%

Patient Characteristics (3): Disease Group and Severity Scores

- "Disease group" is classified based on diagnostic codes (shown in Appendixes A and B).
- "Infectious disease" includes all types of infections listed on the diagnostic code table.
- Note that PIM2 (Pediatric Index of Mortality 2) is different from adult severity scoring systems in terms of the following points: (i) PIM2 directly predicts a mortality rate without defining the severity score, and (ii) PIM2 predicts an ICU mortality rate, instead of an In-hospital mortality rate.
- Since "All patients" contains readmissions, we do not calculate SMRs (Standard Mortality Ratio) at this point. Please refer to the section "Evaluation of Severity Score" (p.24) for these results.

	All patients	Critically ill	Monitoring	Pediatric
Total admissions	5908	3071	2256	581
Disease group				
Cardiovascular	26.6%	27.8%	20.9%	42.3%
Neurological	21.1%	17.1%	27.1%	18.9%
Respiratory	18.6%	13.9%	24.7%	18.9%
Gastrointestinal	18.6%	22.7%	15.3%	9.5%
Musculoskeletal/Skin	5.0%	4.0%	6.1%	5.5%
Genitourinary	2.5%	2.0%	3.5%	1.4%
Trauma	2.1%	3.5%	0.4%	1.0%
Sepsis	1.9%	3.5%	0%	1.2%
Metabolic	1.8%	2.5%	1.3%	0.2%
Gynecological	0.8%	1.2%	0.5%	0%
Others	1.0%	1.8%	0%	1.1%
Infectious disease	8.7%	14.4%	1.4%	6.5%
APACHE III score*	52 (39-70)	63 (47 - 83)	42 (33 - 53)	-
Predicted mortality rate*	6.9% (2.8-19.8)	13.4% (4.9 - 37.5)	3.6% (1.9 - 7.1)	-
APACHE II score*	14 (11-18)	16 (13 - 22)	12 (9 - 14)	-
Predicted mortality rate*	11.8% (6.0-25.4)	19.8% (10.1 - 38.9)	6.8% (4.4 - 11.3)	-
SAPS II score*	27 (18-38)	34 (25 - 47)	19 (14 - 25)	-
Predicted mortality rate*	7.9% (2.9-21.3)	15.3% (6.5 - 39.2)	3.3% (1.7 - 6.5)	-
PIM2 Predicted mortality rate*	1% (0.2 - 2.1)	-	-	1% (0.2 - 2.1)

*Median (25th - 75th)

Top 10 Most Frequent Diseases

- The top 10 diseases among all patients are all post-operative.
- The number of patients following surgery for GI cancer is outstanding in critically ill adults.
- Most of "Other neurologic disease" in adult patients in "monitoring" are intracerebral endovascular treatment, especially coil embolism of unruptured cerebral aneurysm.
- The top 4 pediatric admissions are all "Other disease". This reveals the limitation of applying adult disease names to pediatric patients. Most of "Other cardiovascular disease" are surgery for congenital heart disease.
- Diagnostic codes are shown in Appendixes A and B.

All patients

	Code		Diagnostic name	
1	1405	Post-operative	GI cancer	9.9%
2	1506	Post-operative	Other neurologic disease	8.1%
3	1302	Post-operative	Respiratory neoplasm - lung	6.7%
4	1504	Post-operative	Laminectomy/Spinal cord surgery	5.6%
5	1208	Post-operative	Other cardiovascular disease	5.5%
6	1206	Post-operative	Valvular heart surgery	4.2%
7	1304	Post-operative	Other respiratory disease	3.4%
8	1902	Post-operative	Orthopedic surgery	3.4%
9	1505	Post-operative	Craniotomy for neoplasm	3.3%
10	1207	Post-operative	Coronary artery bypass graft	2.9%

Critically ill adults

	Code		Diagnostic name	
1	1405	Post-operative	GI cancer	9.5%
2	1206	Post-operative	Valvular heart surgery	5.6%
3	1504	Post-operative	Laminectomy/Spinal cord surgery	4.6%
4	1207	Post-operative	Coronary artery bypass graft	3.9%
5	1506	Post-operative	Other neurologic disease	3.9%
6	1401	Post-operative	GI perforation	3.0%
7	211	Non-operative	Other respiratory disease	2.7%
8	102	Non-operative	Cardiac arrest	2.6%
9	1303	Post-operative	Respiratory neoplasm - mouth/larynx/sinus/trachea	2.5%
10	212	Non-operative	Bacterial pneumonia	2.1%

Adults, monitoring patients

	Code		Diagnostic name	
1	1302	Post-operative	Respiratory neoplasm - lung	16.0%
2	1506	Post-operative	Other neurologic disease	14.1%
3	1405	Post-operative	GI cancer	12.8%
4	1504	Post-operative	Laminectomy/Spinal cord surgery	7.4%
5	1213	Post-operative	Endoluminal aortic repair	6.2%
6	1505	Post-operative	Craniotomy for neoplasm	5.6%
7	1902	Post-operative	Orthopedic surgery	5.2%
8	1304	Post-operative	Other respiratory disease	4.3%
9	1303	Post-operative	Respiratory neoplasm - mouth/larynx/sinus/trachea	4.1%
10	1206	Post-operative	Valvular heart surgery	3.5%

Pediatric

	Code		Diagnostic name	
1	1208	Post-operative	Other cardiovascular disease	35.1%
2	1304	Post-operative	Other respiratory disease	11.7%
3	1506	Post-operative	Other neurologic disease	7.7%
4	1408	Post-operative	Other GI disease	6.5%
5	1504	Post-operative	Laminectomy/Spinal cord surgery	4.1%
6	109	Non-operative	Other cardiovascular disease	4.0%
7	1505	Post-operative	Craniotomy for neoplasm	3.1%
8	1902	Post-operative	Orthopedic surgery	2.9%
9	1903	Post-operative	Dermatological surgery	1.9%
10	213	Non-operative	Viral pneumonia	1.7%

ICU Treatments

- "Reattach MV within 48 hours" shows how often mechanical ventilation was resumed within 48 hours before tracheostomy is performed. Although it has almost the same meaning as the reintubation rate within 48 hours, "Reattach MV within 48 hours" includes patients who underwent tracheostomy before ICU admission.
- "IRRT" includes peritoneal dialysis. "RRT for AKI" includes the patients for whom intermittent or continuous renal replacement therapy was performed and the patient has not had maintenance dialysis as his/her chronic disease.
- Central venous catheterization and arterial catheterization are performed in about 40% and over 90% of all patients, respectively.
- Mechanical ventilation is performed in about 40% of all patients.
- Tracheostomy is performed in 4% of critically ill adults, and a surgical tracheostomy is performed more frequently than percutaneously. The median number of days from the ICU admission to the tracheostomy is 11 days. It seems that this value is about the same as the period of mechanical ventilation.

	All patients	Critically ill	Monitoring	Pediatric
Total admissions	5908	3071	2256	581
Central venous catheterization	42.6%	52.9%	26.9%	49.4%
Arterial catheterization	90.7%	90.6%	94.3%	77.1%
Mechanical ventilation	41.8%	56.0%	17.8%	59.7%
Length of MV (days)*	0.7 (0.3 - 3.0)	1.3 (0.5 - 3.8)	0.3 (0.2 - 0.5)	0.7 (0.2 - 3.6)
Reattach MV within 48 hours	1.1%	1.7%	0%	1.5%
NPPV	4.2%	6.9%	0.9%	2.8%
Surgical tracheostomy	1.4%	2.3%	0%	1.5%
Percutaneous tracheostomy	0.9%	1.7%	0%	0%
Admission - tracheostomy (days)*	11 (7 – 15)	11 (7 – 15)	-	17 (7 – 35)
IABP	1.4%	2.6%	0.2%	0%
PCPS (VA-ECMO)	0.6%	0.8%	0%	1.5%
VV-ECMO	0.1%	0.1%	0%	0%
IRRT	4.1%	7.1%	1.0%	0.7%
CRRT	5.7%	10.7%	0%	1.2%
RRT for AKI	4.1%	7.6%	0%	1.5%
Plasma exchange	0.5%	0.8%	0%	0.3%
PMX	1.0%	1.9%	0%	0.3%
Other blood purification therapy	0.1%	0.1%	0%	0%

*Median (25th - 75th)
MV: mechanical ventilation, NPPV: noninvasive positive pressure ventilation,
IABP: intra-aortic balloon pumping, PCPS: percutaneous cardio-pulmonary support,
VA: veno-arterial, VV: veno-venous, ECMO: extracorporeal membranous oxygenation,
IRRT: intermittent renal replacement therapy, CRRT: continuous renal replacement therapy,
PMX: polymyxin B direct hemoperfusion.

ICU and Hospital Outcomes

- The ICU and in-hospital mortality rates are 4.2% and 8.5%, respectively.
- The ICU and in-hospital mortality rates for pediatric admissions are both less than half of that for critically ill adults.
- About a quarter of hospital discharge outcomes for critically ill adults are transfer to another hospital. Since the subsequent outcome has not been tracked, their long-term outcomes are unclear.
- "Ward with MV" is the rate of discharge to a general ward with mechanical ventilation.

	All patients	Critically ill	Monitoring	Pediatric
Total admissions	5908	3071	2256	581
ICU discharge outcome				
Ward	86.0%	78.2%	95.8%	89.3%
CCU	0.4%	0.8%	0%	0.2%
HCU	7.8%	12.1%	3.9%	0.7%
NICU	0%	0%	0%	0.2%
PICU	0.5%	0%	0%	4.5%
Other ICUs	0.2%	0.3%	0.2%	0%
Discharge	0.2%	0.3%	0%	0%
Transfer	0.6%	0.7%	0%	2.2%
Mortality	4.2%	7.6%	0%	2.9%
ICU Length of stay (days)*	1.0 (0.8 - 2.9)	2.5 (1.4 - 4.9)	0.8 (0.7 - 0.9)	1.5 (0.8 - 3.8)
Ward with MV	1.8%	2.6%	0.3%	3.3%
Hospital discharge outcome				
Survival	74.8%	60.7%	91.4%	85.2%
Transfer	16.6%	24.6%	7.7%	8.8%
Mortality	8.5%	14.6%	0.9%	6.0%
Hospital Length of stay (days)*	22 (12 - 41)	28 (17 - 50)	15 (9 - 28)	18 (11 - 45)

*Median (25th - 75th)

MV: mechanical ventilation.

Comparison with ANZICS

- The comparison target is ANZICS's latest report, the 2014-2015 version.
  URL: http://www.anzics.com.au/Pages/CORE/CORE-Reports.aspx
- Since ANZICS has already changed the evaluation model for adult and pediatric severity scores to ANZROD and PIM3 respectively, their report does not contain results of the severity scores we use in JIPAD. We contacted the ANZICS-CORE office and received the results of APACHE III scores and predicted mortality rates based on APACHE III-j.
  Reference on ANZROD: Paul E, et al. J Crit Care. 2013; 28: 935-41.
  Reference on PIM3: Straney L, et al. Pediatr Crit Care Med. 2013; 14: 673-81.
- While ANZICS uses disease categories of ANZPICR for pediatric patients, JIPAD uses APD, the same as for adult patients. This causes a mismatch of diagnostic names between ANZICS and JIPAD. For example, congenital heart disease is further classified into more specific disease names in ANZPICR, but is simply classified as "Other cardiovascular disease" in JIPAD. As a result, despite the fact that congenital heart disease does not appear at the top of the frequent disease list of ANZICS, it is ranked first in JIPAD.
- There are more elective admissions in Japan for both adult and pediatric admissions.
- The standard mortality ratio based on APACHE III-j in both databases are much lower than 1. As ANZICS adopts ANZROD in response to this result, it is highly expected that we will develop our own calculation method for the predicted mortality rate suitable for JIPAD.

Admission characteristics and prognoses for adult admissions

	ANZ	JIPAD
Total admissions	147,060	5,327
Age (years)	64 (50-75)	69 (59-78)
Males, %	57.4%	61.3%
APACHE III Score*	44 (31-61)	52 (39-70)
APACHE III-j Predicted mortality rate*	3.8% (1.2-12.9)	6.9% (2.8-19.8)
Average predicted mortality rate	12.0%	17.1%
Elective admissions after elective surgery	43.1%	62.7%
MV within 24 hours of admission	36.3%	39.9%
MV + NPPV over ICU admission	46.1%	42.0%
ICU Length of stay (days)*	1.8 (0.9-3.3)	1.0 (0.8-2.8)
After-hours discharge (18:00-06:00)	14.7%	4.2%
Readmissions	4.6%	4.1%

Admission source		
Ward	16.0%	11.5%
Operating room	51.8%	75.8%
Emergency department	25.9%	12.4%
Directly transferred	6.3%	0.4%
ICU mortality rate	5.5%	4.4%
Discharge outcome		
Survival	64.3%	73.7%
Transfer	27.3%	17.5%
Mortality	8.4%	8.8%
Standard mortality ratio	0.700	0.515

*Median (25th - 75th)

MV: mechanical ventilation, NPPV: noninvasive positive pressure ventilation.

Top 5 most frequent diseases for adult admissions

Australia

	Code		Diagnostic name	
1	1207	Post-operative	Coronary artery bypass graft	6.4%
2	1902	Post-operative	Orthopedic surgery	4.5%
3	1405	Post-operative	GI cancer	4.0%
4	1408	Post-operative	Other GI disease	3.7%
5	1206	Post-operative	Valvular heart surgery	3.6%

New Zealand

1	1207	Post-operative	Coronary artery bypass graft	9.9%
2	1206	Post-operative	Valvular heart surgery	6.0%
3	1405	Post-operative	GI cancer	3.7%
4	703	Non-operative	Drug overdose	3.6%
5	102	Non-operative	Cardiac arrest	3.4%

JIPAD

1	1405	Post-operative	GI cancer	10.9%
2	1506	Post-operative	Other neurologic disease	8.2%
3	1302	Post-operative	Respiratory neoplasm - lung	7.3%
4	1504	Post-operative	Laminectomy/Spinal cord surgery	5.8%
5	1206	Post-operative	Valvular heart surgery	4.7%

Admission characteristics and prognoses for pediatric admissions

	ANZ	JIPAD
Total admissions	11,492	581
Age (months)*	23 (5–88)	23 (5-72)
Male infants, %	57.5%	58.2%
Elective admission	31.3%	74.9%
MV within 1 hour of admission	40.2%	57.8%
MV over ICU admission	48.2%	60.2%
Length of stay in PICU (days)*	1.6 (0.9–3.2)	1.5 (0.8-3.8)
After-hours discharge (18:00-06:00)	10.7%	2.8%
Readmissions	7.4%	9.6%
PICU mortality rate	2.4%	2.9%
In-hospital mortality rate	3.5%	6.0%

*Median (25th - 75th)

MV: mechanical ventilation.

Top 5 most frequent diseases for pediatric admissions

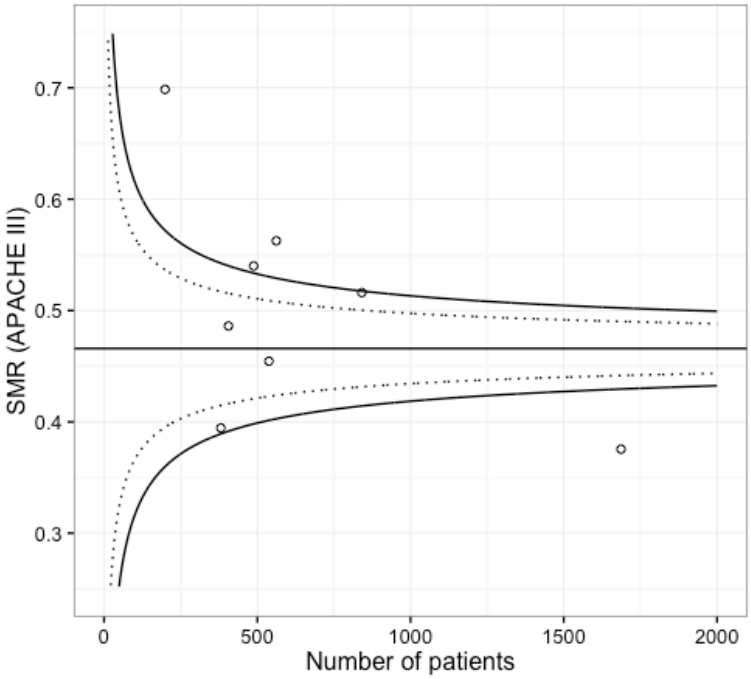
	Australia		New Zealand	
1	Bronchiolitis	13.0%	Bronchiolitis	18.8%
2	Pneumonia or Pneumonitis	4.9%	Bronchial asthma	6.5%
3	Seizures	4.8%	Pneumonia or Pneumonitis	6.2%
4	Bronchial asthma	4.2%	Seizures	3.9%
5	Diabetic ketoacidosis	2.7%	Central apnea	2.6%

	JIPAD (post-operative)	
1	Other cardiovascular disease	35.1%
2	Other respiratory disease	11.7%
3	Other neurologic disease	7.7%
4	Other GI disease	6.5%
5	Laminectomy/Spinal cord surgery	4.1%

Provision of Benchmark Information for Participating Facilities

- We provide benchmark information for facilities which are subject to data analysis in the Annual Report.
- The benchmark information contains comparison results of aggregate as well as each facility's individual data. Specific items in these results are as follows:
  - Patient characteristics (1): basic information
  - Patient characteristics (2): type, form, and source of ICU admission
  - Patient characteristics (3): disease group and severity score
  - Top 10 most frequent diseases
  - ICU treatments
  - ICU and hospital outcomes
  - Funnel plot: the horizontal axis is the number of patients, and the vertical axis is SMRs based on the severity score. The solid and dotted lines are plotted with 3SD and 2SD, respectively.

Funnel plot example (APACHE III-j)



Evaluation of Severity Scores

- Readmissions and patients for ICU procedures are excluded from the sample.
- APACHE III, II, SAPS II are evaluated based on the in-hospital mortality rate of adult admissions, and PIM2 is evaluated based on the ICU mortality rate of pediatric admissions. In this report, we also evaluated PIM2 based on the in-hospital mortality rate, as the ICU mortality rate of pediatric admissions is low.
- We conducted an evaluation of only critically ill adults as a sub-group analysis.
- We did not create the frequency distribution of PIM2, as it already shows the predicted mortality rate and the pediatric mortality rate is low.

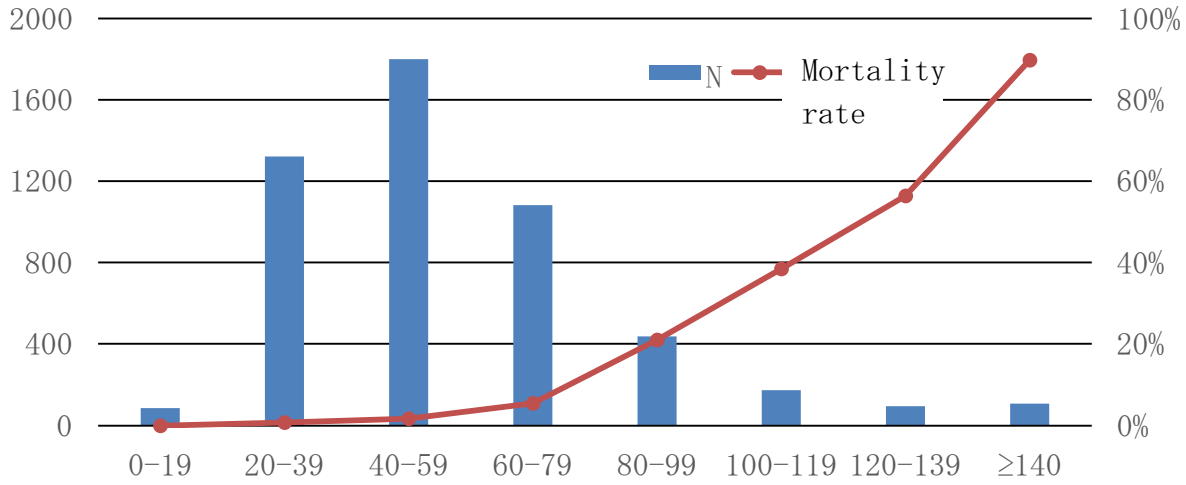
	All adult patients	Critically ill	Pediatric
Total admissions	5103	2886	525
ICU mortality rate	4.0%	7.1%	2.7%
In-hospital mortality rate	7.9%	13.5%	4.2%
APACHE III score[#]	57.3 ± 28.1	67.7 ± 31.3	-
Predicted mortality rate[#]	16.0 ± 0.2%	23.9 ± 0.3%	-
SMR	0.496	0.565	-
APACHE II score[#]	15.1 ± 7.2	17.8 ± 8.0	-
Predicted mortality rate[#]	19.4 ± 0.2%	27.5 ± 0.2%	-
SMR	0.410	0.491	-
SAPS II score[#]	29.9 ± 17.6	37.7 ± 18.7	-
Predicted mortality rate[#]	17.3 ± 0.2%	26.5 ± 0.3%	-
SMR	0.460	0.509	-
PIM2 Predicted mortality rate[#]	-	-	3.3 ± 0.1%
SMR	-	-	0.817
(SMR of in-hospital mortality)			(1.284)

[#]Mean ± SD

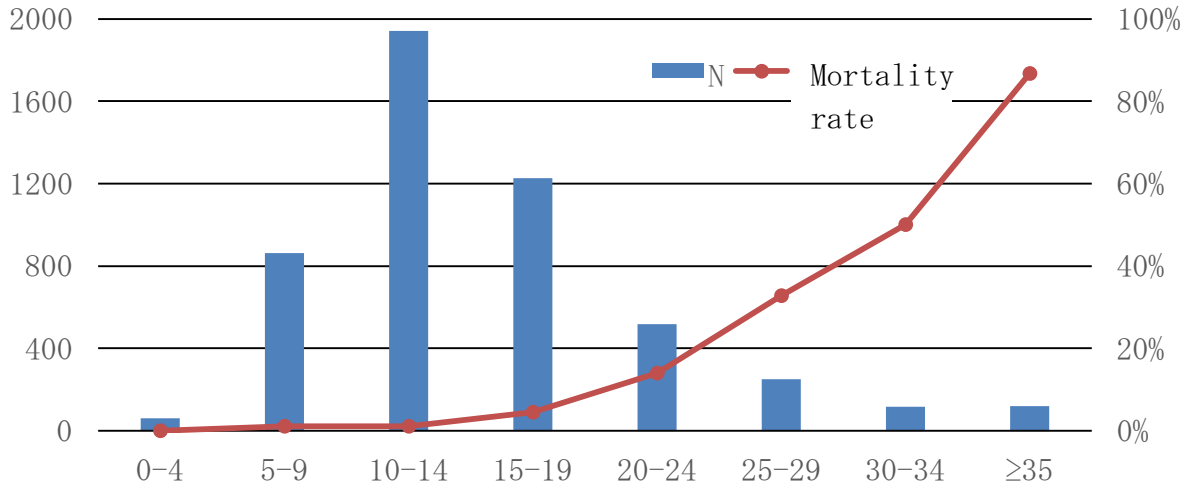
SMR: standard mortality ratio

- SMRs in all scoring systems are over-estimation, as they show a low value.
- However, the SMR of PIM2 is close to 1 compared to adult scoring systems'.
- SMRs in the three adult scoring systems close to 1 in order of APACHE III, SAPS II, and APACHE II. This order is coincident with the announcement order of each scoring system (APACHE III-j: 2001, SAPS II: 1993, APACHE II: 1985).

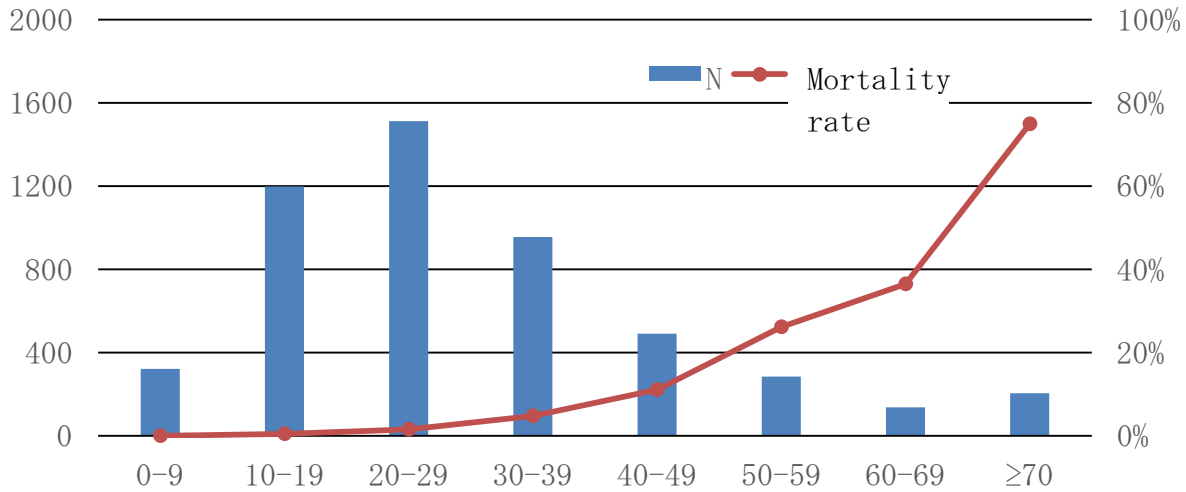
Distribution of APACHE III



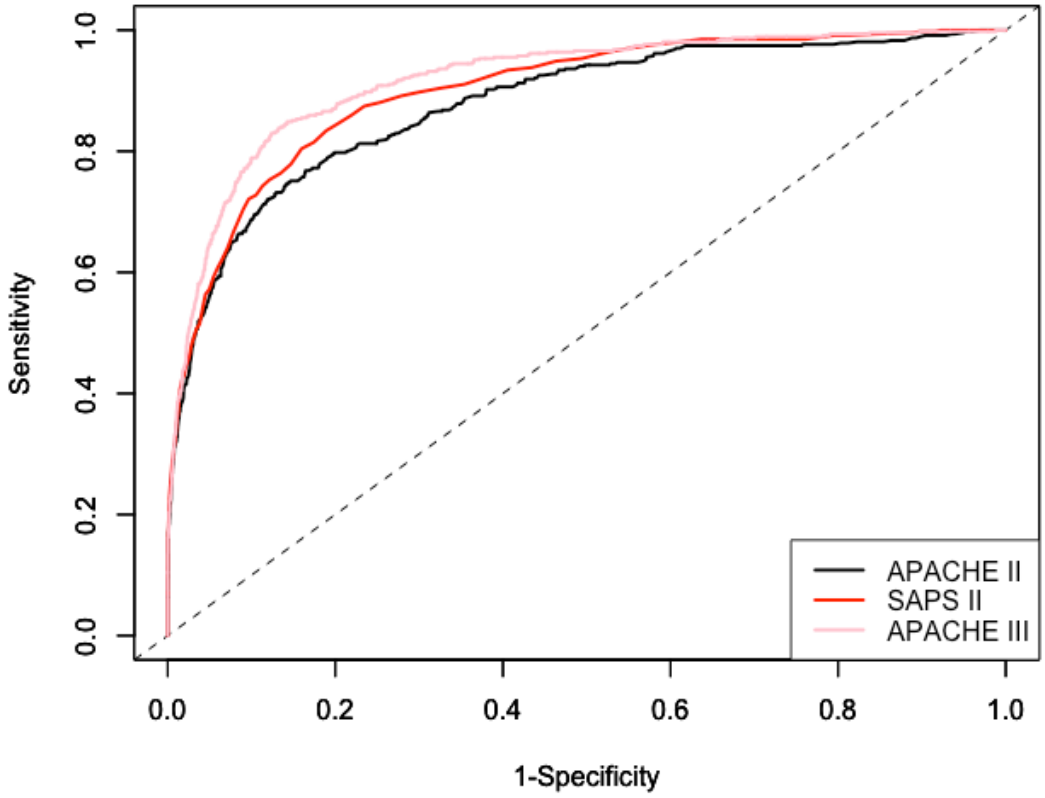
Distribution of APACHE II



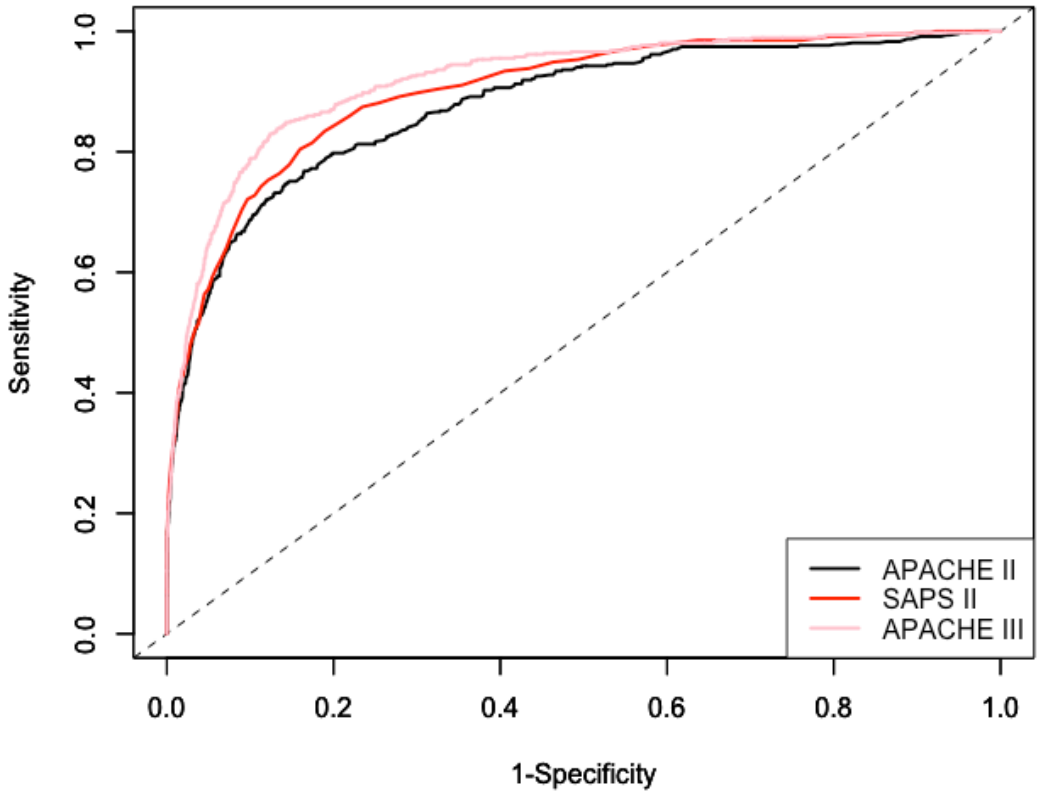
Distribution of SAPS II



ROC curve of adult severity score: All adult patients



ROC curve of adult severity score: Critically ill

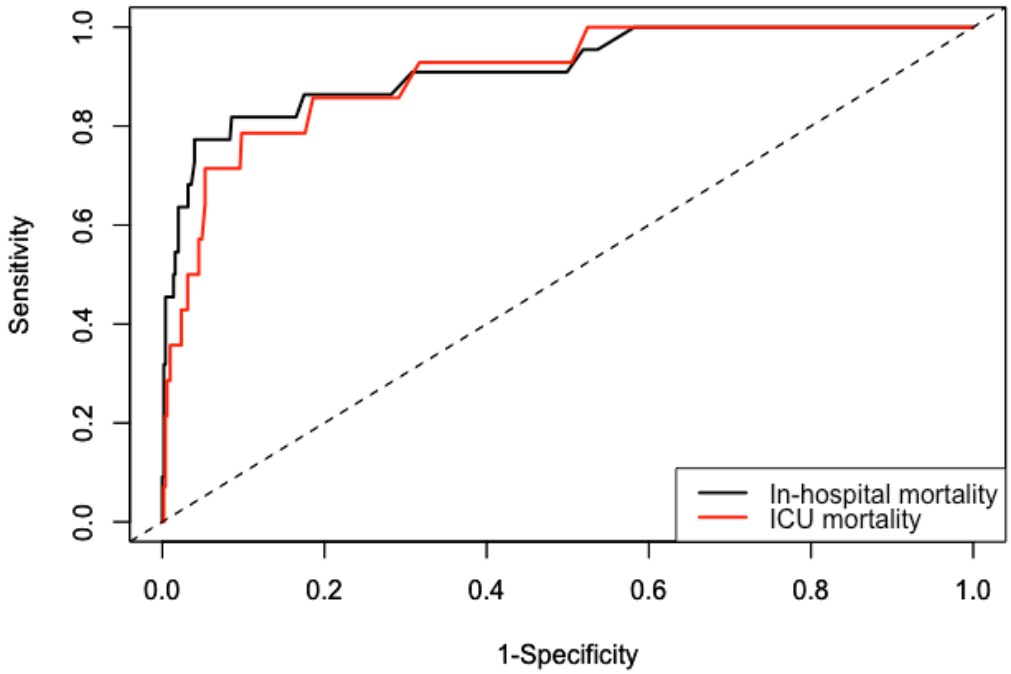


Area under the ROC curve of adult severity scores

	All adult patients	Critically ill
APACHE III score*	0.919 (0.904 - 0.934)	0.891 (0.873 - 0.909)
APACHE II score*	0.882 (0.863 - 0.901)	0.844 (0.821 - 0.867)
SAPS II score*	0.905 (0.889 - 0.921)	0.867 (0.847 - 0.888)

*Median (25th - 75th)

ROC curve of PIM2 (ICU mortality, In-hospital mortality)



Area under the ROC curve of PIM2

ICU mortality*	0.905 (0.827 - 0.984)
In-hospital mortality*	0.917 (0.849 - 0.984)

*Median (25th - 75th)

The value of area under the ROC curve is also high in order of APACHE III, SAPS II, and APACHE II like SMRs, and their p-values are less than 0.05 in all comparative tests.

Simulated Study: Infection and SIRS

- As an example showing the effectiveness of a multicenter database, we reproduced the study using ANZICS-APD database published in the NEJM.
  Reference: Kaukonen KM, et al. N Engl J Med. 2015; 372: 1629-38.
- We extracted patients who have infectious disease from all adult admissions by using diagnostic codes.
- Although it is preferable that we target only infections with 3 point or more organ disorders in the SOFA score, this study targets all infections as SOFA scores are not available in JIPAD.
- Patients satisfying more than two SIRS criteria are classified as SIRS (+) and others are classified as SIRS (-). Note that we did not use measurement values of immature granulocyte for this classification as these data are not available.

Patient characteristics

	All patients	SIRS (+)	SIRS (-)	p-value
Total admissions	474	426	48	-
Age (years)*	73 (65 - 80)	73 (64 - 80)	74 (69 - 83)	0.097
Males, %	62.4%	61.5%	70.8%	0.271
Postoperative admission	46%	43%	72.9%	<0.001
APACHE III score#	84.2 ± 32.2	86.6 ± 32.4	63.2 ± 21.1	<0.001
Predicted mortality rate*	34 (15 - 64)	37 (18 - 67)	12 (6 - 33)	<0.001
ICU Length of stay (hours)*	70 (25 - 187)	74 (28 - 193)	50 (20 - 124)	0.071
Hospital Length of stay(days)*	32 (18 - 61)	32 (18 - 61)	27 (16 - 51)	0.379
Discharge outcome				0.008
Mortality	24.3%	26.1%	8.3%	
Survival	46.2%	44.1%	64.6%	
Transfer	29.5%	29.8%	27.1%	

*Median (25th - 75th) #Mean ± SD

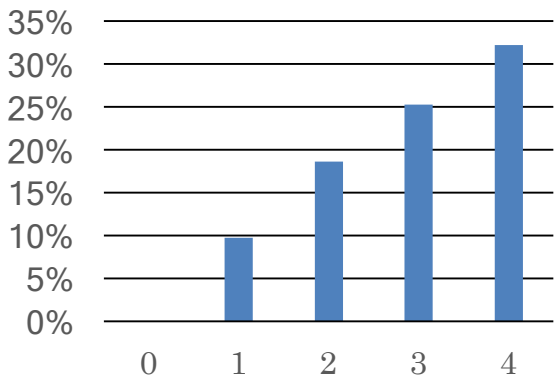
SIRS criteria and distribution

	All patients	SIRS (+)	SIRS (-)	p-value
Abnormal body temperature	56.5%	62%	8.3%	<0.001
Hyperthermia	39.2%	43.4%	2.1%	<0.001
Hypothermia	20.5%	21.8%	8.3%	0.036
Tachycardia	82.1%	88.7%	22.9%	<0.001

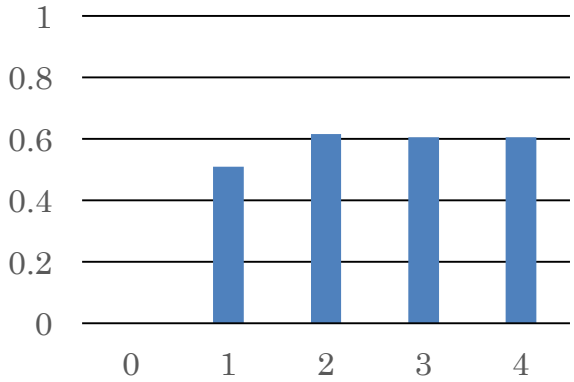
Abnormal respiration	88.6%	93.7%	43.8%	<0.001
Abnormal WBC	60.3%	66%	10.4%	<0.001
High WBC	46%	50.2%	8.3%	<0.001
Low WBC	14.3%	15.7%	2.1%	0.008
SIRS score*	3 (2 - 4)	3 (2 - 4)	1 (1 - 1)	<0.001
Score distribution				<0.001
0 (N=7)	1.5%	0%	14.6%	
1 (N=41)	8.6%	0%	85.4%	
2 (N=102)	21.5%	23.9%	0%	
3 (N=178)	37.6%	41.8%	0%	
4 (N=146)	30.8%	34.3%	0%	

*Median (25th - 75th)

SIRS score and In-hospital mortality rate



SIRS score and SMR



Results

- Patient characteristics: these results show the following trends compared to the previous work: the proportion of SIRS (-) group is comparable; the patient's age is higher; the rate of postoperative admission is higher; the APACHE III score is higher; the length of stay in hospital is longer; the mortality rate of SIRS (-) group is lower; and the score distribution is comparable.
- SIRS score and In-hospital mortality rate: the number of patients with SIRS score 0 are only 7 and their discharge outcome are all "Survival". Although in-hospital mortality rates for SIRS score 1 to 4 increase almost in direct proportion to these scores, they become almost the same level by correcting with the predicted mortality rate of APACHE III.
- Conclusion: there is no obvious threshold in SIRS scores. Unlike the previous work, however, the corrected mortality rate (SMR) does not increase in proportion to SIRS scores.

Upcoming Activities

Annual report for fiscal year 2016

Although the number of targeted facilities for data analysis remained at 9, as this year is the first attempt, many facilities started data collection in April 2016 or earlier. Thus, it is expected that the number of targeted facility increases to more than 20 in fiscal year 2016.

Collaboration with the CTG committee

We are in discussions with the CTG committee considering to provide JIPAD as a database for a domestic multicenter study in the future.

Participation in international registry

We are planning to build an international registry in cooperation with Dr. Leo Celi of MIT, Dr. David Pilcher of ANZICS, and others.

Collaboration with the PICU committee

- We are creating a disease list for pediatric admissions and various documents related to it in cooperation with PICU committee members.
- We are planning to incorporate the collected items in ANZPICR to handle PIM3 and other scoring systems in future JIPAD.
- It is expected that we will be able to conduct more detailed analyses of pediatric data in future annual reports, if we could handle more pediatric admissions.

Addition and change of collected items*

* whether to introduce and when to introduce them are unclear, as this is still a draft.

- Presence or absence of high flow nasal cannula
- Highest value of lactic acid within 24 hours of admission
- Items required to calculate SOFA score (within 24 hours of admission)
  - Lowest platelet count
  - Presence or absence of catecholamine and its dose
- Items required to calculate ANZROD
  - Admission source (home, nursing home, other hospitals, ICUs in other hospitals)
  - Presence or absence of treatment restrictions at the timing of the ICU admission
- It might be preferable that we delete data items for “Readmissions” to prevent human errors when inputting data, since readmissions can be almost exactly estimated by the

admission date and the birthday.

Addition and adjustment of disease classification*

* whether to introduce and when to introduce them are unclear, as this is still a draft.

- After stroke surgery (Other neurologic disease)
- Unruptured aneurysm (Other neurologic disease)
- Carotid artery stenting (Carotid endarterectomy)
- Single trauma excluding head (Multiple trauma)
- Clarification of the treatment of surgeries and catheterizations performed outside the operating room.

Calculation of predicted mortality rates

- Although AUROC of the predicted mortality rate based on adult severity scores shows high discrimination of 0.9, the SMR is very low value of 0.5. Since the latest scoring system adopted in JIPAD (APACHE III-j) was calibrated in the United States in 2001, it is hard to say that the scoring system matches the current situation in Japan.
- Both ANZICS and ICNARC have developed their own scoring systems.
- A new scoring system might be created when an international registry actually starts running, it seems to take a considerable amount of time to complete.
- One of our urgent tasks is to establish the calculation method for predicted mortality rates suitable for the current situation in Japan. Since a sufficient number of admissions is necessary for this calculation, it is highly expected that more facilities participate to JIPAD in the future.

Appendix A: Diagnostic Code Table - Non-operative

System	Diagnostic name	Code
Cardiovascular	Cardiogenic shock	101
	Cardiac arrest	102
	Aortic aneurysm	103
	Congestive heart failure	104
	Peripheral vascular disease	105
	Rhythm disturbance	106
	Acute myocardial infarction	107
	Hypertension	108
	Cardiomyopathy	110
	Unstable angina	111
	Other cardiovascular disease	109
Respiratory	Aspiration pneumonia	201
	Respiratory neoplasm including larynx/trachea	202
	Respiratory arrest	203
	Pulmonary edema non cardiac / ARDS	204
	COPD	206
	Pulmonary embolism	207
	Mechanical airway obstruction	208
	Asthma	209
	Parasitic pneumonia	210
	Bacterial pneumonia	212
	Viral pneumonia	213
	Other respiratory disease	211
Gastrointestinal	Hepatic failure	301
	GI bleeding - varices	303
	GI bleeding - ulcer/laceration	305
	GI bleeding - diverticulosis	306
	GI perforation	308
	GI obstruction	309
	GI vascular insufficiency	310
	Pancreatitis	311
	GI cancer	312
	Other GI inflammatory disease	313
	Other GI disease	307

System	Diagnostic name	Code
Neurological	Intracerebral hemorrhage	401
	Subarachnoid hemorrhage	402
	Stroke	403
	Neurologic infection	404
	Neurologic neoplasm	405
	Neuromuscular disease	406
	Seizure	407
	Epidural hematoma	409
	Coma	410
	Other neurologic disease	408
Sepsis	Sepsis other than urinary	501
	Sepsis of urinary tract origin	502
	Sepsis with shock other than urinary tract	503
	Sepsis of urinary tract origin with shock	504
Trauma	Head trauma +/- multi trauma	601
	Multiple trauma excluding head	602
	Burns	603
	Multi trauma with spinal injury	604
	Isolated cervical spine injury	605
Metabolic	Metabolic coma	701
	Diabetic ketoacidosis	702
	Drug overdose	703
	Other metabolic disorder	704
Hematological	Coagulopathy/Neutropenia/Thrombocytopenia	801
	Other hematologic disease	802
Genitourinary	Renal disorders	901
	Pre-eclampsia	902
	Hemorrhage, postpartum (female only)	903
Musculoskeletal/Skin	Musculoskeletal/Skin disorders	1101
	Cellulitis/Soft tissue infection	1102
Other medical disorders	Other medical disorders	1002

Appendix B: Diagnostic Code Table - Post-operative

System	Diagnostic name	Code
Cardiovascular	Peripheral vascular disease	1202
	Peripheral artery bypass graft	1203
	Elective aortic aneurysm	1204
	Carotid endarterectomy	1205
	Valvular heart surgery	1206
	Coronary artery bypass graft	1207
	Dissecting aortic aneurysm	1209
	Ruptured aortic aneurysm	1210
	Aorto-femoral bypass graft	1211
	CABG with valve repair/replacement	1212
	Endo-luminal aortic repair	1213
	Other cardiovascular disease	1208
Respiratory	Respiratory infection	1301
	Respiratory neoplasm - lung	1302
	Respiratory neoplasm - mouth/larynx/sinus/trachea	1303
	Other respiratory disease	1304
Gastrointestinal	GI perforation	1401
	GI bleeding	1403
	GI obstruction	1404
	GI cancer	1405
	Cholecystitis/Cholangitis	1406
	Liver transplant	1407
	Fistula/Abscess surgery	1409
	GI vascular ischemia resection surgery	1410
	Pancreatitis	1411
	Peritonitis	1412
	Other GI inflammatory disease	1413
	Other GI disease	1408

System	Diagnostic name	Code
Neurological	Intracerebral hemorrhage	1501
	Subdural/Epidural hematoma	1502
	Subarachnoid hemorrhage	1503
	Laminectomy/Spinal cord surgery	1504
	Craniotomy for neoplasm	1505
	Other neurologic disease	1506
Trauma	Head trauma +/- multi trauma	1601
	Multiple trauma excluding head	1602
	Burns	1603
	Multi trauma with spinal injury	1604
	Isolated cervical spine injury	1605
Genitourinary	Renal neoplasm	1701
	Kidney transplant	1704
	Genitourinary surgery/procedure	1705
	Other renal disease	1703
Gynecological	Hysterectomy	1801
	Pregnancy-related disorder	1802
	Other gynecological disease	1803
Musculoskeletal/Skin	Orthopedic surgery	1902
	Skin surgery	1903
	Cellulitis/Soft tissue infection	1904
Hematological	Hematological disease	2101
Metabolic	Metabolic disease	2201

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