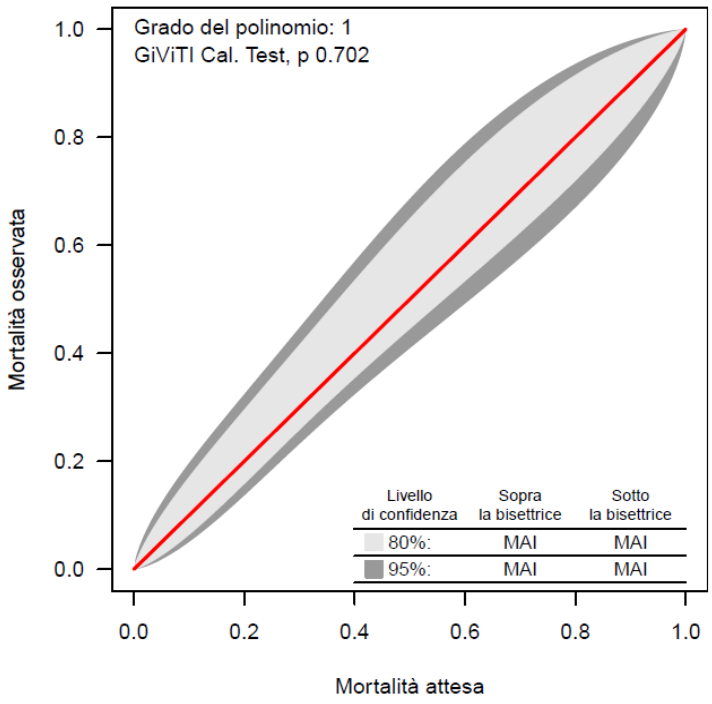
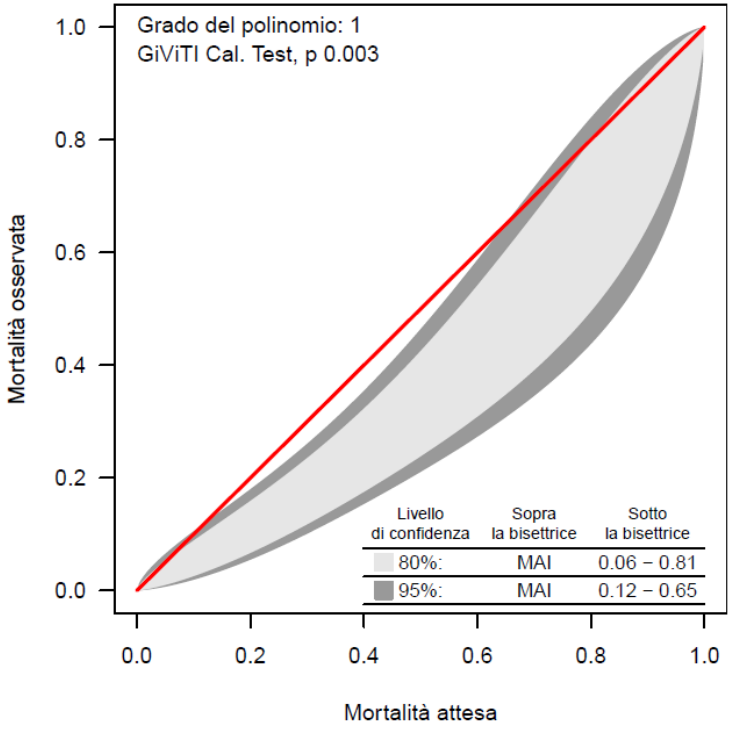
prologo

Analisi della mortalità: banda di calibrazione Osservati/Attesi



2012



2013

Il reingresso in Terapia Intensiva

CHEST / 118 / 2 / AUGUST, 2000

A Systematic Review of Risk Factors and Outcomes

Andrew L. Rosenberg, MD; and Charles Watts, MD, FCCP

Study	Type of Study	Study Period	Total Admissions	ICU Readmission†
Knaus et al[31]	APACHE II	1979–1982	5,015	9.7
Knaus et al[32]	APACHE III	1988–1990	17,105	4.6
Zimmerman et al[33]	APACHE III update	1993–1996	42,950	5.6
International				
Rowan et al[34]	APACHE II study in Britain and Ireland	1987–1989	10,841	4.2
Markgraf et al[35]	German ICUs SAPs and APACHE study	1991–1994	3,382	8.1
Rivera-Fernandez et al[36]	Spanish APACHE III study	1992–1996	12,174	3.6
Goldhill and Sumner[37]	United Kingdom	1992–1996	23,331	7.9
Moreno and Morais[38]	EURICUS I	1994–1995	15,445	4.2

*EURICUS = European Intensive Care Units Studies.
†Percent of total ICU admissions.

Readmission to intensive care: a review of the literature

Author	Country	Study design	Sample	Main results
Paratz *et al.* [12]	Australia	Case-control study comparing readmitted patients with patients admitted for same diagnostic criteria	All patients (n = 74) readmitted to ICU in a 12 month period	Readmission rate 7.7%. Common reasons for readmission were respiratory, cardiovascular and neurologic problems
Yoon *et al.* [13]	Korea	A study group whose ICU discharge was directed by intensivists. A control group (whose data were retrospectively extracted from their medical records) who did not have intensivists actively involved in their ICU discharge	1,929 patients admitted to two medical-surgical ICUs	Readmission rate of the study group was 3.9% and 6.5% for the control group. The common reasons for readmission (both groups) were respiratory disease, postoperative complications, sepsis and cardiac problems. Readmitted patients stayed on average three to four times longer in ICU than those not readmitted
Turkistani [14]	Saudi Arabia	Retrospective review of patients' medical records	All patients (n=27) readmitted to a surgical ICU in a 3 year period	Readmission rate 2.6%. Most common reason for readmission was respiratory problems. Mortality rate of readmitted patients was 37%
Metnitz *et al.* [15]	Austria	Prospective analysis of ICU admissions and readmissions	All patients (n=19,040) admitted to 30 ICUs during a 2 year period	Readmission rate 5.1%. Readmitted patients had higher severity of illness and more organ failures on first admission to ICU. They also required a significantly higher level of care during their first ICU admission and significantly more 'organ support'
Amin *et al.* [16]	India	Prospective analysis of ICU admissions	All patients (n=1,190) admitted to a surgical ICU during a 12 month and a 15 month period	Readmission rate 8.7%. Common causes of readmission were respiratory problems, gastrointestinal problems and sepsis. Readmitted patients were sicker, had longer stays in ICU and higher mortality rates (34% vs 17%), than those not readmitted
Nishi *et al.* [17]	USA	Retrospective review of patients' medical records	10,840 patients admitted to a surgical ICU	Readmission rate 0.89%. Common causes of readmission were respiratory, neurologic and cardiac problems. 21.8% of readmissions were deemed preventable 'if certain treatment or actions had been applied' whilst the patient was on a general ward
Bardell *et al.* [18]	Canada	Retrospective review of patients' medical records	2,117 patients admitted to ICU post cardiac surgery	Readmission rate 3.6%. The majority of patients were readmitted for cardiac or respiratory problems. Those readmitted had a much higher mortality rates than patients not readmitted (17% vs 2.8%)
Kogan *et al.* [19]	Israel	Prospective observational study of ICU admissions	1,613 patients 'fast-track' discharged from ICU post cardiac surgery	Readmission rate 3.29%. The majority of readmissions were due to respiratory problems or atrial fibrillation. Those readmitted had a 'significantly prolonged' second ICU stay compared with their initial ICU stay.
Chung *et al.* [20]	UK	Retrospective review of patients' medical records and a comparison of the readmitted patients with a 'matched' cohort	All patients (n=1,745) admitted to cardiac surgical ICU in a 12 month period	Readmission rate 3.7%. The most common reasons for readmission were renal failure, respiratory failure and cardiac arrest. The strongest predictors for readmission were non-elective (i.e. emergency) surgery and higher oxygen requirements upon discharge from ICU. The mortality rate of those patients readmitted was 30%, whilst none of the patients in the matched cohort died.
Levy *et al.* [21]	USA	Retrospective review of patient database and the medical records of 23 patients readmitted to ICU	1,197 patients admitted to an ICU post liver transplant	Readmission rate 19%. The main cause of readmission was cardiopulmonary dysfunction, though other medical problems were often present. Significant predictors of readmission were the patient's age, preoperative blood results and the amount of blood products administered intra-operatively.

Author	Country	Study design	Sample	Main results
Rosenberg *et al.* [22]	USA	Retrospective review of patients' medical records	Consecutive (n=4,684) admissions to a medical ICU during a 4.3 year period	Readmission rate 9.6%. The main causes of readmission included upper gastrointestinal bleeding, pneumonia, respiratory failure and sepsis. Readmitted patients had significantly more co-morbidities and were also sicker and more physiological unstable at the time of first ICU admission and discharge. Readmitted patients were 11 times more likely to die in hospital and have hospital stays almost twice as long as those not readmitted
Cooper *et al.* [23]	USA	Retrospective review of patient database	Admissions (n=13,6419) to 38 ICUs in 28 hospitals during a 4 year period	Readmission rate 6%. Readmitted patients had mortality rates six times higher than those not readmitted. They also had a greater severity of illness on readmission compared with their primary ICU admission
Cohn *et al.* [24]	USA	Retrospective review of patient database and ICU discharge summaries	2,228 patients admitted to ICU post cardiac surgery	Readmission rate 3.9-9.2%. The majority of readmissions were due to respiratory problems such as refractory hypoxia, hypercarbia and respiratory distress. Initial ICU length of stay was longer in those readmitted than those not readmitted
Russell [25]	Australia	Retrospective review of patients' medical records	572 patients admitted to a medical-surgical ICU during a 6 month period	Readmission rate 10.5%. The majority of readmissions were due to cardiac or respiratory problems.
Chen *et al.* [26]	Canada	Retrospective review of patient database	5,127 patients discharged from seven medical-surgical ICUs	Readmission rate 4.3%. The most common reasons for readmission were cardiovascular and respiratory problems. Readmitted patients were sicker on initial ICU admission, had longer length of ICU stay and higher mortality rates than those who did not require readmission
Durbin & Kopel [27]	USA	Retrospective case-control chart review	1,803 patients discharged from a medical and a surgical ICU	Readmission rate 4.6%. The main causes of readmission were respiratory, neurological and cardiac problems. The mortality rate was nearly six times higher in readmitted patients and their length of first ICU stay and hospital stay were more than double those not readmitted
Rubins & Moskowitz [28]	USA	Prospective analysis of ICU admissions	Consecutive (n=300) admissions to a medical ICU	Readmission rate 16%. Cardiac disease and respiratory insufficiency were the diagnoses on readmission for 50% of patients
Snow *et al.* [29]	USA	Retrospective review of patients' medical records	721 patients admitted to a surgical ICU during a 12 month period	Readmission rate 9.4%. Respiratory and central nervous system disorders were the most common reasons for readmission. Of the patients readmitted, 62% demonstrated (retrospectively) one or more warning signs of potential organ dysfunction and 50% were readmitted for a problem related to these warning signs. Approximately one quarter of the readmitted patients in this study died, which was more than three times the reported ICU mortality rate.
Baigelman *et al.* [30]	USA	Retrospective review of patients' medical records	All patients (n=1,069) admitted to critical care units of one hospital during a calendar year	Readmission rate 11.7%. Common causes of readmission were cardiac and respiratory problems. A lack of pulmonary care contributed to the readmission of some patients.
Franklin & Jackson [31]	USA	Retrospective review of patients' medical records	512 admissions to a medical ICU during a 12 month period	Readmission rate 12%. Mortality rate of readmitted patients was 58%, more than twice the overall ICU mortality rate. Common causes of readmission were sepsis, gastrointestinal haemorrhage, drug toxicity and respiratory failure.

Levy *et al.* [21] USA Retrospective review of patient database and the medical records of 23 patients readmitted to ICU 1,197 patients admitted to an ICU post liver transplant Readmission rate 19%. The main cause of readmission was cardiopulmonary dysfunction, though other medical problems were often present. Significant predictors of readmission were the patient's age, preoperative blood results and the amount of blood products administered intra-operatively.

Nishi *et al.* [17] USA Retrospective review of patients' medical records 10,840 patients admitted to a surgical ICU Readmission rate 0.89%. Common causes of readmission were respiratory, neurologic and cardiac problems. 21.8% of readmissions were deemed preventable 'if certain treatment or actions had been applied' whilst the patient was on a general ward

Intensive care readmission: A contemporary review of the literature

Malcolm Elliott[a,b,*], Linda Worrall-Carter[c], Karen Page[d]

Intensive Crit Care Nurs (2013)

Table 3 (*Continued*)

Study	Design	Sample	Evidence level	Key findings
Timmers et al. (2012), Netherlands	Prospective observational cohort study	1682 patients discharged from a surgical ICU	III-2	Readmission rate 8%; 20% were readmitted within 48 hours. Main causes of readmission were respiratory failure (48%), cardiac problems (16%) and sepsis (14%). Readmitted patients were older, mostly had vascular disease (39%) or gastrointestinal surgery (25%), had higher initial illness acuity scores ($p = .003$; $p = .007$) and more co-morbidities ($p = .005$). Long-term mortality rate was significantly higher in readmitted patients.
Abu-Awwad and Buran (2012), North America	Retrospective analysis	6194 patients discharged from medical ICU	Not ranked	3.6% of patients were readmitted or died within 72 hours of ICU discharge. Risk factors predicting readmission included heart rate/blood pressure index, temperature, respiratory rate, GCS, haemoglobin and lymphocyte count ($p < .015$ for all factors).
da Silva et al. (2011), Brazil	Longitudinal prospective study	600 patients admitted to ICU in 4 hospitals	III-2	Readmission rate 9.1%. Antecedents related to infectious or parasitic diseases increased the risk of readmission (OR 2.97; 95% CI 1.23–7.22, $p = .016$). Higher Nursing Activity Score at discharge decreased the readmission risk (OR 0.98; 95% CI 0.95–1.0, $p = .036$).
Renton et al. (2011), Australia	Retrospective longitudinal study	247,103 patients discharged from 38 ICUs	III-3	Readmission rate 5.5%. Factors increasing risk of readmission: admission source other than elective surgery; any chronic health issue; tertiary hospital ICU and discharge after hours (OR > 1.05; $p < .001$). Diagnoses associated with a greater risk of readmission: subarachnoid haemorrhage, non-operative gastrointestinal disorders, haematological conditions, isolated cervical spine injury and hepatic failure (OR > 2; $p < .001$). In-hospital mortality rate was nearly 5 times greater for readmitted patients (OR 5.4; 95% CI 5.1–5.7, $p < .001$).

Table 3 (*Continued*)

Study	Design	Sample	Evidence level	Key findings
Matsuoka et al. (2008), Japan	Retrospective cohort	1835 patients admitted to a single ICU	III-2	Readmission rate 7.7%. In 14.9% of patients, the reason for readmission was lung oedema or atelectasis.
Kaben et al. (2008), Germany	Logistic regression analysis	2852 patients discharged from a surgical ICU	Not ranked	Readmission rate 13.4%. Readmitted patients had higher SAPS II scores (37 vs 33, $p < .001$) on initial ICU admission, high in-hospital mortality rates (17.1% vs 2.9%, $p < .001$). Higher risk of readmission was associated with: age (OR 1.13; 95% CI 1.03–1.24; $p = .04$), maximum sequential organ failure score (OR 1.04 per point; 95% CI 1.01–1.08; $p = .04$) and C-reactive protein level on the day of discharge (OR 1.02; 95% CI 1.01–1.04; $p = .035$).
Gajic et al. (2008), North America	Prospective cohort study	1131 patients admitted to one medical and one medical-surgical ICU	III-2	Readmission rate 8.8%. Reasons for readmission included respiratory failure, haemorrhage, infection, arrhythmia and myocardial ischaemia. Predictors of readmission: ICU admission source (OR 2.256, 95% CI 1.437–3.540, $p < .01$), ICU length of stay (OR 1.404, 95% CI 1.098–1.795, $p < .01$) and requirement for complex pulmonary management (OR 2.149, 95% CI 1.010–4.576, $p < .05$).
Conlon et al. (2008), Ireland	Retrospective review of prospectively collected data	1061 patients discharged from a medical-surgical ICU	Not ranked	Readmission rate 7.4%. Common diagnoses leading to readmission were categorised as respiratory, cardiovascular and septic shock. The most common cause of readmission was respiratory infection.

Table 3 (*Continued*)

Study	Design	Sample	Evidence level	Key findings
Ho et al. (2009), Australia	Linked data cohort study	16,926 admissions to a single ICU	III-2	Readmission rate 3.9%. Readmitted patients were older, were more likely to be originally admitted from the ward or operating theatre, had higher acute physiology scores and more co-morbidities. Early readmissions (<72 hours) were associated with an increased risk of hospital mortality (OR 1.68, 95% CI 1.18–2.39, $p = .004$).
Chrusch et al. (2009), Canada	Prospective cohort study	8693 admissions to 1 medical and 1 surgical ICU	III-2	Readmission rate 5.3%. There was a positive correlation between ICU readmission and average ICU occupancy. Significant risk factors for readmission or post-ICU death: age >35 years (OR 1.46, CI 1.02–2.07, $p < .05$), respiratory diagnosis (OR 1.73, CI 1.11–2.68, $p < .05$), sepsis (OR 1.66, CI 1.08–2.55, $p = .05$), gastroenterology diagnosis (OR 2.55, CI 1.54–4.25, $p < .05$), thoracic surgery (OR 2.79, CI 1.64–4.73, $p < .05$), neurosurgery (OR 1.95, CI 1.14–3.33, $p < .05$), APACHE II score 10–19 (OR 1.5, CI 1.0–2.24, $p < .05$), ICU length of stay 3–10 days (OR 1.72, CI 1.35–2.18, $p < .05$) and ICU discharge at a time of no vacancy (OR 1.56, CI 1.05–2.31, $p < .05$).
Chan et al. (2009), Taiwan	Retrospective medical chart audit	945 discharges from 4 surgical ICUs	Not ranked	Readmission rate 11.6%. Readmitted patients were older, had a longer initial ICU stay (8.05 vs 5.22 days, $p < .001$) were sicker during their initial admission and had higher mortality rates (40% vs 3.6%, $p < .001$). Nearly half of the patients (46.4%) were readmitted with the same diagnosis. Respiratory disease was the most common diagnosis for patients readmitted with a new problem.
Baker et al. (2009), North America	Retrospective comparative analysis	3233 patients discharged from a neuroscience ICU	Not ranked	Readmission rate 3% (39% within 24 hours; 78% within 48 hours). The odds of a patient being readmitted within 72 hours were 2.5 times higher on days when ≥9 patients were admitted to ICU (OR 2.43, 95% CI 1.39–4.26, $p < .05$). The odds of readmission were nearly 5 times higher when ≥10 patients were admitted (OR 4.99, CI 2.45–10.17, $p < .05$).

Table 3 (*Continued*)

Study	Design	Sample	Evidence level	Key findings
Frost et al. (2010), Australia.	Inception cohort study	14,952 patients discharged from a single ICU	III-2	Readmission rate 6.6%. Readmitted patients were more likely to have an ICU stay of 7 days or more odds ratio (OR 2.2, 95% CI, 1.85–2.56, $p < .001$), been non-electively admitted initially (OR 1.7, 95% CI, 1.44–2.08, $p < .01$) and have acute renal failure (OR 1.6, 95% CI 0.97–2.47, $p < .001$). Patients initially admitted to ICU from general wards, the emergency department or other hospitals had a higher risk of readmission.
Lee et al. (2009), South Korea	Prospective observational study	25,717 admissions to 8 ICUs	III-3	1.5% of patients were readmitted within 3 days. Respiratory and cardiovascular problems were most common reason for readmission. The risk of readmission increased when the APACHE III score at the time of discharge exceeded 8.5 (OR 1.16, CI 1.03–1.30, $p < .013$). A 1 point increase in the score was associated with a 21% increased risk of readmission (OR 1.21, 95% CI 1.108–1.325, $p < .05$)
Butler et al. (2009), North America	Retrospective cohort study	6511 patients discharged from ICU	III-2	Readmission rate 6%. Readmitted patients had higher APACHE II and SAPS II scores (16 vs 14; $p < 0.001$). Patients with gastrointestinal disorders were most likely to be readmitted, followed for gastrointestinal surgery for neoplasms and congestive cardiac failure.
Japiassu et al. (2009), Brazil	Prospective observational study	577 patients admitted to a mixed ICU	III-3	Readmission rate 10.7%. Average time to readmission was 9 days. Readmitted patients: tended to be older (75 vs 67 years; $p < .01$); were more likely to be admitted with respiratory insufficiency or sepsis (33 vs 13%, $p < .01$); admitted for medical reasons (49 vs 32%, $p < .05$); have first ICU stay longer than 3 days (35 vs 23%, $p < .01$) and have higher SAPS II scores (27 vs 23, $p < .01$). Older age, acute physiology score and admission for respiratory problems or sepsis were independently associated with readmission.

Table 3 ICU readmission studies.

Study	Design	Sample	Evidence level	Key findings
de Araujo et al. (2013), Brazil	Prospective observational cohort study	977 patients discharged from two ICUs	III-2	Readmission rate 13.7% in medical-surgical ICU; 9.3% in trauma/neurosurgical ICU. Readmissions resulted in increased morbidity, length of stay and total costs.
Kramer et al. (2013), North America	Retrospective cohort study	263,082 admissions to 105 ICUs in 46 hospitals	III-2	Readmission rate 6.3%. Readmitted patients had higher post-discharge mortality (21.3% vs 3.6%), longer initial ICU lengths of stay (4.9 vs 3.4 days) and longer hospital stays (13.3 vs 4.5 days); $p < .001$.
Kramer et al. (2012), North America	Retrospective cohort study	229,375 admissions to 97 ICUs in 35 hospitals	III-2	Readmission rate 6.1%. Risk factors included location before ICU admission, age, co-morbidities, diagnosis, ICU length of stay, physiologic abnormalities at time of discharge and discharge to a step-down unit ($p < .001$).
Ouanes et al. (2012), France	Retrospective analysis of prospective database	3462 patients admitted to four ICUs	Not ranked	Post-ICU mortality or readmission rate 7%. Independent risk factors for post-ICU mortality or readmission: age ($p < .002$), SAPS II score at ICU admission ($p < .0001$), use of a central venous catheter ($p < 0.0001$) and discharge at night ($p < .002$).
Laia et al. (2012), Taiwan	Retrospective analysis of prospective database	192,201 patients admitted to ICU	Not ranked	Readmission rate 13%. Risk factors for readmission ($p < .05$): age >39 years, female gender, ischaemic heart disease, cerebrovascular disease, pneumonia, sepsis, heart failure, chronic liver disease, diabetes mellitus and COPD.
Brown et al. (2012), North America	Retrospective cohort study	196,202 patients admitted to 156 ICUs	III-2	2% of readmissions occurred within 48 hours of discharge; 3.7% within 120 hours. Median time to readmission was 3 days. Medical patients in tertiary hospitals had higher odds of 48 hour (OR 1.51; 95% CI 1.12–2.02) and 120 (OR 1.63; 95% CI 1.24–2.16) hour readmission than patients in community hospitals.

Table 3 (*Continued*)

Study	Design	Sample	Evidence level	Key findings
Boudesteijn et al. (2007), Netherlands	Retrospective case–control study	1393 patients admitted to a medical-surgical ICU	III-2	Readmission rate 1.8%. Most common reason for readmission (68%) was respiratory deterioration. 39% of readmitted patients died. In multivariate analysis, significant predictors of readmission were: age (OR 1.1, 95% CI 1.0–1.3, $p < .03$) ventilator time during first admission (OR 1.1, CI 1.0–1.1, $p = .03$). Readmitted patients had a significantly longer ventilation times (during both admissions) and total ICU length of stay.
Ho et al. (2006), Australia	Nested case–control study	1405 admissions to a single ICU	III-2	Readmission rate 1.3%. C-reactive protein concentration within 24 hours before ICU discharge was associated with a higher risk of readmission ($p < .0001$).
Frankel et al. (2006), North America	Retrospective analysis of prospectively collected routine clinical data	4956 patients admitted to a surgical ICU	Not ranked	Readmission rate 1.8%. Most common reason for readmission was respiratory problems: 46% of readmissions before, 51% during and 80% after implementation of accreditation council staffing guidelines.
Alban et al. (2006), North America	Prospective observational study	10,840 patients admitted to a surgical ICU	III-3	Readmission rate 2.7%. Readmitted patients had higher APACHE II scores on the day of original ICU discharge (15.7 vs 13.8, $p < .001$). Initial ICU length of stay was longer for readmitted patients (4.9 vs 3.2 days, $p < .001$). Readmission significantly increases the risk of mortality independent of the admission severity score.

OR = Odds Ratio; CI = Confidence Interval; APACHE = Acute Physiology and Chronic Health Evaluation; TISS = Therapeutic Intervention Scoring System; MET = Medical Emergency Team; SAPS = Simplified Acute Physiology Score.

Study	Design	Sample	Evidence level	Key findings
Lone (2011), Scotland	Retrospective cohort study	8413 patients admitted to ICU	III-2	Readmission rate 9.6%. Independent predictors of readmission: out of hours discharge ($p < .007$); one or more co-morbidities (<.002); and discharge to another critical care area or hospital ($p < .001$).
Elliott et al. (2011), Australia	Qualitative analysis of clinicians' opinions.	21 clinical nurses, educators and managers	Not ranked	Key factors associated with readmission: premature ICU discharge, delayed medical care on the ward, heavy nursing workloads on the wards, lack of adequately qualified staff and clinically challenging patients.
Uzoiloo et al. (2010), Germany	Retrospective analysis	2558 patients discharged from a surgical ICU	Not ranked	Readmission rate 8.3% in elective discharges and 25.1% in unplanned discharges ($p < .001$). Half of all readmissions were for surgical complications. Half of all readmissions had initially been discharged electively. Hospital mortality rate was 5.8 times higher for readmitted patients ($p < .001$). Readmission for respiratory failure accounted for most of the mortality.
Miller et al. (2010), England.	Retrospective audit	2127 admissions to a medical-surgical ICU	Not ranked	Readmission rate 5.7%. 10.4% of readmitted patients were discharged out of hours. 28.7% of readmissions occurred between days 2 and 7.
Makris et al. (2010), Australia	Retrospective case–control study	205 patients readmitted to a medical-surgical ICU within 72 hours	III-2	Readmission rate 3.1%. Readmitted patients had significantly higher overall mortality (OR 4.7, 95% CI 2.1–10.7). Independent risk factors for readmission: chronic respiratory disease (OR 3.7, 95% CI 1.2–12, $p = .029$), pre-existing anxiety/depression (OR 3.3, 95% CI 1.7–6.6, $p < .001$), immobility (OR 2.3, 95% CI, 1.4–3.6, $p = 0.001$), enteral nutrition (OR 2.0, 95% CI 1.0–4.0, $p = 0.041$) and non-weekend ICU discharge (OR 1.9, 95% CI 1.1–3.5, $p = 0.029$). Physiological derangement on the ward strongly predicted readmission (OR 26, 95% CI 8.0–81, $p < 0.001$), though only 20% of patients meeting MET criteria had a MET call made.

Intensive care readmission: A contemporary review of the literature

Malcolm Elliott[a,b,*], Linda Worrall-Carter[c], Karen Page[d]

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Table 3 ICU readmission studies.

Study	Design	Sample	Evidence level	Key findings
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Intensive Crit Care Nurs (2013)

Intensive care readmission: A contemporary review of the literature

Malcolm Elliott[a,b,*], Linda Worrall-Carter[c], Karen Page[d]

Table 4 Definitions of ICU readmission.

Definition	Citing studies	
Returning to ICU during the same hospitalisation	de Araujo et al. (2013) Ouanes et al. (2012) da Silva et al. (2011) Renton et al. (2011) Miller et al. (2010) Frost et al. (2010) Butler et al. (2009) Ho et al. (2009)	Chan et al. (2009) Kaben et al. (2008) Conlon et al. (2008) Campbell et al. (2008) Pilcher et al. (2007) Ho et al. (2006) Alban et al. (2006)
Returning to the same or different ICU after discharge to an area that provided a lower level of care during the same hospitalisation	Kramer et al. (2012, 2013)	
Returning to the same ICU during a single hospitalisation	Brown et al. (2012) Lone (2011)	
More than one admission to ICU during a 12 month period	Lala et al. (2012)	
A return to ICU within 48 hours	Boudestelin et al. (2007)	
A return to ICU within 72 hours	Makris et al. (2010) Baker et al. (2009)	
A return to ICU within 7 days	Chrusch et al. (2009) Gajic et al., 2008	
A return to ICU within 30 days	Timmers et al. (2012) Matsuoka et al. (2008)	
Returning to ICU during the same hospitalisation or within 3 months of ICU discharge	Japiassul et al. (2009)	
None provided	Abu-Awwad and Buran (2012) Elliott et al. (2011) Utzolino et al. (2010) Lee et al. (2009)	Song et al. (2007) Klimasauskas and Kekstas (2007) Frankel et al. (2006)

Intensive Crit Care Nurs (2013)

Riammissioni GIVITI

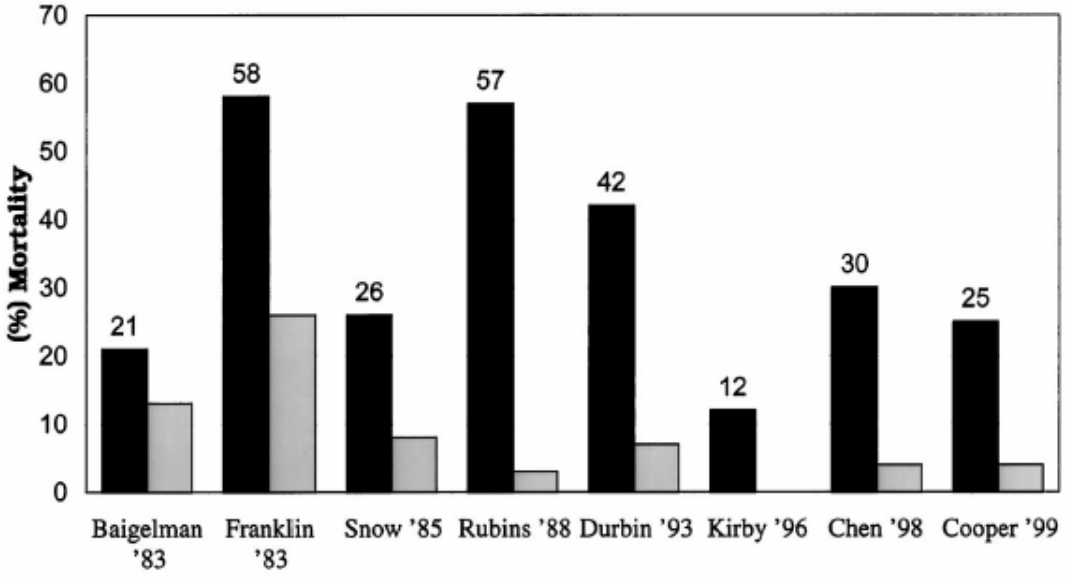
anno	N°ricoveri	% riammissioni	% > 96 ore
2011	46000	2.7	51
2012	53000	3.3	57
2013	57000	3.2	59

Riammissioni GIVITI toscana

anno	N°ricoveri	% riammissioni	% > 96 ore
2011	8000	2.8	52
2012	8000	3.3	55
2013	8000	3.0	57

A Systematic Review of Risk Factors and Outcomes

Andrew L. Rosenberg, MD; and Charles Watts, MD, FCCP



A Systematic Review of Risk Factors and Outcomes

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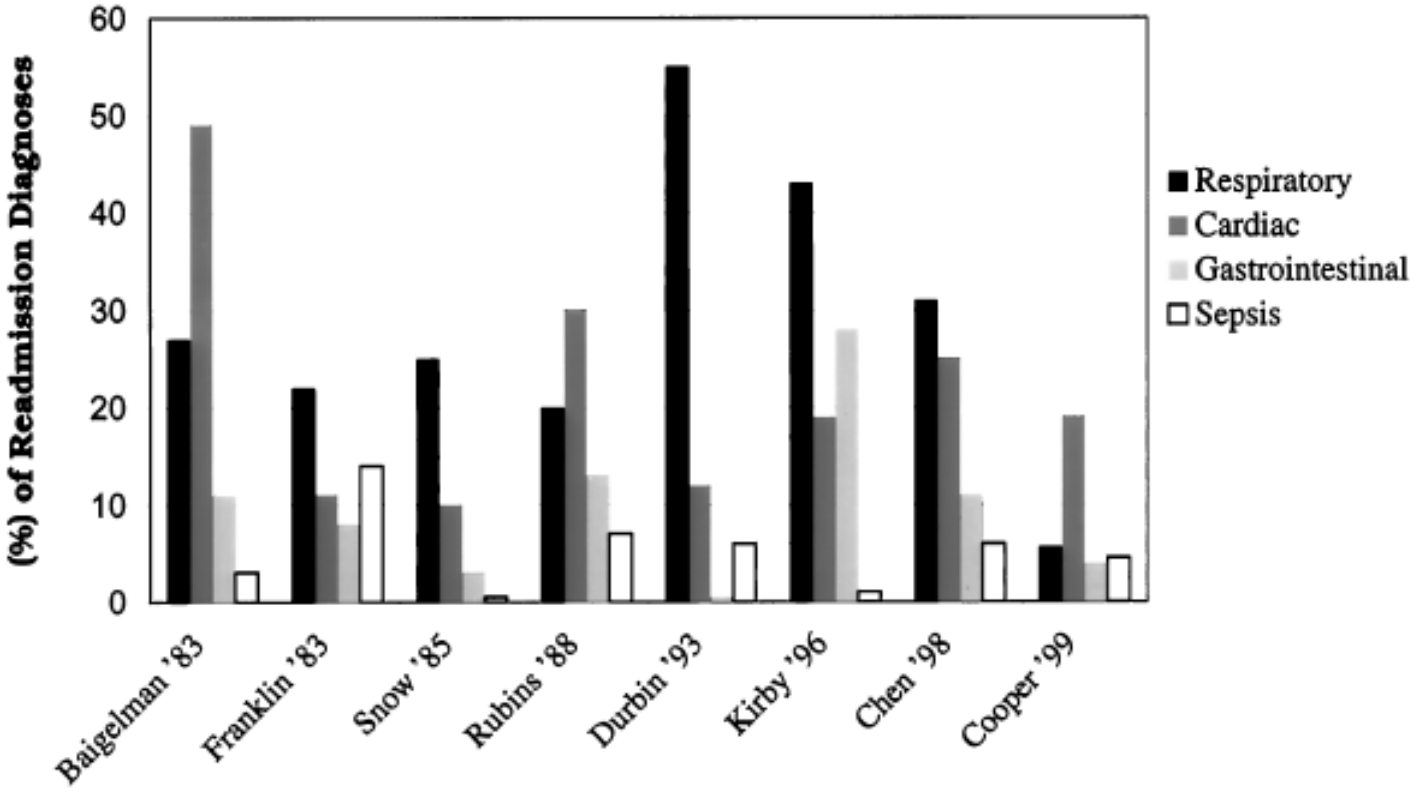

Patients Readmitted to ICUs*

A Systematic Review of Risk Factors and Outcomes

Study	Readmitted With Same Diagnosis as First Admission	
	Patients	%
Franklin and Jackson[22]	11/19	58
Snow et al[23]	11/33	33
Durbin and Kopel[25]	—	47
Kirby and Durbin[26]	4/31	13
Chen et al[27]	32/107	30
Cooper et al[28]	242/1,210	20

Patients Readmitted to ICUs*

A Systematic Review of Risk Factors and Outcomes

Study	Predictors of ICU Readmission†
Baigelman et al[21]	Premature discharge‡
Franklin and Jackson[22]	Sepsis
	Fever
	Hypoxemia
	Hypotension
	Upper-GI bleeding
	Intermediate care unit with less than two open beds
Snow et al[23]	Fever within 24 h of ICU discharge
	Purulent sputum
	Urine output < 30 mL/h
	Abnormal BUN and/or creatinine
	$Paco_2$ > 45 mm Hg
	Pao_2 < 70 mm Hg
Rubins and Moskowitz[24]	Age, yr
	Admission APS
	GI bleed
	Hematocrit < 32
	Heart rate > 110 beats/min
Durbin and Kopel[25]	Respiration rate, breaths/min
	Discharge Hct, %
	Positive blood cultures
	Positive fluid balance
Kirby and Durbin[26]	None
Chen et al[27]	Age
	Medical vs surgical diagnosis
	Upper-GI bleeding
	Neurologic disease
	Sepsis
Cooper et al[28]	Age
	Admission APS
	Severity-adjusted hospital mortality ratio
	Hypoxemia
	GI bleed
	Nosocomial pneumonia
	Elevated BUN

Critically ill patients readmitted to intensive care units – lessons to learn?

	% of all patients	% of non-read pat	% of read pat	*p* value
Ventilatory support				
Mechanical ventilation	7.8	7.4	16.2	<0.001
Supplementary ventilatory support	56.8	56.4	63.2	<0.001
Treatments for improving lung function	64.5	64.0	73.5	<0.001
Cardiovascular support				
Single vasoactive medication	16.9	16.7	21.7	<0.001
Multiple vasoactive medication	6.6	6.3	11.3	<0.001
Intravenous replacement of large fluid losses	2.6	2.6	3.5	0.061
Peripheral arterial catheter	8.4	7.9	17.9	<0.001
Central venous line	46.4	45.7	58.3	<0.001
Renal support				
Renal replacement therapy	1.1	1.1	1.7	0.068
Active diuresis	17.7	17.4	24.5	<0.001

Philipp G. H. Metnitz
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Intensive Care Med (2003) 29:241–248

Critically ill patients readmitted to intensive care units – lessons to learn?

Variable	*p* value	Odds ratio	95% CI
Age	<0.001	1.08	1.03–1.14
Male sex	<0.001	1.36	1.17–1.59
Number of organ failures at first admission	<0.001	1.11	1.04–1.18
Supplementary ventilatory support (last ICU day)	<0.001	1.72	1.43–2.06
Mechanical ventilation (last ICU day)	<0.001	3.00	2.31–3.89
Multiple vasoactive medications (last ICU day)	0.020	1.33	1.05–1.70
Active diuresis (last ICU day)	0.007	1.28	1.07–1.52

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Readmission to intensive care: development of a nomogram for individualising risk

Steven A Frost, Victor Tam, Evan Alexandrou,
Leanne Hunt, Yenna Salamonson, Patricia M Davidson,
Michael J A Parr and Ken M Hillman

Table 1. Characteristics of patients who survived an episode of intensive care and were transferred to general wards, by readmission status*

	Readmission to ICU status				
Characteristic	No readmission to ICU	Early readmission to ICU (< 72 hours)	Late readmission to ICU (≥ 72 hours)	Combined	*P*
Admissions	13 965	404	583	14 952	
Number of patients	12 534	374	522	13 430	
Mean age in years (SD)	57 (18)	59 (18)	60 (17)	57 (18)	< 0.001
Male *n* (%)	8 448 (61%)	257 (64%)	349 (60%)	9 054 (61%)	0.400
Elective admission to ICU *n* (%)	4 390 (31%)	82 (20%)	166 (20%)	4 588 (31%)	< 0.001
Source of ICU admission *n* (%)					< 0.001
Emergency department	7 140 (51%)	190 (47%)	254 (44%)	7 584 (51%)	
Operating theatre/recovery ward	4 229 (30%)	95 (24%)	140 (24%)	4 464 (30%)	
General ward	1 639 (12%)	83 (21%)	117 (20%)	1 839 (12%)	
Another hospital	914 (7%)	32 (8%)	70 (12%)	1 016 (7%)	
Another ICU	22 (< 1%)	1 (< 1%)	2 (< 1%)	25 (< 1%)	
Coronary care unit	19 (< 1%)	3 (1%)	0	22 (< 1%)	
Mean APACHE II score (SD)	13 (7)	15 (8)	16 (7)	13 (7)	< 0.001
Median ICU length of stay (IQR)	2 (1–4)	2 (1–6)	3 (1–7)	2 (1–4)	< 0.001
ICU stay ≥ 7 days *n* (%)	1 782 (13%)	108 (27%)	174 (30%)	2 064 (14%)	< 0.001
Discharged from ICU after hours† *n* (%)	6 965 (50%)	211 (52%)	348 (60%)	7 524 (50%)	< 0.001
Charlson Index *n* (%)					
No comorbidity	11 475 (82%)	331 (82%)	463 (79%)	12 269 (82%)	0.040
1	706 (5%)	17 (4%)	22 (4%)	745 (5%)	
2	537 (4%)	21 (5%)	25 (4%)	583 (4%)	
≥ 3	1 245 (9%)	35 (9%)	73 (13%)	1 353 (9%)	
Acute renal failure in ICU *n* (%)	145 (1%)	6 (1%)	17 (3%)	168 (1%)	< 0.001
In-hospital mortality *n* (%)	637 (5%)	91 (23%)	141 (24%)	869 (6%)	< 0.001

APACHE = Acute Physiology and Chronic Health Evaluation. ICU = intensive care unit. IQR = interquartile range. * Categorical data were compared using a Pearson χ^2 test, and continuous data using a Wilcoxon or Kruskal-Wallis test. † Discharged from ICU outside the hours of 08:00–16:00.

terapia intensiva

"Your pulse is very, very weak !"

- Adottare scale di valutazione giornaliere (SWIFT, TISS)
- Liaison nurse
- Emergency team
- Outreach team

The Stability and Workload Index for Transfer (SWIFT) Tool

Variable	Swift Points
Original source of ICU admission	
Emergency department	0
Transfer from inpatient nursing unit or outside hospital	8
Total ICU length of stay (duration in days)	
<2	0
2-10	1
>10	14
Last measured PaO2/FIO2 ratio (during ICU admission)	
>400	0
<400 and > or = 150	5
<150 and > or = 100	10
<100	13
Glasgow Coma Scale at time of ICU discharge	
>14	0
11-14	6
8-10	14
<8	24
Last arterial blood gas PaCO2	
<45 mm Hg	0
>45 mm Hg	5

> 15 predittivo di riammissione

Critically ill patients readmitted to intensive care units – lessons to learn?

	Non-read pat		Read pat		*p* value
	No.	%	No.	%	
Patients					
Number of patients	14400		780		
Age, years (mean ±SD)	62.6±17.0		64.8±14.9		<0.001
Male sex	8684	60.3	509	65.3	<0.001
LOD score (median and quartiles)	2 (1–4)		2 (1–4)		<0.001
Number of organ failures (median and quartiles)	2 (1–2)		2 (1–3)		<0.001
SAPS II score (median and quartiles)	25 (18–35)		28 (21–38)		<0.001
SAPS II – expected deaths	2054	14.3	130	16.7	0.031
Observed hospital mortality	753	5.2	169	21.7	<0.001
Type of admission					
Medical	7055	49.2	357	46.1	
Scheduled surgical	4407	30.7	242	31.2	
Unscheduled surgical	2881	20.1	176	22.7	n.s.
Comorbidities					
Hematologic disease	159	1.1	7	0.9	n.s.
AIDS	29	0.2	0	0.0	n.s.
Metastasizing cancer	622	4.3	22	2.8	0.022
Chronic renal failure	725	5.0	56	7.2	0.004
Chronic respiratory failure	1162	8.1	67	8.6	n.s.
Chronic cardiac failure	2110	14.7	100	12.8	n.s.
Resources use					
ICU length of stay (days; median and quartiles)	3 (2–6)		3 (2–7)		0.003
TISS-28 score per patient per stay (median and quartiles)	71 (44–167)		85 (52–211)		<0.001
TISS-28 score per patient per day (median and quartiles)	25.3 (18.0–32.6)		29.4 (20.0–36.3)		<0.001
TISS-28 score last ICU day (median and quartiles)	22 (16–28)		26 (18–32)		<0.001

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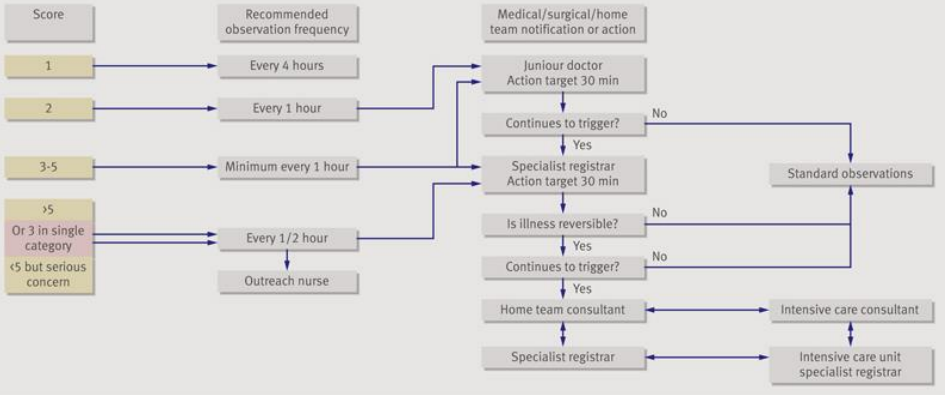
reparti

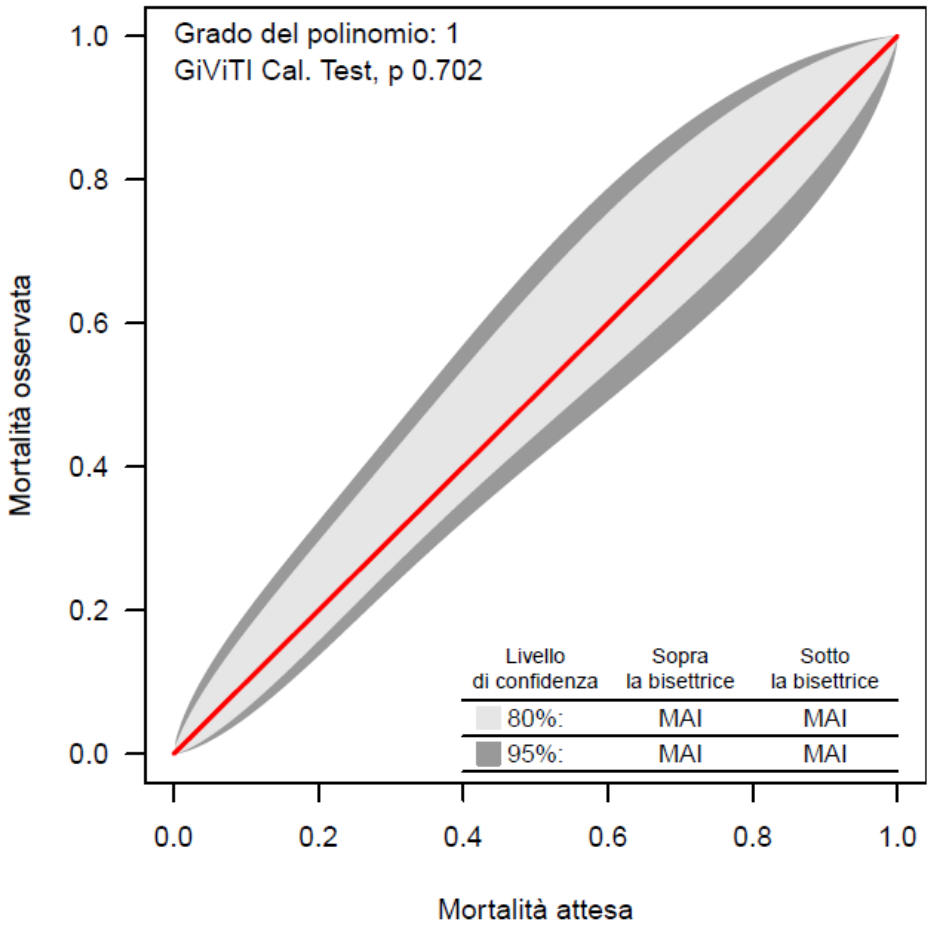
- MEWS (modified early warning score)

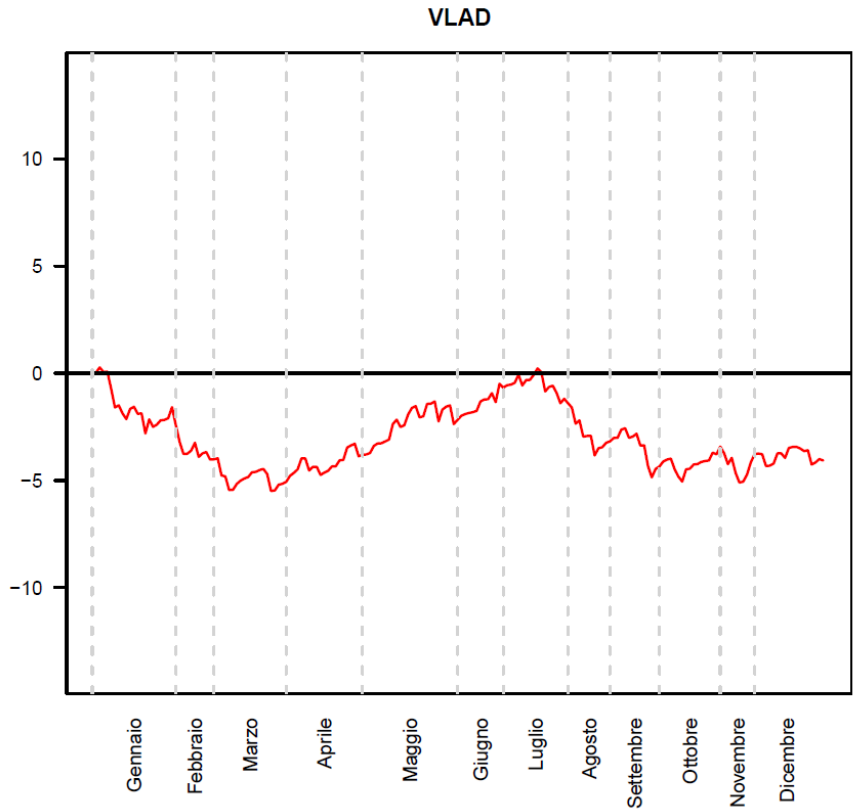
Score	3	2	1	0	1	2	3	Home team variants name and date
Central nervous system		Confused or agitated		**A**lert	Respond to **V**oice	Respond to **P**ain	**U**: No response	
Respiratory rate (breaths/min)	‹8			8-20	21-30		›30	
Heart rate (beats/min)	‹40		40-50	51-100	101-110	111-130	›130	
Systolic blood pressure (mm Hg)	‹70	71-80	81-100	101-180	181-200	201-220	›220	
Temperature (°C)	‹34	34.0-35.0		35.1-37.5	37.6-38.5	38.6-40.0	›40	
Oxygen saturation with appropriate oxygen therapy	‹90%	91-93%		94-100%				
Urine output (over 2 hours or more)	‹30 ml/hr							



epilogo

2012


Grado del polinomio: 1
GiViTI Cal. Test, p 0.702
Livello di confidenza
Sopra la bisettrice
Sotto la bisettrice
80%: MAI MAI
95%: MAI MAI
Mortalità osservata
Mortalità attesa
0.0
0.2
0.4
0.6
0.8
1.0


VLAD
10
5
0
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Gennaio
Febbraio
Marzo
Aprile
Maggio
Giugno
Luglio
Agosto
Settembre
Ottobre
Novembre
Dicembre

Riammissioni S.M.Nuova

anno	N°ricoveri	% riammissioni	% > 96 ore
2011	218	<1	100
2012	209	6.7	80 deceduti
2013	218	1.8	50

- Età media 79, 5 ch, 3 med, SAPS medio basso, pluricomorbidità