

Subintensive care unit for the elderly: a new model of care for critically ill frail elderly medical patients

Anette Hylen Ranhoff¹, Renzo Rozzini^{2,3}, Tony Sabatini^{2,3}, Angela Cassinadri^{2,3}, Stefano Boffelli^{2,3}, Marco Ferri^{2,3}, Nicola Travaglini^{2,3}, Antonella Ricci^{2,3}, Alessandro Morandi^{2,3}, Marco Trabucchi³

¹Geriatric Research Group, Ulleval University Hospital, Oslo, Norway, ²Department of Internal Medicine and Geriatrics, Poliambulanza Hospital, Brescia, ³Geriatric Research Group, Brescia, Italy

Objective. An increasing number of elderly patients are admitted to the hospital for critical diseases and the gap between supply and demand of intensive care resources is a growing problem. To meet this challenge, 4 beds in a 24-bed acute care for the elderly (ACE) medical unit were dedicated to a subintensive care unit (SICU). Severely ill elderly medical patients, requiring a higher level of care than provided in ordinary wards, are admitted. The aim of the study was to describe the characteristics of the setting and to discuss its usefulness based on data obtained after the first period of implementation.

Methods. This article describes the development, management, economics and patient characteristics of the SICU. Patient care combines the ACE model with a highly specialised medical care. Patients admitted to the SICU are compared with patients treated in the ordinary ACE unit before the SICU opened. All patients received a multidimensional evaluation, including demographics, main diagnosis, number of chronic somatic diseases, Charlson index, APACHE II score, APACHE-APS subscore, number of currently administered drugs, serum albumin, cognitive status (Mini-Mental State Examination), depression (Geriatric Depression Scale) and functional status (basic and instrumental activities of daily living). Ward physicians performed assessment and collection of data.

Results. During the first 16 months, 489 patients were admitted,

401 according to the selection criteria ($60 \pm$ years and APACHE II score ≥ 5 and/or APACHE-APS score ≥ 3). Mean age was 78.1 years, mean APACHE II score 14.5 (moderate severity) and non-invasive mechanical ventilation was received by 87 (21.7%). The most common diagnoses were respiratory failure, cardiac disease and stroke. Mean length of stay in the SICU was 61.8 h, and 6.0 days in the hospital. Compared with ACE-unit patients admitted during 2002 ($n = 1380$), SICU patients were obviously more seriously ill (APACHE II score 14.5 vs 6.7). When comparing patients of same illness severity (APACHE-APS score ≥ 3) ($n = 125$), patients treated in the SICU had lower in-hospital mortality than those treated in the ordinary ACE ward (12.5 vs 19.2%). Only a few patients (3.5%) were transferred to the intensive care unit as a consequence of increased severity of illness.

Conclusions. The SICU is an innovative method to treat frail elderly patients with more severe conditions. Low hospital mortality compared with that of severe patients in the ACE unit supports the usefulness of this model. It could be implemented in medical units of large hospitals in order to give optimal care and advanced interventions to the frail elderly and to avoid intensive care unit overcrowding.

(Intern Emerg Med 2006; 1 (3): 197-203)

Key words: care units, critical care, elderly

Introduction

Worldwide the elderly population is increasing and within the year 2050 the number of elderly patients of 75 years of age and older is expected to double. At the same

time, more frail patients (mainly elderly persons) are admitted to the hospital for serious acute diseases¹ and the lack of intensive care resources has become a problem in many countries²⁻⁴. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease have been analysed and the forecast of supply and demand for intensivists through 2030 predicts a large gap².

Acute ill elderly patients are often medically complicated patients with pre-morbid cognitive impairment, disability and comorbidity that affect the outcome from the acute disease^{5,6}. Such patients are believed to get the best treatment in dedicated hospital settings, i.e. an acute care of the elderly (ACE) medical unit⁷. However, for the more critically ill elderly, a higher and more technically advanced level of care is needed. Trained doctors and

Received 19 April 2006; accepted 6 June 2006.

The LONATI Foundation in Brescia sponsored the building and equipment of the unit described. The study was partly supported by a grant to the main author from the Faculty of Medicine, University of Oslo, Norway.

Address for correspondence: Dr. Renzo Rozzini, Dipartimento di Medicina Interna e Geriatria, Ospedale Poliambulanza, Via Bissolati 57, 25124 Brescia, Italy.

E-mail: rozzini-enzo@poliambulanza.it

© 2006 CEPI Srl

nurses using advanced technical equipment, such as monitors for cardiac and respiratory function, non-invasive mechanical ventilators and volumetric pumps for intravenous and enteral nutrition, may operate outside a full intensive care setting⁸. Recent developments in coronary⁹, stroke¹⁰, and respiratory care¹¹ have given new possibilities for effective and advanced treatment of common acute disorders, at a more advanced level than ordinary wards can provide, allowing at the same time the satisfaction of both the elderly patients' and the hospital board's needs. On this background we developed a subintensive care unit (SICU) especially designed for elderly patients.

The aim of the study was to describe the characteristics of the setting and to discuss its usefulness on the basis of data obtained after the first period of implementation and to compare these data with those from patients treated in the ordinary ACE unit before the SICU was opened.

Methods

Study population

Patients included in the study are admitted primarily from the emergency department (95%), but also from the geriatric ward or other wards in the hospital (4%); only 4 patients are admitted from the intensive care unit. They should be medical patients requiring frequent, but usually non-invasive, monitoring of vital signs and intensive interventions for serious acute disease defined by an APACHE II score¹² of at least 5 and/or Acute Physiology Score (APS)¹³ of at least 3. These patients are compared with a control group of patients admitted to the ACE unit before the opening of the SICU. Among these, we selected a special group with the same severity of illness according to the APACHE-APS score.

Guidelines for admission and discharge are adapted from the guidelines on admission and discharge for adult intermediate care units, provided by the American College of Critical Care Medicine and the Society of Critical Care Medicine¹¹ and are shown in Table 1. Possible patient admissions to the unit are requested by the admitting emergency physician, or the responsible physician of other units in the hospital, to the physician in charge who accepts or refuses the admission.

Setting

Twenty four beds of the Department of Internal Medicine and Geriatrics of the Poliambulanza General Hospital (340 beds; 41 000 admissions/year to the emergency department, 3300 patients/year admitted in medical wards) have been organised following the ACE model of care, based on a prepared environment, interdisciplinary team management, patient-centred nursing care plans,

review of medical care to prevent iatrogenic events and early discharge planning, with the aim of improving functional outcome and decreasing discharge to nursing home^{7,14}.

After a period of planning, from January 2003, 4 beds of the unit were dedicated to the SICU. The SICU is an integrated part of the ACE unit located in the middle of the ward, just in front of the nursing station. All beds are equipped for non-invasive monitoring of cardiac and respiratory function (heart rate, electrocardiographic recording, respiratory frequency, oxygen saturation, blood pressure, temperature). A small nursing station with a monitor for all beds and a computer is also located in the SICU. Volumetric pumps for intravenous infusions and enteral nutrition (PEG, NG) are available, and the unit has 3 non-invasive mechanical ventilators (Vision BiPap, Respironics Inc., Murrysville, PA, USA). The beds have electronic regulation and possibility of rails on half of the length, giving protection, but not physical restraint. Each bed area can be separated from the others by curtains, but also has the view of a green area through large windows. Adequate lightening is provided in dark hours to visualise the room enough to ensure orientation and prevent falls, but not to disturb sleep. A trolley with equipment for intubations, a defibrillator and drugs for handling critical situations is located at the entrance of the unit.

Processes and principles of care

The elements of the caring process are shown in Table 2. The care is based on two principles: a highly specialised medical care and comprehensive geriatric assessment and care as defined in the ACE model^{7,14}. Systematic assessment of functional and cognitive abilities and an interdisciplinary team approach aid in the diagnosis of health-related problems, development of plans for treatment, follow-up and coordination of care.

When the patient is admitted to the SICU, a ward physician and a nurse perform comprehensive geriatric assessment (Table 2). From this assessment and all other available data, patient-centred care plans are developed and discharge planning starts. The physicians visit the patients at least twice daily for assessment including screening for delirium, communication of nurses' observations and results of examinations, review of medical care and adjustments of plans and goals.

Four physicians who are specialists in internal medicine or geriatrics staff the unit; one is a cardiologist and three are in training positions to become geriatricians or specialists in internal medicine. They serve the SICU as well as the ordinary ward and an outpatient clinic. A ward physician is available in the hospital 24 h/day.

Equipment and expertise for spirometry and cardiac Doppler echocardiographic examinations are available in the unit. Specialist consultants from other departments

Table 1. Admission and discharge guidelines for the subintensive care unit (SICU) for the elderly.

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>I. Admission criteria</i> |
| A. Cardiac system |
| 1. Low probability for ST-elevation myocardial infarction |
| 2. Haemodynamically stable myocardial infarction |
| 3. Any haemodynamically stable dysrhythmia |
| 4. Congestive heart failure without shock (NYHA class III-IV) |
| 5. Hypertensive urgency without evidence of end-organ damage |
| B. Pulmonary system |
| 1. Haemodynamically stable patients with respiratory failure requiring non-invasive mechanical ventilation |
| 2. Patients who require frequent monitoring of vital signs or aggressive pulmonary physiotherapy |
| C. Neurologic disorders |
| 1. Patients with established, stable stroke who require frequent neurologic assessments or frequent suctioning or turning |
| 2. Patients with chronic, but stable neurologic disorders, such as neuromuscular disorders, who require frequent nursing interventions |
| D. Drug ingestion and drug overdose |
| 1. Any patient requiring frequent neurologic, pulmonary, or cardiac monitoring for drug ingestion or overdose who is haemodynamically stable |
| E. Gastrointestinal disorders |
| 1. Gastrointestinal bleeding with minimal orthostatic hypotension responsive to fluid therapy |
| 2. Variceal bleeding without evidence of bright red blood by gastric aspirate and stable vital signs |
| 3. Acute liver failure with stable vital signs |
| F. Endocrine |
| 1. Diabetic ketoacidosis patients requiring constant intravenous insulin infusion, or frequent injections of regular insulin during early regulation phase after recovery from diabetic ketoacidosis |
| 2. Hyperosmolar state with resolution of coma |
| 3. Thyrotoxicosis, hypothyroid state requiring frequent monitoring |
| G. Miscellaneous |
| 1. Appropriately treated and resolving early sepsis without evidence of shock or secondary organ failure |
| 2. Patients requiring closely titrated fluid management |
| 3. Any patient requiring frequent nursing observation or monitoring of vital signs who does not fall under the above categories may be considered for admission (i.e. Addison's disease, renal failure, delirium, hypercalcemia or other electrolyte disturbances) |
| <i>II. Patients who are not appropriate for admission</i> |
| A. Complicated acute myocardial infarction with temporary pacemaker, angina, haemodynamic instability, significant pulmonary oedema or significant ventricular dysrhythmias |
| B. Patients requiring heavy nursing loads and titrated patient care 12-24 h/day |
| C. Patients with acute respiratory failure who are intubated or at imminent risk of requiring intubation |
| D. Patients requiring invasive haemodynamic monitoring with a pulmonary artery or left atrial catheter or an intracranial pressure monitor |
| E. Patients in status epilepticus |
| F. Patients with catastrophic brain illness or injury who are not to be resuscitated and are not candidate for organ donation |
| G. Patients from whom aggressive modalities of care are being withheld or have been withdrawn, such that they are receiving only comfort measures |
| <i>III. Discharge of patients from the SICU shall take place:</i> |
| A. When a patient's physiological status has stabilised and the need for intensive patient monitoring is no longer necessary and the patient can be cared for on a general unit |
| B. When a patient's physiological status has deteriorated, and active life support is required or highly likely, the patient should be transferred to the intensive care unit |
| C. Patients from whom, during their stay in the SICU, aggressive modalities of care are being withheld or have been withdrawn, such that they are receiving only comfort measures |

From Nasraway et al.¹¹, modified.

see the patients on request, usually with no delay, but mainly in the daytime. A resuscitation team, composed of one anaesthesiologist physician and one anaesthesiologist nurse working in the adjacent intensive care unit (6 beds), is available at all times for assistance in case of cardiac arrest or other critical situations.

One nurse is at all times responsible for the unit, which gives a nurse-to-patient ratio of 1:4. Further help when needed is obtained from the general ward. The nurses are

dedicated and especially trained to observe and care for critically ill elderly patients. Nursing activities are based on an adapted Roper's activities of living model¹⁵. The nurse does assessments of activities of daily living (ADL) and follows protocols for preventing pressure ulcers, nosocomial infections, falls and delirium. One important rule is to never leave a patient alone and physical restraints are not used¹⁶. A physiotherapist is available for assessment of patients, counselling of the nurses and

Table 2. Process of care for patients admitted to the subintensive care unit (SICU).

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>In the Emergency Department or other referring department</i> |
| Social history (civil status, living conditions, formal and informal care, etc.) |
| Medical history (previous diseases, injuries, surgical and medical treatments) |
| Actual problem-oriented history |
| Physical examination (check list) |
| Assessment of severity (APACHE II score) |
| <i>In the SICU/ACE unit</i> |
| Comprehensive geriatric assessment on admission |
| - IADL and BADL (Barthel index) 2 weeks prior to admission and on admission |
| - screening for delirium with CAM |
| - nurse assessment (ability to communication, IADL-BADL, elimination, mood and sleep) |
| Review of medical care (main diagnoses, comorbidity, adverse events, medication, examinations and procedures) |
| Patient-centred care plans (including prevention of pressure sores, delirium and falls) |
| Define expected clinical goals |
| Discharge planning |
| Visit of patients (at least twice daily): review of medical care, patient-centred care plans, clinical goals and plan for discharge |
| Assessment at discharge: MMSE, Geriatric Depression Scale, and BADL |
| ACE, acute care for the elderly; APACHE, Acute Physiology and Chronic Health Evaluation; BADL, basic activities of daily living; CAM, Confusion Assessment Method; IADL, instrumental activities of daily living; MMSE, Mini-Mental Status Questionnaire. |

direct patient care. The most common tasks are assistance for early mobilisation and respiratory physiotherapy. Unrestricted visits by relatives to older patients reduce the level of anxiety. The relatives are therefore invited to stay in the unit and there are no restrictions on visiting hours.

Data collection

Ward physicians collected variables from consecutively admitted SICU patients from 15 January 2003 to 15 April 2004, and from patients admitted to the ACE unit during 2002. Among the patients admitted to the ACE unit, 125 had an APACHE II score ≥ 5 and/or an APACHE-APS score ≥ 3 and were considered as a reference group.

A total of 489 patients were admitted to the SICU. Eighty-eight patients with an APACHE II score < 5 and/or an APS score < 3 , were placed in the unit for practical reasons, but not by intention of the unit. They are excluded from the dataset.

None of the patients refused to be treated in the SICU. All data are routinely collected by the ward physicians and put into a database. No extraordinary examinations or interventions were done to the patients. Information on the study was submitted to the hospital ethics committee and approval from the Institutional Research Board was granted. Data about functional status 2 weeks prior to admission were obtained from the patient or a close relative. These

data include basic ADL obtained by the Barthel index¹⁷ and an instrumental ADL score that was an additive sum (0-8) of the number of instrumental ADL in which the patient was dependent. Severity of illness was recorded by the APACHE II score (range 0-71, severe impairment)¹² including the APS score (range 0-44, severe impairment)¹³. This index was previously implemented in our unit following the international standards for the ACE unit¹⁴. Serum albumin was recorded on admission. The Charlson comorbidity index was used to measure comorbidity¹⁸ with scores 0 to 33. Delirium was detected on admission and by daily assessments with the Confusion Assessment Method¹⁹. Physicians administered the Mini-Mental State Examination²⁰ at patient discharge. Main diagnoses were grouped according to the International Classification of Diseases, version 10. Length of stay in the SICU was recorded in hours and total hospital stay in days.

Statistical analysis

Data to characterise the patients in the SICU, and for comparison with data from patients in the ordinary ACE unit in 2002 were examined by descriptive statistics. Frequencies (percentages) of dichotomised variables were compared using the χ^2 test, and for comparison of means the Student's *t*-test was used. The SPSS version 11.0 was used (SPSS Inc., Chicago, IL, USA).

Results

Table 3 shows the characteristics of 1380 patients admitted to the ACE unit during 2002, and of a selected group of 125 patients with APACHE-II score ≥ 5 and/or APACHE-APS score ≥ 3 , and of 401 SICU patients. Mean age in the SICU and in the ACE unit was similar (78.1 vs 78.8 years), whereas mean APACHE II score was obviously higher in the SICU (14.5 vs 6.7) being a criterion of admission. The APACHE-APS score was similar in the selected ACE and SICU patients. Age and comorbidity were higher in the ACE selected group than in SICU patients, accounting for the higher APACHE score.

The most common main diagnosis in the SICU was respiratory failure (caused by pneumonia or sepsis, or an exacerbation of chronic respiratory failure due to chronic obstructive pulmonary disease) occurring in 172 patients (42.9%). Eighty-seven patients (21.7%) received non-invasive mechanical ventilation; delirium was detected in 117 patients (29.2%) vs 95 (6.9%) in the ACE unit. Among ventilated patients, delirium occurred in 31 (35.6%). In-hospital mortality was higher in the SICU patients (12.5%) than in ACE patients (3.6%), but was significantly lower than that found in the selected severe ACE patients (19.2%); 346 (86.3%) patients were transferred from the SICU to other beds in the ACE unit,

Table 3. Characteristics of patients (> 60 years) admitted in the acute care for the elderly (ACE) unit during 2002 (A), of selected patients with an APACHE II score ≥ 5 and/or an APACHE-APS score ≥ 3 admitted to the ACE unit during 2002 (B), and patients with an APACHE II score ≥ 5 and/or APACHE-APS score ≥ 3 admitted in the subintensive care unit (SICU) for the elderly (C).

| | A (n=1380) | B (n=125) | C (n=401) | p* |
|-------------------------------------|------------------|------------------|------------------|---------|
| Age (years) | 78.8 \pm 9.3 | 82.3 \pm 6.8 | 78.1 \pm 8.8 | < 0.05 |
| Female gender | 911 (66.0%) | 49 (56%) | 196 (49%) | NS |
| Living alone | 52 (37.7%) | 37 (29.6%) | 102 (25.4%) | NS |
| Vision impairment | 293 (21.2%) | 33 (26.4%) | 116 (29.0%) | NS |
| History of heavy alcohol use | 83 (6.0%) | 6 (4.8%) | 20 (5.0%) | NS |
| No. of IADL lost 2 weeks previously | 3.3 \pm 2.7 | 4.5 \pm 2.9 | 3.4 \pm 3.0 | NS |
| Barthel index (0-100) | | | | |
| 2 weeks previously | 84.9 \pm 24.6 | 65.6 \pm 33.9 | 72.8 \pm 33.0 | NS |
| On admission | 75.0 \pm 28.2 | 36.6 \pm 35.9 | 28.8 \pm 35.2 | NS |
| At discharge | 78.8 \pm 26.2 | 47.5 \pm 38.2 | 49.3 \pm 39.4 | NS |
| MMSE score (0-30) at discharge | 22.6 \pm 7.2 | 17.0 \pm 10.7 | 19.1 \pm 11.0 | NS |
| Charlson index (0-33) | 6.9 \pm 2.5 | 8.9 \pm 2.9 | 6.5 \pm 2.0 | < 0.05 |
| APACHE II score (0-71) | 6.7 \pm 2.8 | 17.9 \pm 5.7 | 14.5 \pm 6.0 | < 0.05 |
| APACHE-APS (0-33) | 2.1 \pm 2.6 | 8.8 \pm 3.6 | 9.0 \pm 5.7 | NS |
| Serum albumin (g/dl) | 4.0 \pm 0.6 | 3.5 \pm 0.6 | 3.3 \pm 0.6 | NS |
| Serum cholesterol (mg/dl) | 205.2 \pm 51.4 | 175.8 \pm 49.8 | 174.2 \pm 49.7 | NS |
| Maximum number of drugs | 4.2 \pm 3.2 | 5.0 \pm 2.2 | 7.6 \pm 3.2 | < 0.05 |
| Main diagnoses | | | | |
| Respiratory failure | 255 (18.5%) | 35 (28.0%) | 172 (42.9%) | < 0.001 |
| Cardiac disease | 264 (19.1%) | 28 (22.4%) | 111 (27.7%) | NS |
| Stroke | 171 (12.4%) | 15 (12.0%) | 44 (11.0%) | NS |
| Gastrointestinal bleeding | 197 (14.3%) | 12 (9.6%) | 27 (6.7%) | NS |
| Cancer-related problems | 127 (9.2%) | 18 (14.4%) | 23 (5.7%) | < 0.01 |
| Acute renal failure | 36 (2.6%) | 7 (5.6%) | 16 (4.0%) | NS |
| Other | 527 (38.2%) | 6 (4.8%) | 8 (1.9%) | NS |
| Cumulative delirium | 95 (6.9%) | 27 (21.6%) | 128 (31.2%) | < 0.01 |
| Indwelling bladder catheter | 170 (12.3%) | 45 (36.0%) | 228 (56.9%) | < 0.01 |
| Non-invasive mechanical ventilation | – | – | 87 (21.7%) | |
| Length of SICU stay (h) | – | – | 61.8 \pm 62.4 | |
| Length of hospital stay (days) | 6.1 \pm 3.2 | 7.7 \pm 5.2 | 6.0 \pm 4.9 | NS |
| Mortality in the SICU | – | – | 31 (7.7%) | – |
| Mortality (in hospital) | 50 (3.6%) | 24 (19.2%) | 50 (12.5%) | < 0.05 |

APACHE, Acute Physiology and Chronic Health Evaluation; APS, Acute Physiology Score; IADL, instrumental activities of daily living; MMSE, Mini-Mental Status Questionnaire. * B vs C.

24 (6.0%) to other departments and 31 (7.7%) died while in the SICU. Patients transferred to the intensive care unit were only 14 (3.5%); for most of them, due to their comorbidities and chronic disease severity, the SICU was considered the highest level of care to be provided.

Length of stay for ACE patients was 6.1 \pm 3.2 days, for the 125 ACE selected severe patients was 7.7 \pm 5.2 days, and for the SICU patients was 6.0 \pm 4.9 days. When patients died during hospitalisation were excluded, length of hospital stay was 6.1 \pm 3.3, 7.7 \pm 3.8 and 6.4 \pm 4.8, respectively. Running costs of the SICU were increased due to employment of four full-time nurses (160 000 Euro/year) and to the use of drugs and disposable equipment like ventilator tubes, catheters, etc. (20 000 Euro/year). These costs were balanced by the increase of the DRG reimbursement (from 1.2 \pm 0.8 to 1.9 \pm 1.9 for the ACE

unit and the SICU, respectively). A private foundation in Brescia sponsored a minor rebuilding of the room and the technical equipment. The total cost of these investments was about 300 000 Euro.

Discussion

We present a model of care for critically ill frail elderly patients. It is a specialised SICU integrated with and managed by the same principles as the ACE unit. Other special models of care integrated in an ACE unit have recently been presented, such as the delirium room and the acute stroke care unit^{22,23}.

The SICU is a model for intermediate care, defined as being a level of care between ordinary wards and

intensive care¹¹. Before developing the SICU, we found no reports in the literature on SICUs especially designed for the elderly filling a gap between intensive care and ordinary wards, and being a safe setting for patients with a lower risk of hospital death than the average intensive care patients¹¹. In fact, only specialised intermediate care units for cardiac patients²⁴, respiratory patients^{25,26}, and high dependency units for surgical patients²⁷ have been developed.

To study the usefulness of the SICU, we compared data with those obtained from patients treated in the ACE unit before the opening of the SICU, and particularly with a selected patient group with more severe disease. This comparison indicates the usefulness of the new unit by showing a lower mortality among patients treated in the SICU.

The SICU patients are critically ill and frail, in that they either need continuous monitoring or are at high risk for functional impairment, delirium, pressure sores and malnutrition^{16,28}.

Owing to the higher illness severity, higher comorbidity and biological frailty, as shown by the comorbidity Charlson index and serum albumin, frail elders develop a high degree of homeostasis breakdown as can be mirrored by the great derangement in functional impairment (Table 3). This condition calls for nurses and doctors well trained towards preventive actions aimed at preserving elders from loss of their functional capability. Delirium is common in critical ill elderly patients, as also shown by our data. The combination of delirium and severe disease can probably be better treated in a setting like the SICU, where personnel have a high knowledge about delirium in the elderly as well as about critical care. High quality of care of delirium will diminish behavioural disturbances allowing treatments such as non-invasive mechanical ventilation.

When a new service is established, it may be a danger of unintentional use. During the first year, 88 patients (18%) who did not match the selection criteria were treated in the SICU. The reason for this was mainly to use available beds and these patients were transferred to other beds when patients who filled the criteria were admitted. In general, the admission policy, conducted by the ward physicians, protects the unit from unintentional use because the critical patients always are given the first priority and because patients not fulfilling the criteria for admission are moved if a critically ill patient needs the bed. After the first period of the SICU, unintentional use has become rare.

Future developments in medicine will probably increase the use of advanced interventions in the elderly and the demand for high-level care beds will increase. The SICU is an innovative method to meet this challenge.

The increasing demand for providing non-mechanical ventilation in respiratory failure and interventions in

patients with acute coronary syndrome has initiated respiratory units and coronary units at a semi-intensive level of care²⁴⁻²⁶. The SICU provides care to a wide range of critically ill elderly patients and has elements of a coronary unit, a respiratory intensive care unit, a stroke unit, and a delirium room. Respiratory failure and cardiac diseases were the most common main diagnoses, but a wide range of other disorders has also been treated in the SICU. Since it may be difficult for doctors and nurses to be experts in all these fields, the best way to prevent this problem is to adopt an active policy for calling specialist consultants from other departments, as is the routine in the SICU.

The adopted model of comprehensive geriatric assessment, taking into account premorbid health status, allows better defining the goals of care, its elements and intensity and an adequate follow-up. Our unit was developed also with the aim of solving a practical problem in the hospital, namely the lack of intensive care beds. The number of patients over 75 years of age admitted from the emergency department was similar during 2003 to the previous years (1079 in 2002, 1099 in 2003), whereas in 2003 401 elderly patients (256 were more than 75 years old) were admitted to the SICU. A recent study from the UK has shown that many patients in general wards had needs that might have been more appropriately addressed in critical care units²⁹. Before the opening of our SICU, 125 critically ill patients per year were treated in our ACE unit (year 2002), which was probably an inadequate level of care. We think that this might represent a silent ageism in access to critical care³⁰ and believe that models of care such the SICU will counteract such ageism and also increase the number of available critical beds for other age groups.

References

1. Carson SS. The epidemiology of critical illness in the elderly. *Crit Care Clin* 2003; 19: 605-17.
2. Angus DC, Kelley MA, Schmitz RJ, White A, Popovich J Jr, on behalf of the Committee on Manpower for Pulmonary and Critical Care Societies (COMPACCS). Caring for the critically ill patient. Current and projected workforce requirements for care of the critically ill and patients with pulmonary disease: can we meet the requirements of an aging population? *JAMA* 2000; 284: 2762-70.
3. Mohammadi I, Martin O, Argaud L, St Denis M, Ferry T, Robert D. Patients refused in admission to an intensive care unit. Prospective evaluation of the causes and outcome. *Presse Med* 2003; 32 (Pt 1): 1738-40.
4. Barbieri S, Feltracco P, Michieletto E, Basso I, Spagna A, Giron G. Demand and availability of intensive care beds. A study based on the data collected at the SUEM 118 Central of Padua from October 1996 to December 2001. *Minerva Anesthesiol* 2003; 69: 625-39.

5. Campbell SE, Seymour DG, Primrose WR, for the ACMEPLUS Project. A systematic literature review of factors affecting outcome in older medical patients admitted to hospital. *Age Ageing* 2004; 33: 110-5.
6. Bo M, Massaia M, Raspo S, et al. Predictive factors of in-hospital mortality in older patients admitted to a medical intensive care unit. *J Am Geriatr Soc* 2003; 51: 529-33.
7. Landefeld CS, Palmer RM, Kresevic DM, Fortinsky RH, Kowal J. A randomized trial of care in a hospital medical unit especially designed to improve the functional outcomes of acutely ill older patients. *N Engl J Med* 1995; 332: 1338-44.
8. Cucherat M, Bonnefoy E, Tremeau G. Primary angioplasty versus intravenous thrombolysis for acute myocardial infarction. *Cochrane Database Syst Rev* 2003; (3): CD001560.
9. Wardlaw JM, Zoppo G, Yamaguchi T, Berge E. Thrombolysis in acute ischaemic stroke. *Cochrane Database Syst Rev* 2003; (3): CD000213.
10. Ram FS, Picot J, Lightowler J, Wedzicha JA. Non-invasive positive pressure ventilation for treatment of respiratory failure due to exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2004; (3): CD004104.
11. Nasraway SA, Cohen IL, Dennis RC, et al. Guidelines on admission and discharge for adult intermediate care units. American College of Critical Care Medicine and the Society of Critical Care Medicine. *Crit Care Med* 1998; 26: 607-10.
12. Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. *Crit Care Med* 1985; 13: 818-29.
13. Knaus WA, Wagner DP, Draper EA. Relationship between acute physiologic derangement and risk of death. *J Chronic Dis* 1985; 38: 295-300.
14. Rozzini R, Sabatini T, Trabucchi M. The network for elderly care in Italy: only a correct use of acute wards allows an overall functioning of the health care system. *J Gerontol A Biol Sci Med Sci* 2003; 58: 190-1.
15. Roper N. Definition of nursing: 1. *Br J Nurs* 1994; 3: 355-7.
16. Inouye SK, Charpentier MP. Precipitating factors for delirium in hospitalized elderly persons. *JAMA* 1996; 275: 852-7.
17. Mahoney FI, Barthel DW. Functional evaluation: the Barthel index. *Md State Med J* 1965; 14: 61-5.
18. Charlson M, Pompei P, Ales K, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987; 40: 373-83.
19. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegel AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 1990; 113: 941-8.
20. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res* 1975; 12: 189-98.
21. Flaherty JH, Tariq SH, Raghavan S, Bakshi S, Moinuddin A, Morley JE. A model for managing delirious older inpatients. *J Am Geriatr Soc* 2003; 51: 1031-5.
22. Allen KR, Hazelett SE, Palmer RR, et al. Developing a stroke unit using the acute care for elders intervention and model of care. *J Am Geriatr Soc* 2003; 51: 1660-7.
23. Rozzini R, Sabatini T, Trabucchi M, Ranhoff AH. Stroke units and acute care for elders model of care. *J Am Geriatr Soc* 2004; 52: 1587-8.
24. Tosteson AN, Goldman L, Udvarhelyi IS, Lee TH. Cost-effectiveness of a coronary care unit versus an intermediate care unit for emergency department patients with chest pain. *Circulation* 1996; 94: 143-50.
25. Elliott MW, Confalonieri M, Nava S. Where to perform noninvasive ventilation? *Eur Respir J* 2002; 19: 1159-66.
26. Confalonieri M, Gorini M, Ambrosino N, Mollica C, Corrado A, for the Scientific Group on Respiratory Intensive Care of the Italian Association of Hospital Pneumologists. A. Respiratory intensive care units in Italy: a national census and prospective cohort study. *Thorax* 2001; 56: 373-8.
27. Pappachan JV, Millar BW, Barrett DJ, Smith GB. Analysis of intensive care populations to select possible candidates for high dependency care. *J Accid Emerg Med* 1999; 16: 13-7.
28. Geraci JM, Ashton CM, Kuykendall DH, Johnson ML, Wu L. In-hospital complications among survivors of admission for congestive heart failure, chronic obstructive pulmonary disease, or diabetes mellitus. *J Gen Intern Med* 1995; 10: 307-14.
29. Hubbard RE, Lyons RA, Woodhouse KW, et al. Absence of ageism in access to critical care: a cross-sectional study. *Age Ageing* 2003; 32: 382-7.
30. Rozzini R, Sabatini T, Trabucchi M. A silent ageism in access to critical care [letter]. *Age Ageing* 2004; 33: 517.