12RC4

Special population in the ICU: the elderly patient

T. Schuerholz, G. Marx

Surgical Intensive Care Medicine, University Hospital Aachen, Aachen, Germany

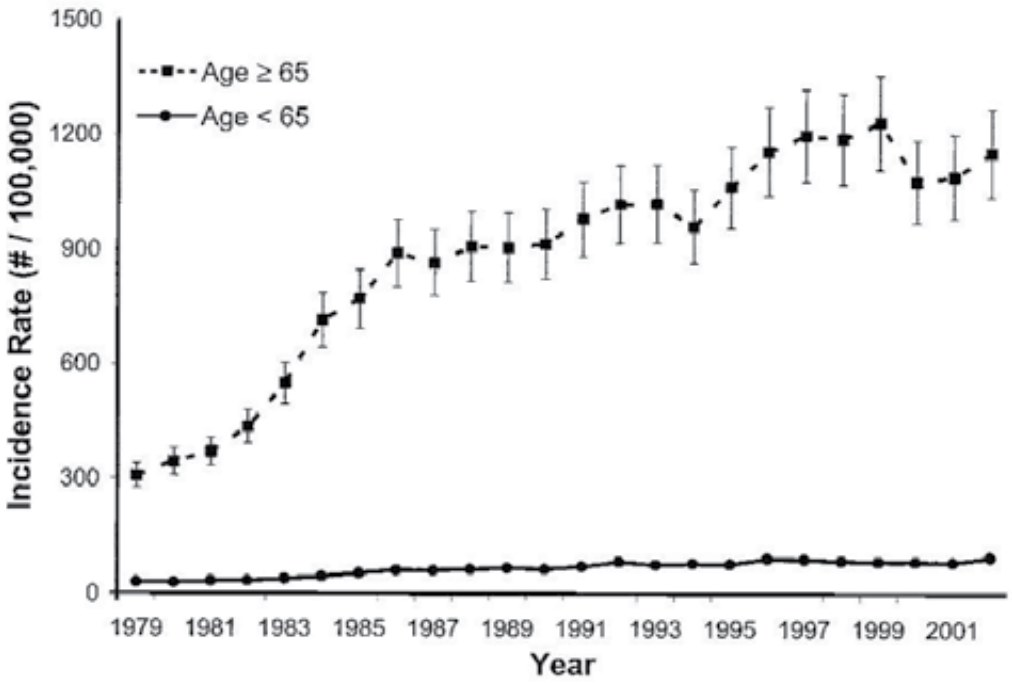
Saturday, June 6, 2009 16:00 - 16:45 Room: Yellow 1-2

Introduction

The exact definition of the 'elderly' patient on ICU is not clear [1]. The uncertainty is reflected by 'elderly' patients being differentiated by a measure somewhere between 60 and 80 yr of age, although persons between 65 and 79 yr of age are defined by the medical subject heading (MeSH) as 'aged'. Chronologically, medical treatment of the elderly patient begins at 65 years. Since this is not an adequate definition one should take into account other factors such as intellectual deterioration, immobilisation, or incontinence to help determine inclusion into the group 'the elderly' [1].

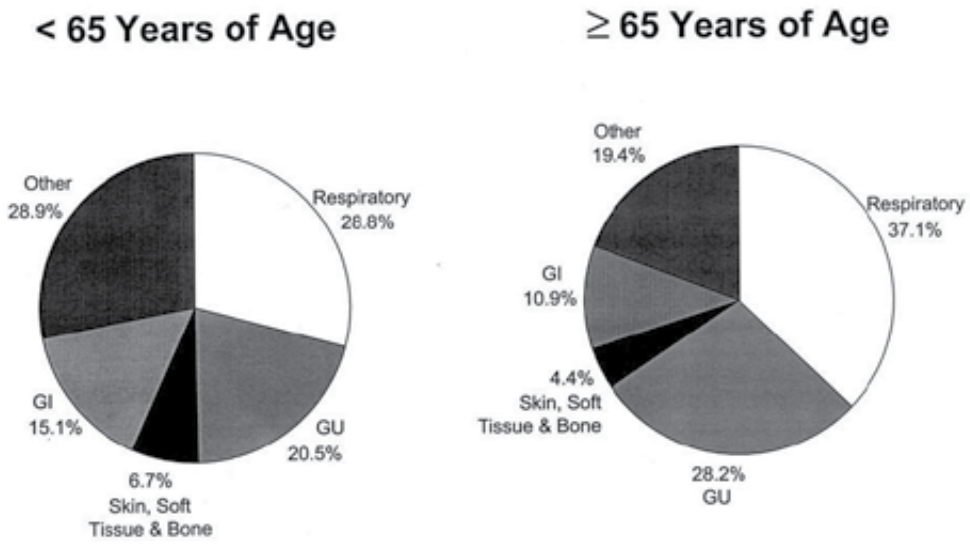
The proportion of elderly (>65 yr) people in the industrialised countries, such as Germany, is expected to rise by approximately 40% within the next 40 yr [2]. As a consequence, more and more patients will have to be treated on ICUs. Currently, half of all ICU days are required for patients older than 65 yr [3]. The mortality of elderly patients on ICU is about 25%, and even higher when the pre-hospitalisation morbidity was advanced [4]. Martin and co-workers described increasing morbidity in patients above 65 yr (Figure 1) [3]. There is considerable ambiguity about the complex interactions between the source or type of infection (Figure 2), co-morbid disease and increased age [3]. Clarifying this issue may allow the development of risk prediction models for important clinical outcomes like sepsis [5].

Figure 1



Age-adjusted incidence rates of sepsis among hospitalised patients; stratified by age ≥ 65 (dashed line) or < 65 (solid line). Points are mean values; bars represent the SEM. Reproduced with permission from: Martin GS, Mannino DM, Moss M. The effect of age on the development and outcome of adult sepsis. Crit Care Med 2006; **34***: 15-21.*

Figure 2



Distribution of sources of infection among sepsis patients, stratified by age. GI = gastrointestinal infections, GU = genitourinary infections. Reproduced with permission from: Martin GS, Mannino DM, Moss M. The effect of age on the development and outcome of adult sepsis. Crit Care Med 2006; **34***: 15-21.*

The elderly patient and sepsis

Sepsis appears to be a disease of the elderly and the susceptibility for sepsis and septic shock is increased in people > 60 yr of age [6]. US reports from 2001 and 2003 found that the mean age of severely septic patients was 63.8 yr and this has increased over time and was > 65 yr by the year 2000. The incidence of severe sepsis increased with age and although people > 65 yr account for ~ 12% of the US population, they represent two-thirds of all septic patients [5, 7]. Comparable results were obtained in the French EPISEPSIS trial with a median age of 65 yr for severe sepsis. Furthermore, the survivors in this study had a median age of 61 yr, compared with 70 yr in the non-survivors [8]. Another US study found a continuous increase in the incidence of sepsis with increasing age. The detailed characteristics reflect differences between various ethnic groups in co-existing conditions such as HIV-infections and diabetes mellitus [9].

The age of the patient is among the factors postulated to influence outcome in sepsis. A German nationwide survey reported a greater hospital mortality in patients > 60 yr, although the estimated prevalence of sepsis and severe sepsis was comparable between younger and older patients [10]. Another study of selenium in patients with systemic inflammatory response syndrome (SIRS), sepsis and septic shock confirmed a 15-20% rise in mortality for every 15 yr of increasing age in both treated and untreated groups [11]. Angus and co-workers demonstrated that the overall mortality rates for severe sepsis doubled between 15 yr and 35 yr of age and rise another 15% in the sixth decade of life [7]. More data from patients with severe sepsis were published in the UK [12]. Over the nine years of the study there was an increase in the admission rate of severe sepsis patients. The mean age in this population rose by 2.5 yr (from 59.5 to 62 yr), whereas the illness severity is comparable with respect to the Acute Physiology And Chronic Health Evaluation (APACHE) II score. A Spanish study of empirical antibiotic therapy revealed that non-survivors were significantly older than the survivors (61 vs. 57 yr, p = 0.029). Interestingly, in this investigation the risk factors which were independently associated with 28-day and in-hospital death were identified and age, itself, was not one [13].

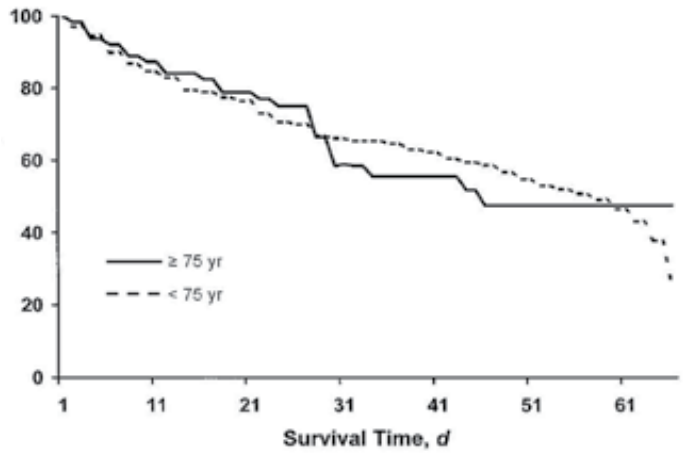
Wichmann and colleagues found a comparable incidence of sepsis (11-12%) in patients between 40-60 yr, 60-80 yr and > 80 yr [14]. Only younger patients had less sepsis. The mortality from sepsis doubled in patients between 20-40 yr and 40-60 yr, and rose by a further 7-10% in patients between 60-80 yr and those > 80 years. These findings were confirmed in a more recent study from

France [15]. Patients with severe sepsis were significantly older compared with non-septic patients. Additionally, more men suffered from severe sepsis and needed more organ support. The septic patients required a longer ICU and hospital stay. The survivors were 5 years younger than patients who died. Compared with patients < 50 years, increasing age was accompanied by an odds ratio for death of between 1.35 and 2.35. In contrast to the Spanish study age was an independent risk factor for death. These conflicting results may be explained by more frequent accompanying disease in the elderly patients.

The elderly patient and ventilator support

Esteban and co-workers investigated survival with respect to age in patients ventilated for more than 12 h. The discriminators were set by analysis at 43 yr and 70 yr. Whereas the duration of artificial ventilation, ICU and hospital stay were similar compared with younger patients, those aged > 70 yr had a reduced ICU and hospital survival [16]. The authors found acute renal failure and shock associated risk factors in the patients > 70 yr. They concluded that age alone is not a reason to withhold therapy. Instead of age, 'accompanying risk factors' based on the patient's underlying condition should be taken into account to estimate prognosis [16]. This reflects the inadequate definition of elderly patients and the need to integrate factors such as intellectual deterioration, immobilisation, and incontinence etc as described above. Another study looked at mechanically ventilated medical patients above or below 75 yr of age [17]. The older patients spent the same time on ventilator support and had comparable in-hospital mortality (Figure 3), although the cost of care was lower. The authors stated that mechanical ventilation should not be limited in patients solely on the basis of chronologic age.

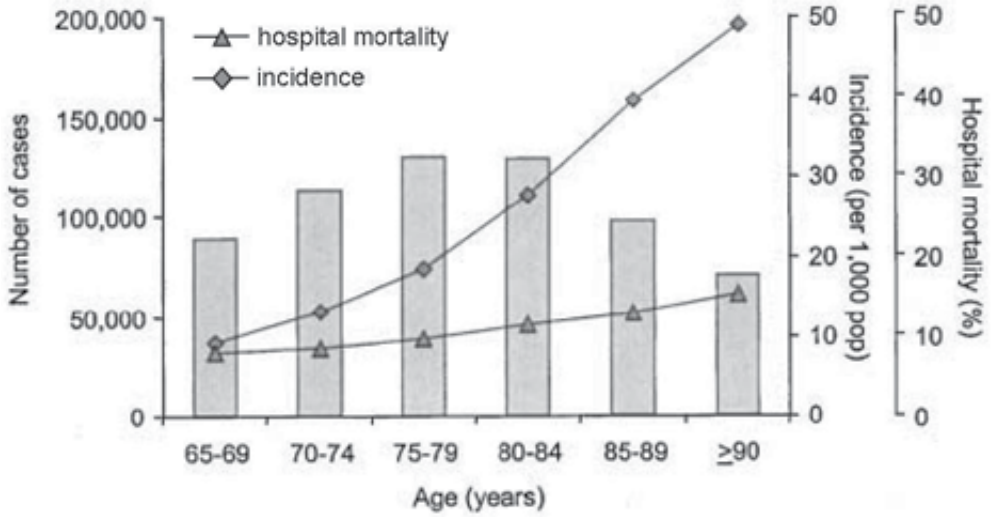
Figure 3



Kaplan–Meier analysis showing survival of ventilated patients by age; the solid line indicates patients ≥ 75 yr, the dashed line indicates patients < 75 yr. Cox proportional hazards analysis confirmed that survival did not differ between groups (p > 0.2).
Reproduced with permission from: Ely EW, Evans GW, Haponik EF. Mechanical ventilation in a cohort of elderly patients admitted to an intensive care unit. Ann Intern Med 1999; **131***: 96-104.*

An earlier investigation compared patients in a medical ICU younger or older than 65 yr of age [18]. In contrast to the more recent study, they found increasing age to be an independent predictor of death and suggested that age should be incorporated into future study design. The differences in concomitant factors, underlying diseases and hospital-to-hospital variations in ICU admission may contribute to the different findings between the studies. Indeed, Kaplan and co-workers found that the hospital mortality due to pneumonia is increased with age (7.8% in patients 65–69 yr, vs 15.4% in those > 90 yr (Figure 4) [19]. However, mortality was elevated in patients with more co-morbidity, as confirmed by Nierman et al in a previous study [4].

Figure 4



Age-specific number of cases, incidence, and hospital mortality for hospitalised community-acquired pneumonia; data from the HCFA 1997 Medicare discharge database and represent only cases > 65 yr. Incidence (diamonds) and hospital mortality (triangles) both rose with age across all age groups ($p < 0.001$). The number of cases fell beyond 80 yr because of the age distribution of the underlying population. Grey bars = number of cases. Reproduced with permission from: Kaplan V, Angus DC, Griffin MF, Clermont G, Scott Watson R, Linde-Zwirble WT. Hospitalized community-acquired pneumonia in the elderly: age- and sex-related patterns of care and outcome in the United States. Am J Respir Crit Care Med 2002; 165: 766-72.

The incidence of acute respiratory failure and requirement for mechanical ventilation increases by a factor of ten from 55 to 85 yr of age [20]. Patients with Acute Respiratory Distress Syndrome (ARDS) were investigated with a cut-off of 70 yr between older and younger patients (median age of groups 46 yr and 75 yr) [21]. The more elderly patients were ventilated for significantly longer, had a longer ICU stay and had a 50% greater mortality rate. When patients were grouped by decade of age the authors found a continuously declining survival rate the older the patient. Nevertheless, they did not recommend that resources should be directed away from aged patients with acute lung injury.

Conclusion

In the APACHE system, age points account for only minor part of the tool. There are conflicting results on whether age alone is a risk factor for mortality. However, the elderly patient, no matter how old he or she is, has a greater risk of dying in the ICU. Elderly septic patients are more severely ill, but were treated to the same extent as patients < 65 yr. The source of sepsis may be different in the elderly and ARF as a complication is more common. These factors may contribute to a greater mortality in the ICU and in hospital of patients > 65 yr. Future studies should be based on clear criteria of determining elderly and younger people. These criteria should be accepted by investigators and must not include chronological age alone, but also take into account other factors.

Beyond outcome measures such as mortality, some studies, especially in the last decade, have investigated the quality of life in the post-ICU period. Several studies have demonstrated improved, or at least unaffected, quality of life (QOL) whereas other studies showed worse QOL. However, a uniform approach to QOL is lacking [22].

Key Learning Points

- 'Elderly' ICU patients are inadequately defined.
- The source of sepsis may be different in the elderly patient.
- The incidence of sepsis increases with advancing age.
- The requirement for mechanical ventilation increases with age.
- Elderly patients have a greater risk of dying in the ICU.

References

1. Sieber CC. [The elderly patient--who is that?]. Internist (Berl) 2007; 48: 1190-4.
2. Statistisches and Bundesamt. Bevölkerung Deutschlands bis 2050. (www.destatis.de).
3. Martin GS, Mannino DM, Moss M. The effect of age on the development and outcome of adult sepsis. Crit Care Med 2006; 34: 15-21.
4. Nierman DM, Schechter CB, Cannon LM, Meier DE. Outcome prediction model for very elderly critically ill patients. Crit Care Med 2001; 29: 1853-9.
5. Martin GS, Mannino DM, Eaton S, Moss M. The epidemiology of sepsis in the United States from 1979 through 2000. N Engl J Med 2003; 348: 1546-54.
6. Valles J, Rello J, Ochagavia A, Garnacho J, Alcala MA. Community-acquired bloodstream infection in critically ill adult patients: impact of shock and inappropriate antibiotic therapy on survival. Chest 2003; 123: 1615-24.
7. Angus DC, Linde-Zwirble WT, Lidicker J, et al Epidemiology of severe sepsis in the United States: analysis of incidence, outcome, and associated costs of care. Crit Care Med 2001; 29: 1303-10.
8. Brun-Buisson C, Meshaka P, Pinton P, Vallet B. EPISEPSIS: a reappraisal of the epidemiology and outcome of severe sepsis in French intensive care units. Intensive Care Med 2004; 30: 580-8.
9. Dombrovskiy VY, Martin AA, Sunderram J, Paz HL. Occurrence and outcomes of sepsis: influence of race. Crit Care Med 2007; 35: 763-8.
10. Engel C, Brunkhorst FM, Bone HG, et al. Epidemiology of sepsis in Germany: results from a national prospective multicenter study. Intensive Care Med 2007; 33: 606-18.
11. Angstwurm MW, Engelmann L, Zimmermann T, et al. Selenium in Intensive Care (SIC): results of a prospective randomized, placebo-controlled, multiple-center study in patients with severe systemic inflammatory response syndrome, sepsis, and septic shock. Crit Care Med 2007; 35: 118-26.
12. Harrison DA, Brady AR, Rowan K. Case mix, outcome and length of stay for admissions to adult, general critical care units in England, Wales and Northern Ireland: the Intensive Care National Audit & Research Centre Case Mix Programme Database. Crit Care 2004; 8: R99-111.
13. Garnacho-Montero J, Garcia-Garmendia JL, Barrero-Almodovar A, et al. Impact of adequate empirical antibiotic therapy on the outcome of patients admitted to the intensive care unit with sepsis. Crit Care Med 2003; 31: 2742-51.
14. Wichmann MW, Inthorn D, Andress HJ, Schildberg FW. Incidence and mortality of severe sepsis in surgical intensive care patients: the influence of patient gender on disease process and outcome. Intensive Care Med 2000; 26: 167-72.
15. Guidet B, Aegerter P, Gauzit R, Meshaka P, Dreyfuss D. Incidence and impact of organ dysfunctions associated with sepsis. Chest 2005; 127: 942-51.
16. Esteban A, Anzueto A, Frutos-Vivar F, et al. Outcome of older patients receiving mechanical ventilation. Intensive Care Med 2004; 30: 639-46.
17. Ely EW, Evans GW, Haponik EF. Mechanical ventilation in a cohort of elderly patients admitted to an intensive care unit. Ann Intern Med 1999; 131: 96-104.
18. Zilberberg MD, Epstein SK. Acute lung injury in the medical ICU: comorbid conditions, age, etiology, and hospital outcome. Am J Respir Crit Care Med 1998; 157: 1159-64.
19. Kaplan V, Angus DC, Griffin MF, et al. Hospitalized community-acquired pneumonia in the elderly: age- and sex-related patterns of care and outcome in the United States. Am J Respir Crit Care Med 2002; 165: 766-72.
20. Behrendt CE. Acute respiratory failure in the United States: incidence and 31-day survival. Chest 2000; 118: 1100-5.
21. Ely EW, Wheeler AP, Thompson BT, et al. Recovery rate and prognosis in older persons who develop acute lung injury and the acute respiratory distress syndrome. Ann Intern Med 2002; 136: 25-36.
22. Hennessy D, Juzwishin K, Yergens D, Noseworthy T, Doig C. Outcomes of elderly survivors of intensive care: a review of the literature. Chest 2005; 127: 1764-74.