

Incidence of Severe Sepsis in The Netherlands; A Point-Prevalence Survey

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Introduction

Severe Sepsis is a dreaded complication of infection and highly compromises chances of survival. Mortality rates are in the range of 30% and patients require intensive care (IC) treatment for prolonged periods of time.¹ Resource consumption of this group of patients is high. Recently, the results of new agent for the treatment of severe sepsis have come available,² and others are in development. These events may change the future burden of severe sepsis, and in anticipation of this, estimates of the national burden-of-illness are useful. For that purpose, updated estimates of the incidence of severe sepsis are needed.

Objective

The objective was twofold:

- To determine the annual incidence of severe sepsis in the Netherlands.
- To compare the outcomes of two methods to calculate an annual incidence number from a point-prevalence survey.

Methods

ICU's were invited to participate in a one-day survey (11 December 2001) and monitor patients during the first 24 hours of their stay if admitted with a proven or strongly suspected infection. Patient specific questionnaires captured demographic and clinical information, presence of Systemic Inflammatory Response Syndrome (SIRS) and functional status of seven organ systems. The annual national incidence was calculated following two approaches based on the survey incidence and prevalence respectively.

Incidence based

$$I = \frac{I_{ds}}{R} \times (104\alpha + 261)$$

I = Incidence (ptnts/year)

I_{ds} = Daily incidence in survey (ptnts/day)

R = Ratio of participating ICU's

α = Reduction of admission rate on weekends

Prevalence based³

$$P = I \times D \Rightarrow I = \frac{P_s}{R \times D}$$

P = Prevalence (# ptnts)

P_s = Prevalence in survey (# ptnts)

D = Duration of ICU stay (years)

Duration of ICU stay (D) was calculated from the geometrical mean duration-to-date, corrected for α .

Results

The participating 47 ICU's represented 42% of the national admission capacity ($R=0.42$) and had 455 admitted patients during the study period. The questionnaire was completed for 152 patients; 134 met the ACCP/SCCM⁴ criteria for severe sepsis (P_s), of whom 18 were newly admitted during the survey (I_{ds}). Prevalent severe sepsis patients were on average 64 ± 15 years old and 63% was male.

The incidence based calculation yielded the following national incidence numbers (\pm SE):

| | I_d | I | Per 1000 inhabitants |
|---------------|------------|--------------------|----------------------|
| Severe Sepsis | 42 ± 9 | $13,137 \pm 2,821$ | 0.82 ± 0.18 |
| Septic Shock | 16 ± 6 | $5,109 \pm 1,866$ | 0.32 ± 0.12 |

The prevalence based calculation yielded the following national incidence numbers (\pm SE):

| | P | I | Per 1000 inhabitants |
|---------------|--------------|-----------------|----------------------|
| Severe Sepsis | 316 ± 23 | $8,643 \pm 929$ | 0.54 ± 0.06 |
| Septic Shock | 125 ± 16 | $3,932 \pm 710$ | 0.24 ± 0.04 |

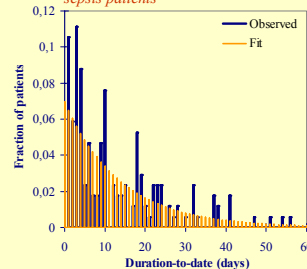
Many severe sepsis patients (37%) were previously admitted in surgery. Reason for admission was most commonly acute infection (62%) and the source of infection was most commonly the lung (47%). Respiratory failure, present in 26% of the patients, was the most common co-morbidity.

Discussion

Using a D of 13.3 days, the expected ratio of P_s/I_{ds} would be 11.3. In the survey we found 7.4 (134/18). Reasons for this discrepancy might be overestimation of α , D_i or I_{ds} , or an underestimation of P_s .

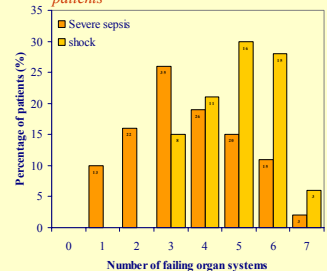
- Overestimation of α is improbable, as this factor is based on overall admission rates during weekdays and weekends rather than 'infection' admission rates, which are expected to decrease less over weekends.
- A 20% variation in α resulted in a 1-3% variation in incidence.
- Overestimation of D is conceivable, as it was estimated from an indirect data fit. However, the ICU LOS of 13.3 days is consistent with literature.
- Measurement of I_{ds} has a low power and is sensitive to daily variations.
- Underestimation of P_s is conceivable, as only the first 24 hours of admission are considered, which might have resulted in inaccurate exclusion of patients.

Figure 1: Geometric fit of observed duration-to-date in prevalent severe sepsis patients



The geometric mean duration-to-date was 13.3 ± 1.1 days for severe sepsis patients (figure 1), and 11.6 ± 1.5 days for shock patients.

Figure 2: Failing organ systems in prevalent severe sepsis patients



Severe sepsis patients had on average 3.6 ± 1.6 failing organ systems, and shock patients 4.9 ± 1.2 (mean \pm SD). In-bar labels in figure 2 represent absolute numbers.

Conclusion

Different approaches to calculate annual incidence from the results of a point-prevalence survey lead to different outcomes. The prevalence based method was preferred because it was based on a larger population and less sensitive to daily variation. The annual incidence of 8,643 cases represents 0.6% of all hospital admissions and 11% of all ICU admissions, and is comparable to e.g. the annual incidence of lungcancer in the Netherlands.

References

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