

Nosocomial infections in the elderly: time for review of the definition?

LETTER TO THE EDITOR

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To the Editor—Infections account for three quarters of nosocomial febrile illnesses among hospitalised patients.¹ The ability to identify nosocomial infection (NI) in elderly patients in an accurate and timely manner is of paramount importance, as this group is especially vulnerable to poorer outcomes associated with a delayed diagnosis.^{2,3} The widely used Center for Disease Control (CDC) definition of NI emphasises the presence of characteristic clinical features, positive supportive investigations and positive culture results.⁴ However, such strict criteria for NI may not be applicable in the elderly, who often present atypically and for whom prompt empirical treatment should be instituted based on clinical judgement, even in the absence of definitive investigation results. An earlier study in a long-term care facility reported that while most of the identified NIs were consistent with CDC criteria, the most frequent indicators that did not fully comply were documented symptoms, physician diagnosis and initiation of antibiotic therapy.⁵ The aim of our study was to ascertain the applicability of the CDC criteria to the elderly population in an acute setting.

We prospectively evaluated 281 patients (mean age 81.3±7.6 years) who were newly admitted to an acute geriatric unit from November 2006 to July 2007. Because our sample was derived from a primary study examining nutritional factors in hospitalised elderly, patients admitted to the palliative care service, those who were dangerously ill, or readmitted were excluded. NI was defined using modified criteria based on the physician's diagnosis and initiation of empirical treatment.⁴ To qualify as nosocomial, the infection had to become evident after 48 hours of admission, and not be an extension of an infection already present on admission.⁴ We compared clinical characteristics, investigation results and culture results between NIs diagnosed via CDC criteria with

those not fulfilling CDC criteria. We made further comparisons by classifying the clinical features into four categories: (1) fever exceeding 38°C, (2) presence of symptoms or signs of infection, (3) positive supportive investigations, and (4) positive cultures. Using regression analysis, we also analysed length of hospital stay, Modified Barthel Index (MBI) at discharge and 6 months, and 6-month mortality in relation to presence of NI before and after adjustment for age, gender, dementia, depression, severity of illness, and the admission MBI.

Using modified criteria, 34 NIs occurred in 33 (11.7%) of the patients, yielding a point prevalence rate of 3.5 per 1000 bed days. In contrast, the CDC criteria identified only 11 NIs (rate: 1.2 per 1000 bed days) that comprised 10/25 (40%) patients with urinary tract infections and 1/8 (12.5%) patients with pneumonia. Patients with NI not fulfilling CDC criteria were less likely to be delirious, malnourished, functionally impaired and severely ill on admission ($p=0.17-0.39$, **TABLE**). In addition, NIs not fulfilling CDC criteria were more likely to have an earlier onset of symptoms ($p=0.05$), fever not exceeding 38°C ($p=0.03$), no localising symptoms ($p=0.06$), negative microscopy ($p=0.02$) and negative culture ($p<0.001$). Such patients were also less likely to have at least three of the four core clinical features that underpin a diagnosis of NI by CDC criteria (22% vs 100%, $p<0.001$). When outcomes were examined, all 33 patients with NIs had longer length of hospital stay (16.8 vs 10.8, adjusted $p<0.001$) and more impaired discharge MBI values (60.3 vs 67.1, adjusted $p<0.001$) compared with those without NI, but there was no difference in terms of 6-month MBI values or mortality.

Our results indicate that the CDC criteria tended to under-diagnose NIs, in particular pneumonia

TABLE
Baseline characteristics and clinical features of nosocomial infections fulfilling Centre for Disease Control criteria (NI-CDC) versus those that do not (NI-non CDC)

Characteristics	NI-CDC (n=11)	NI-non CDC (n=23)	P value
Baseline characteristics			
Age (mean±SD) [years]	82.4±4.7	82.6±7.8	0.94
Female (%)	60.0	69.6	0.44
Dementia (%)	40.4	30.4	0.79
Delirium (%)	30.0	8.7	0.17
Malnourished by subjective global assessment (%)	50.0	30.4	0.31
Premorbid Modified Barthel Index (mean±SD) [range, 0-100]	76.2±28.9	86.6±21.3	0.39
Severity of illness index (mean±SD) [range, 1-4]*	2.7±0.5	2.5±0.6	0.28
Clinical features			
Onset of symptoms (mean±SD) [days of hospitalisation]	10.8±6.0	7.0±4.7	0.05
Fever exceeding 38°C (%)	54.5	17.4	0.03
Localising symptoms (%)	54.5	21.7	0.06
Physical signs (%)	54.5	30.4	0.40
White cell count (mean±SD) [x1000/mm ³]	10.6±3.9	9.9±3.5	0.57
Positive imaging (%)	9.1	21.7	0.37
Positive microscopy (%)	100.0	60.9	0.02
Positive culture (%)	100.0	53.2	<0.001
Classification by CDC criteria core categories [†] (%)			
0 factor	-	4.3	<0.001
1 factor	-	17.4	-
2 factors	-	56.5	-
3 factors	60.0	21.7	-
4 factors	40.0	-	-

* Higher scores indicate greater severity of illness

† Presence of any of the following four categories: (1) fever exceeding 38°C, (2) presence of symptoms or signs of infection, (3) positive supportive investigations, and (4) positive cultures

among hospitalised elderly patients. This discrepancy is largely attributable to atypical presentations (fever not exceeding 38°C and absence of localising symptoms) and attenuated investigation results (negative microscopy and culture results) that ensue in elderly patients who are malnourished, often functionally impaired, and appear less ill. It is unlikely that liberal diagnoses by physicians contributed to the CDC criteria under-diagnosing NIs, as there were clinical features consistent with CDC criteria in all but one of these patients, who nonetheless had supportive features of an infection (fever of 37.8°C and left shift on differential white cell count). Moreover, the predictive validity of the modified criteria was corroborated by the poorer interim outcomes (longer hospital stay and more impaired MBI values upon discharge).

Our results raise concerns about the applicability of the stringent CDC criteria for NI in hospitalised elderly patients. When confronted with an elderly patient presenting with what might be a nosocomial infection, the decision on whether to initiate antibiotic therapy should take into account the possibility of atypical clinical presentations and attenuated investigation results. It should therefore be predicated on the overall clinical suspicion, the risk-benefit ratio and the urgency to treat. It is nevertheless important to recognise that the exclusion criteria peculiar to our study may limit the generalisability of our findings and further studies are therefore recommended.

References

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