

# A 2-factor model helped rule out early-stage necrotizing fasciitis

Wall DB, Klein SR, Black S, de Virgilio C. A simple model to help distinguish necrotizing fasciitis from nonnecrotizing soft tissue infection. *J Am Coll Surg*. 2000 Sep;191:227-31.

## QUESTION

How accurate is a 2-factor model in differentiating early-stage necrotizing fasciitis (NF) from other non-necrotizing soft-tissue infections (NNFs)?

## DESIGN

The model was derived by using data from a previous case-control study, and a retrospective cohort study was used to validate the model.

## SETTING

A university medical center in Torrance, California, United States.

## PATIENTS

Data from 42 patients (mean age 39 y, 81% men, 50% with NF and 50% with NNF) were used for the derivation set, and data from 359 patients (mean age 44 y, 77% men, 9% with NF and 91% with NNF) hospitalized between April 1998 and March 1999 with a primary diagnosis of NF or NNF infection at discharge were used for the validation set. More patients with NF had a history of hepatitis (19% vs 7%,  $P = 0.03$ ) and were intravenous (IV) drug users (71% vs 30%,  $P < 0.001$ ).

## DESCRIPTION OF PREDICTION GUIDE

Derivation included comparison of vital signs on admission, findings on physical examination, laboratory measurements, and radiographic studies. The decision-tree model predicted NF in the derivation set if a patient, at admission, had a white blood cell (WBC) count  $> 15.4 \times 10^9/L$  or a serum sodium level  $< 135$  mmol/L, or both. The serum sodium level measurement was adjusted with the following mathematical formula for patients with hyperglycemia (serum glucose level  $> 200$  mg/dL): corrected sodium level = measured sodium level + 0.016 (measured glucose level - 100).

## MAIN OUTCOME MEASURE

Surgery-confirmed necrotic fascia or muscle.

## MAIN RESULTS

In the validation set, 39% of patients with NF had  $\geq 1$  characteristic clinical finding,

## Presence of white blood cell count $> 15.4 \times 10^9/L$ or serum sodium level $< 135$ mmol/L, or both, to predict early-stage necrotizing fasciitis\*

Sample	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
Derivation	95% (76 to 100)	95% (76 to 100)	20	0.05
Validation	90% (74 to 98)	76% (71 to 80)	3.7	0.13

\*LRs defined in Glossary and calculated from data in article.

such as necrotic skin, bullae, or gas on radiography. The model predicted NF for 28 of the 31 patients (90%) with NF and 80 of the 328 patients (24%) with NNF. Of patients with NF, 16 met the criteria by using the WBC count alone, 1 by using serum sodium levels alone, and 11 by using both. Sensitivities, specificities, and likelihood ratios are shown in the Table.

## CONCLUSION

In patients with soft-tissue infections, a model using 2 factors (high white blood cell count or low serum sodium levels) helped rule out early-stage necrotizing fasciitis.

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For correspondence: Dr. C. de Virgilio, Department of Surgery, Harbor-UCLA Medical Center, 1000 West Carson Street, Box 25, Torrance, CA 90509, USA. FAX 310-782-1562. ■

## COMMENTARY

In this study, Wall and colleagues develop and validate a prediction guide for NF, a rare soft-tissue infection for which early diagnosis is important because of the rapid need for surgery. Diagnosis of NF is difficult, and previous preoperative diagnostic evaluations have not stood the test of time (1). New diagnostic proposals should therefore be viewed with caution. The model proposed in the study by Wall and colleagues is not adequate for stand-alone use. Although the authors suggest some practical means to use the model to improve diagnosis, the physical examination variables they suggest considering (tense edema, purplish discoloration, and neurologic deficit) were not kept in the derivation model. The authors admit that their suggestions to improve diagnosis may not work as well as hoped.

In contrast to the findings of Wall and colleagues, 3 recent studies in other populations found no difference in WBC count at presentation between NF and NNF infections (2-4). Although none of these studies considered serum sodium levels at presentation, the WBC distribution suggests that the test would not have done nearly as well in these populations. Notably, 70% of the patients with NF were IV

drug users, who have a distinctive portal of entry and perhaps a unique host response. This model by Wall and colleagues appears useful to rule out NF in the setting of IV drug use. Low serum sodium levels may be a useful diagnostic clue in other populations as well, but prospective validation of the proposed model in other settings is needed.

Allison J. McGeer, MD  
Mount Sinai Hospital  
Toronto, Ontario, Canada

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