# Survey-based assessment of emergency room physician practices for patients with suspected infection and sepsis

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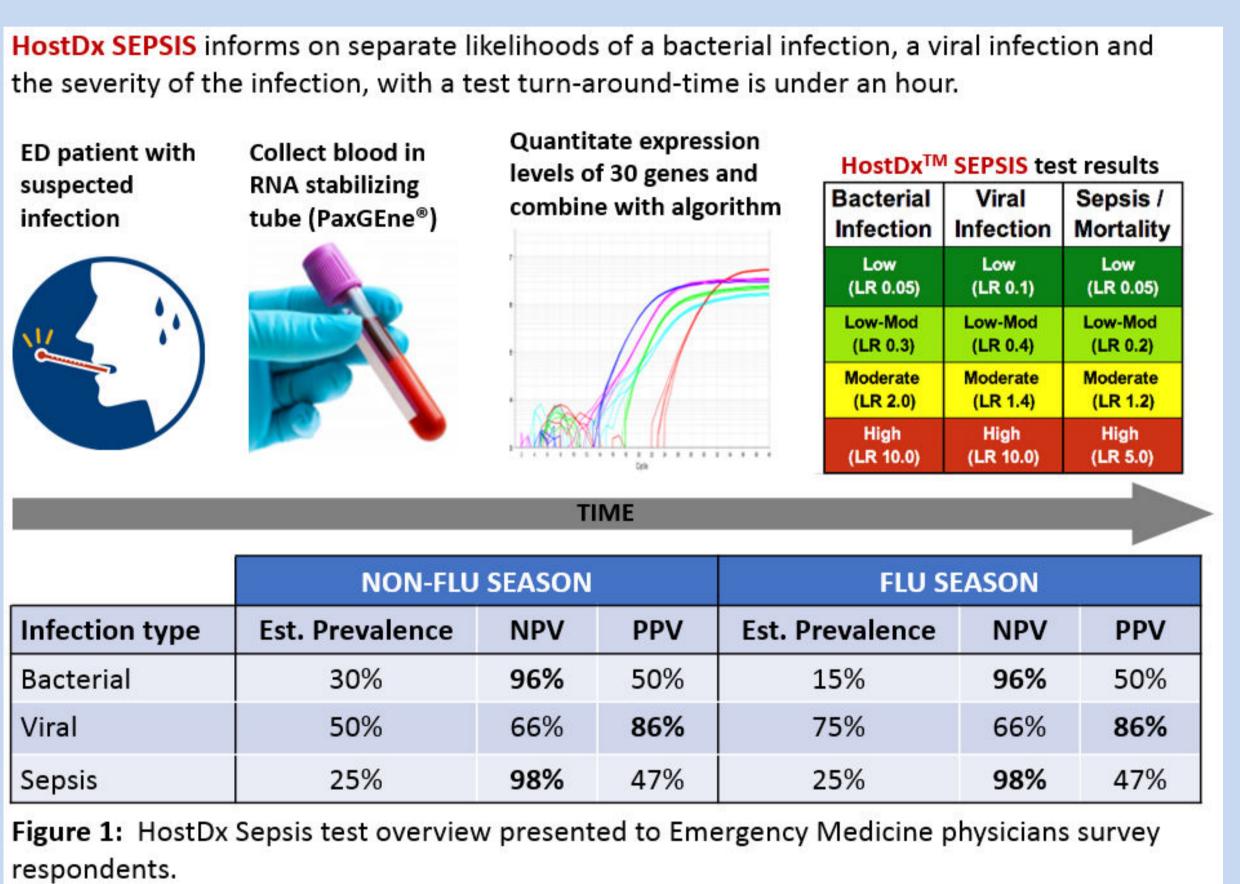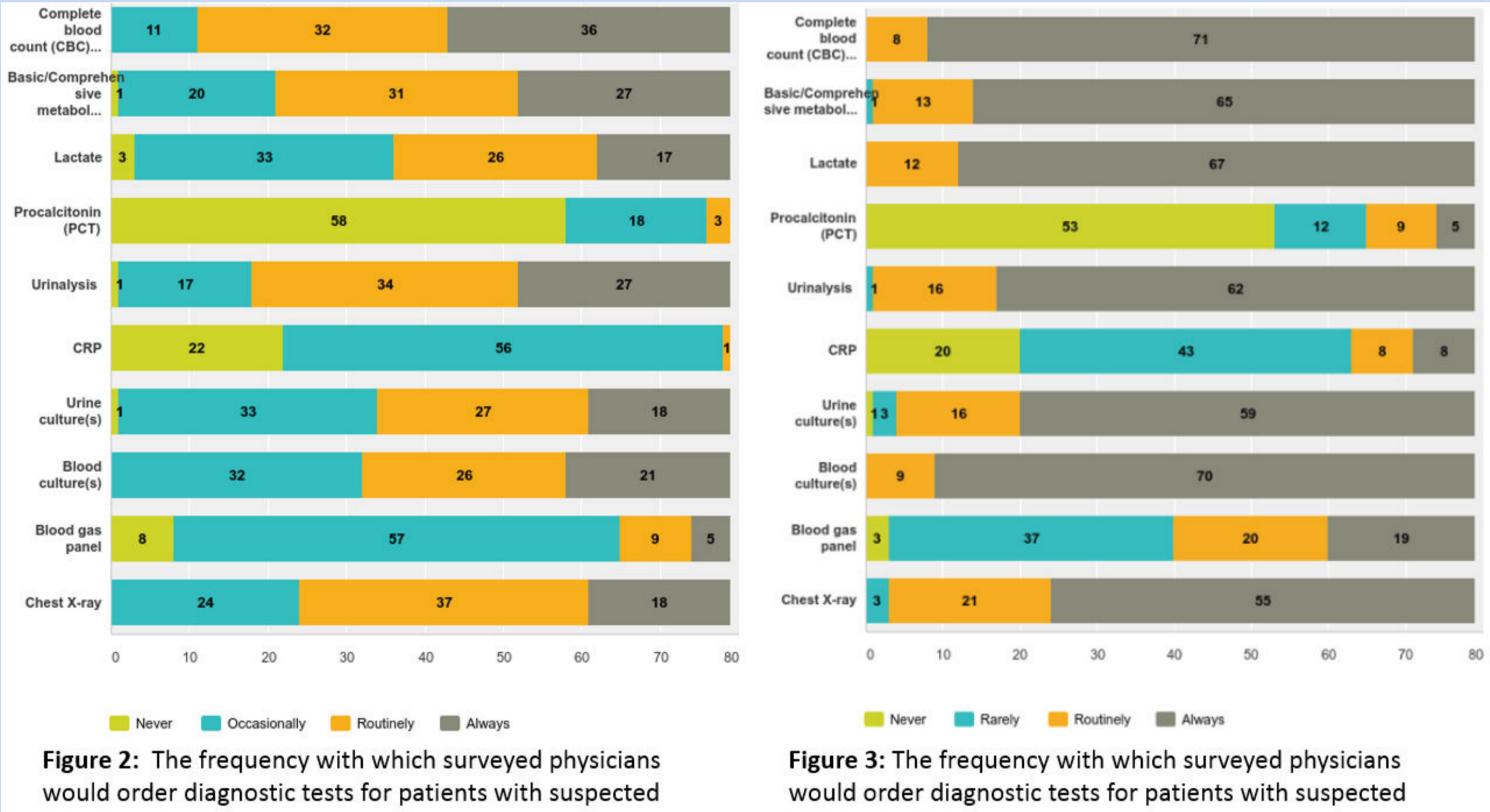
## Background:

Acute infections and sepsis, as leading causes of morbidity and mortality, represent a major burden to healthcare systems around the world. In the UK and US, respectively, 3.5 and 15 million people are assessed annually for acute infection and sepsis in A&E and Emergency Departments.[1,2] Current acute infection and sepsis diagnostics lack the necessary sensitivity and specificity to be truly effective in ED settings.[3] Addressing this significant unmet need, novel diagnostics are being developed. The HostDx[TM] Sepsis diagnostic currently under development (Inflammatix, Inc.) informs on the presence, type (bacterial vs. viral), and severity of infection by reading the host immune response (mRNA patterns from whole blood). The test's algorithm combines the expression levels of 30 genes into clinically actionable scores to predict the likelihood of bacterial infection, viral infection, and 30-day mortality (see figure 1).



HostDx SEPSIS informs on separate likelihoods of a bacterial infection, a viral infection and the severity of the infection, with a test turn-around-time is under an hour.

| Infection type | NON-FLU SEASON | | | FLU SEASON | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Est. Prevalence | NPV | PPV | Est. Prevalence | NPV | PPV |
| Bacterial | 30% | 96% | 50% | 15% | 96% | 50% |
| Viral | 50% | 66% | 86% | 75% | 66% | 86% |
| Sepsis | 25% | 98% | 47% | 25% | 98% | 47% |

**Figure 1:** HostDx Sepsis test overview presented to Emergency Medicine physicians survey respondents.

This study was designed to identify: (1) prevailing diagnostic practices for suspected acute infections and/or sepsis in emergency medicine settings; (2) emergency physician perspectives regarding the efficacy and value of existing diagnostic procedures; (3) the need for, and perceptions of innovative diagnostic tests, specifically the HostDx Sepsis system, for acute infection and sepsis.

## Methods & Data Collection:

In May 2017, a request to complete an online questionnaire was disseminated to 9,000 US-based ED physicians and 79 completed the survey. The online questionnaire contained 65 questions designed to assess: (1) respondent demographics; (2) current acute infection and sepsis diagnostic practices; (3) physician perceptions regarding the value of current acute infection and sepsis diagnostic practices; (4) physician perceptions of a novel acute infection and sepsis diagnostic, HostDx Sepsis, currently being developed by Inflammatix. Physicians were questioned separately about patients with suspected acute infections and patients with suspected sepsis.

## Results:

*Respondent Demographics:*

Participant's ranged across 24 states whose geographic distributions coincide with population density, infectious disease incidence, and sepsis incidence distributions throughout the US. Most (91%) respondents have been practicing emergency medicine for more than 11 years. Approximately 37% work in Level 1 Trauma Center ED's. Most (63%) respondents work in urban centers, with 30% working in suburban settings, and 5% in a rural areas.

*Current Diagnostic Practices:*

For patients with suspected acute infections, physicians ordered: complete blood count with differential (CBC) (86%); urinalysis (UA) (77%); basic/comprehensive metabolic panel (CMP) (74%); chest x-ray (CXR) (70%); blood cultures (BCX) (59%); urine cultures (UCX) (57%); lactate (54%); procalcitonin (PCT) (4%); and C-reactive protein (CRP) (1%) (see Figure 2). For suspected sepsis patients, physicians ordered: CBC (100%); lactate (100%); BCX (100%); UA (99%); CMP (99%); CXR (96%); UCX (95%); PCT (20%); and CRP (20%) (see Figure 3). Physicians commonly utilized SIRS (77%) to assess severity in suspected sepsis cases; SOFA (19%), qSOFA (19%), SEP-1 (14%), MEWS (13%), and APACHE (13%) were used more rarely.
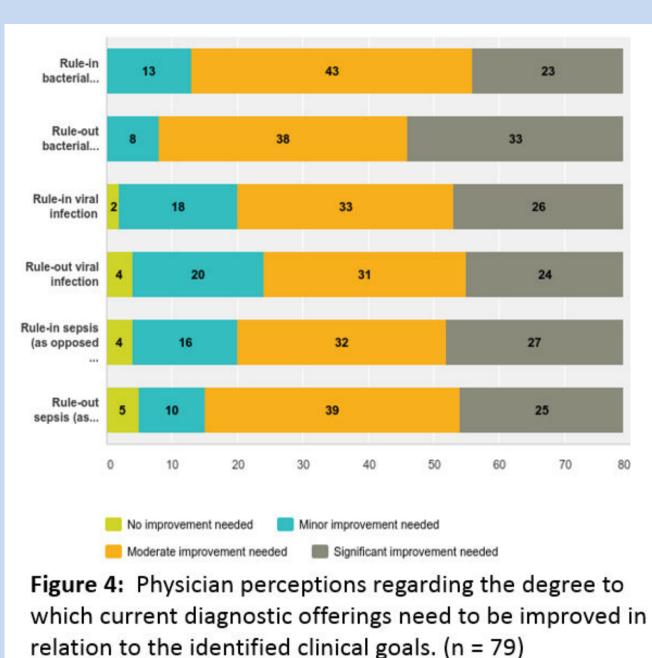


**Figure 2:** The frequency with which surveyed physicians would order diagnostic tests for patients with suspected infection. (n = 79)



**Figure 3:** The frequency with which surveyed physicians would order diagnostic tests for patients with suspected sepsis. (n = 79)

*Respondent Perceptions of Current Diagnostic Practices:*

Most (94%) respondents opined that current diagnostic methods require improvement (see Figure 4). While 94% of respondents indicated that it is important to be able to differentiate between bacterial and viral infections when diagnosing sepsis, 67% of respondents reported that they are dissatisfied with their current ability to rapidly identify and differentiate between infection types (See Figure 5).
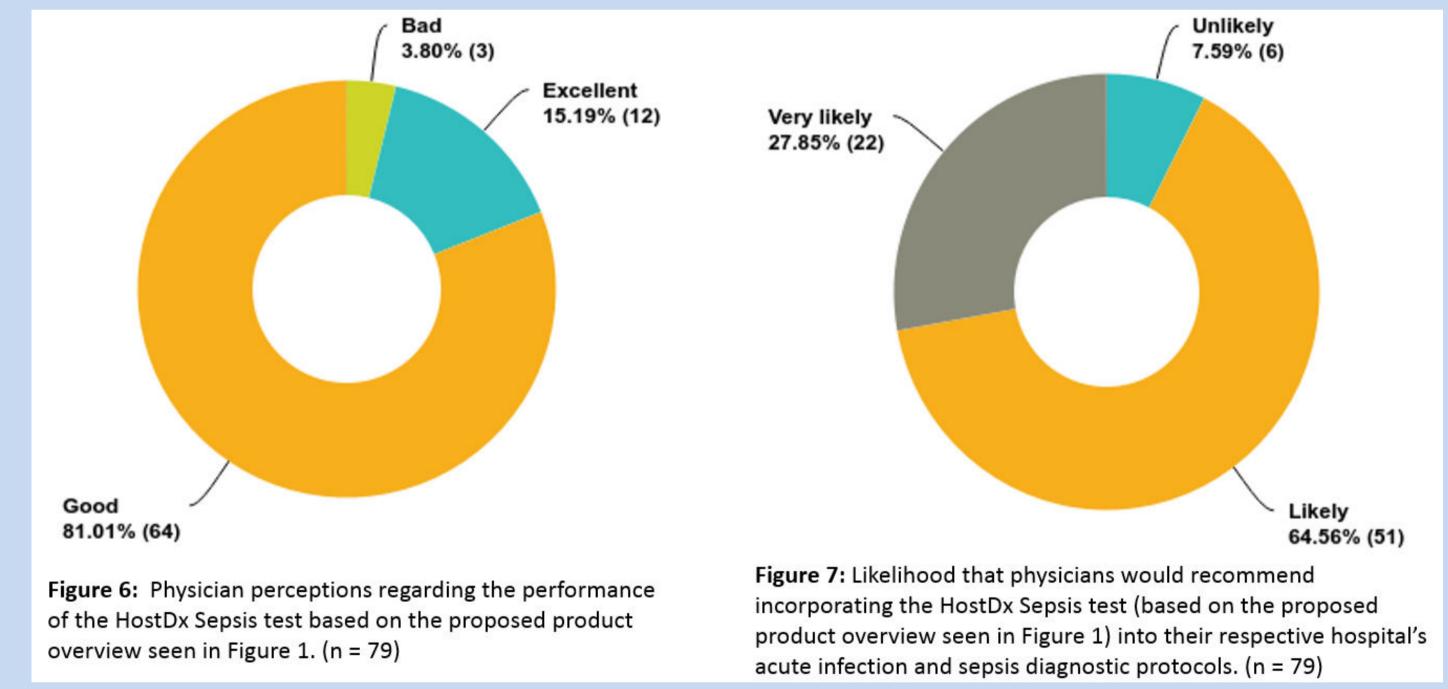
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**Figure 4:** Physician perceptions regarding the degree to which current diagnostic offerings need to be improved in relation to the identified clinical goals. (n = 79)



**Figure 5:** Physician satisfaction with their current ability to rapidly identify whether their patients have bacterial vs. viral infections. (n = 79)

*Respondent Perceptions of HostDx Sepsis:*

Upon presentation of published levels of performance, 81% of physicians perceived the test to be clinically useful and 97% found its performance robust (see Figure 6). Most physicians (92%) would recommend incorporating HostDx Sepsis into their hospital's acute infection and sepsis diagnostic protocols and would order the test (on average) 13 times per week (see Figure 7).



**Figure 6:** Physician perceptions regarding the performance of the HostDx Sepsis test based on the proposed product overview seen in Figure 1. (n = 79)



**Figure 7:** Likelihood that physicians would recommend incorporating the HostDx Sepsis test (based on the proposed product overview seen in Figure 1) into their respective hospital's acute infection and sepsis diagnostic protocols. (n = 79)
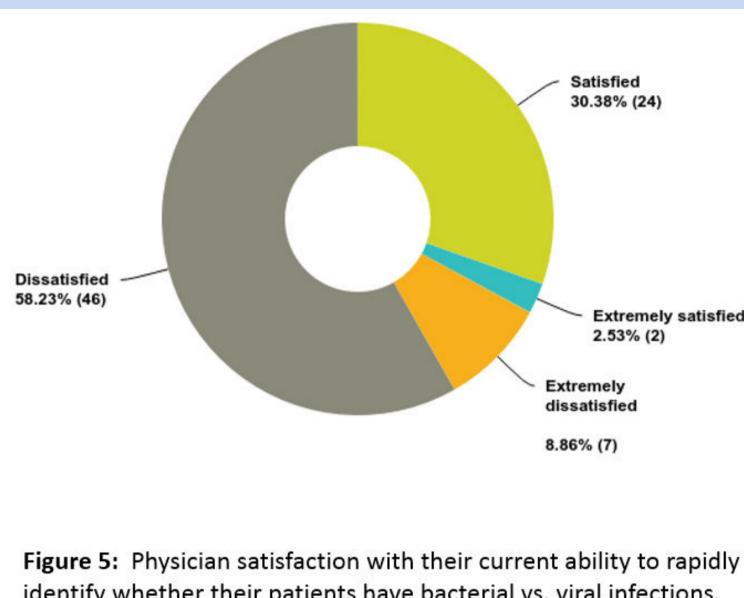
## Discussion & Conclusions:

Current acute infection and sepsis diagnostic practices require physicians to interpret a constellation of results from insufficient, and non-specific tests. Interestingly, PCT levels are rarely used by US acute infection and sepsis diagnostic protocols. Additionally, with the exception of SIRS, diagnostic and prognostic algorithms (i.e., SOFA, qSOFA, etc.) are rarely used by US emergency physicians.

Most clinicians are dissatisfied with their current diagnostic options and opined that the HostDx Sepsis system offers robust performance and significant clinical utility regarding the assessment of acute infection and sepsis; indicating they would readily incorporate the test into their diagnostic practices and implement the test regularly.

## Acknowledgements:

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