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In reply:

We thank Drs. Li and Zhang for their interest in our study. The authors highlight how challenging it can be to choose from the numerous metrics of emergency department (ED) crowding used in previous research. We selected a range of validated measures of ED crowding, covering ED input, throughput, and output workload.[1] The primary exposure of ED occupancy rate and the associated definition of ED crowding (ED occupancy rate $\geq$1) were selected according to past validation, generalizability, simplicity, expert recommendations, and broad use in the ED crowding literature generally and the ED sepsis care literature specifically.[1-5] Although we would expect parallel results with simple patient counts applied to a single ED, this method precludes comparisons between EDs of different sizes, including within our multicenter study. The ED occupancy rate in contrast normalizes the total ED census to an individual ED's capacity.

We used the combination of Third International Consensus Definitions for Sepsis and Septic Shock criteria and a discharge diagnosis code consistent with sepsis to identify eligible patients, but did not require a positive fluid culture result for cohort inclusion and do not currently have available the results of collected fluid cultures. The Table depicts subjects' clinical organ failure data and the derived Sequential [Sepsis-related] Organ Failure Assessment component scores based on ED crowding status. We agree that ED crowding varies with time of day and day of the week. Patients presenting on nights and weekends may also exhibit clinical or demographic differences influencing antibiotic timing. To account for this possible confounding, we prespecified inclusion of indicator variables for nighttime and weekend ED presentation in the multivariable models used to measure the adjusted association between ED crowding and door-to-antibiotic time.

Finally, all patients presenting to study EDs were "admitted" to the ED (ie, assigned to an ED bed) for evaluation and treatment. Drs. Li and Zhang draw attention to some challenges in applying our findings to EDs that use alternative models for patient flow. In fact, because our data suggest that crowding-associated delays occurred during the earliest phases of ED sepsis care, triage-based evaluation and treatment initiation could potentially mitigate the effects of ED crowding on antibiotic timing for sepsis. In general, the effects of different ED care process models on the association between sepsis care and ED crowding require further study.

Table. Sequential [Sepsis-related] Organ Failure Assessment component scores and associated clinical data by ED occupancy rate.

SOFA Score Parameter	ED Occupancy Rate <1 (N=3,075)		ED Occupancy Rate ≥1 (N=497)	
SOFA component scores*				
Respiratory	1.6	(0.9)	1.6	(1.0)
Hepatic	0.4	(0.8)	0.4	(0.8)
Cardiovascular	1.0	(1.0)	1.1	(1.0)
Coagulation	0.5	(0.9)	0.6	(0.9)
Central nervous system	0.5	(1.0)	0.5	(1.0)
Renal	0.9	(1.1)	1.0	(1.2)
ED clinical data determining SOFA score†				
Pao_2/Fio_2 ratio	230	(82)	235	(85)
Mechanical ventilation, No. (%)	123	(4.0)	15	(3.0)
Total bilirubin, mg/dL	1.2	(2.0)	1.3	(2.6)
Lowest ED systolic blood pressure, mm Hg	98	(24)	97	(24)
Vasopressor use in ED, No. (%)	137	(4.5)	22	(4.4)
Platelet count, 1,000/dL	225	(116)	219	(114)
Glasgow Coma Scale score	14.6	(1.8)	14.7	(1.5)
Creatinine, mg/dL	1.72	(1.46)	1.80	(1.60)

SOFA, Sequential [Sepsis-related] Organ Failure Assessment.
Values are reported as mean (SD).
*Patients with missing data for SOFA score component calculation had imputation of a normal value.
†Subjects with no data available: Pao_2/Fio_2 ratio-218, total bilirubin-223, platelets-3, and creatinine level-3.

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To TEE or Not to TEE? That Is the Question

To the Editor:

The recent article by Fair et al[1] provides thought-provoking information about chest compression pause time with transesophageal echocardiography (TEE) versus transthoracic echocardiography (TTE) in cardiac arrest. The authors chose an elegant statistical model to address the inherent complexities of the clinical question and paucity of patients available for analysis (1.4/month). We echo their concerns about external validity because only 7 patients underwent TEE-guided resuscitation and no TTE operator details are provided.

The authors posit that the benefit of TEE is shorter compression pauses, which are associated—according to an observational study of 506 patients[2]—with improved survival. Pauses for procedures were excluded, including those for intubation. Given that intubation is required for TEE, we think that intubation-related pauses reflect a true "cost" of TEE and should therefore be included. This is particularly salient if intubation is performed solely to facilitate TEE because evidence supporting patient-oriented benefit thereof is lacking.

More important is examination of the literature linking shorter compression pauses to increased survival. Two observational trials (n=2,011 and n=2,103) found no such association.[3,4] Three large randomized controlled trials assessing various methods of reducing pause time all failed to show any survival benefit of increased chest compression fraction (ie, shorter pauses).[5-7] A meta-analysis of continuous cardiopulmonary resuscitation by manual compression devices likewise found no survival benefit.[8] Thus, we believe that the argument of shorter pause time does not provide significant justification by itself for the superiority of TEE.

TEE undoubtedly has some advantages over TTE, including increased diagnostic ability for certain conditions, and often better image quality. Given the cost of establishing and maintaining a TEE program, these potential benefits must be considered alongside potential limitations, including lack of knowledge of how often the enhanced diagnostic capabilities of TEE lead to patient-oriented benefits—if at all—and the lack of expediency of acquisition of TEE images. Although to our knowledge no studies have addressed the former question, a recent study of out-of-hospital cardiac arrest reported an average time from emergency department arrival to acquisition of TEE images of 12 minutes.[9] In our experience, TTE images are obtainable in substantially less time, even with unfavorable patient characteristics. Although image quality may occasionally be suboptimal, it is generally sufficient to guide decisionmaking, thereby tipping the balance, in our opinion, in favor of TTE (at least for unselected patients).

Although we believe that TTE is sufficient in most cases, there are likely scenarios in which the delay would not be detrimental or in which patients would benefit from the enhanced capabilities of TEE, although these have yet to be identified. Perhaps a staged approach, such as TTE followed by TEE in certain situations, will prove to be best. We recognize that the challenge of improving cardiac arrest outcomes could be one in which "the native hue of resolution is sicklied o'er with the pale cast of thought, and enterprises of great pith and moment with this regard their