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LETTER

The value of clinical signs as indicators of shock

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Dear Editor,

Clinical trials and consensus definitions have traditionally defined shock as arterial hypotension (e.g., systolic blood pressure < 90 mmHg or mean blood pressure < 65 mmHg) with or without tissue hypoperfusion [1, 2]. Pathophysiologically, shock is the clinical phenotype of circulatory failure resulting in inadequate global oxygen supply and utilization [1]. A task force defined shock as life-threatening systemic tissue hypoperfusion associated with increased lactate levels emphasizing that the presence of arterial hypotension, although commonly present, should not be required to diagnose shock [3]. Instead, it recommended to use clinical signs to detect tissue hypoperfusion. The scientific evidence supporting these statements/recommendations was given as definition, statement of fact, or best practice [3]. We present here the results of a systematic review we conducted with the aim to identify the evidence on the value of ten clinical signs (tachycardia, tachypnoea, skin mottling, capillary refill time, oliguria, altered mental state, diaphoresis, peripheral pulse, peripheral pulse quality, shock index) to detect shock. The protocol of this review was pre-registered (INPLASY2022120047; Dec 12, 2022), and the Preferred Reporting Items for Systematic Review and Meta-Analysis statement [4] guided reporting of the analysis. All searches were conducted using the MEDLINE database (Supplementary Table 1) and performed in duplicate. Furthermore, all reference lists of selected publications were hand searched to identify further evidence. We included retrospective and prospective observational or cohort studies evaluating the relationship between clinical signs and the presence of shock in adults (≥ 19 years). Studies applying shock definitions exclusively based on clinical signs, reports published in languages other than English, commentaries, reviews, editorials, congress abstracts, and case series enrolling < 10 patients were excluded. No limits for sex, geographical region, journal, and publication date were applied. Following study selection, general information (author, publication year, study design, setting, population, shock type and definition) were extracted and results summarized in a spreadsheet. The risk of bias of each study was assessed using the Newcastle–Ottawa Quality Assessment Scale [5]. Out of 19,655 publications, 25 studies including 67,894 subjects were enrolled into the qualitative data synthesis (Supplementary Fig. 1, Supplementary Tables 2–4). Figure 1 summarizes key findings categorized by the type of shock. With an overall moderate risk of bias, reduced peripheral perfusion/temperature, prolonged capillary refill time, skin mottling, and a shock index ≥ 0.7–0.8 were identified as valid clinical indicators of shock. Only few studies supported a relationship between the presence of tachycardia, tachypnoea, or low urine output and shock. No reports on altered mental state, diaphoresis, and peripheral pulse quality as shock indicators were found. Two important limitations need to be considered when interpreting our results. First, given the heterogeneity of statistical methods among included studies, we could not perform a quantitative meta-analysis but had to qualitatively synthesize the study results. Second, as most studies used standard shock definitions which typically relied on the presence of arterial hypotension, we

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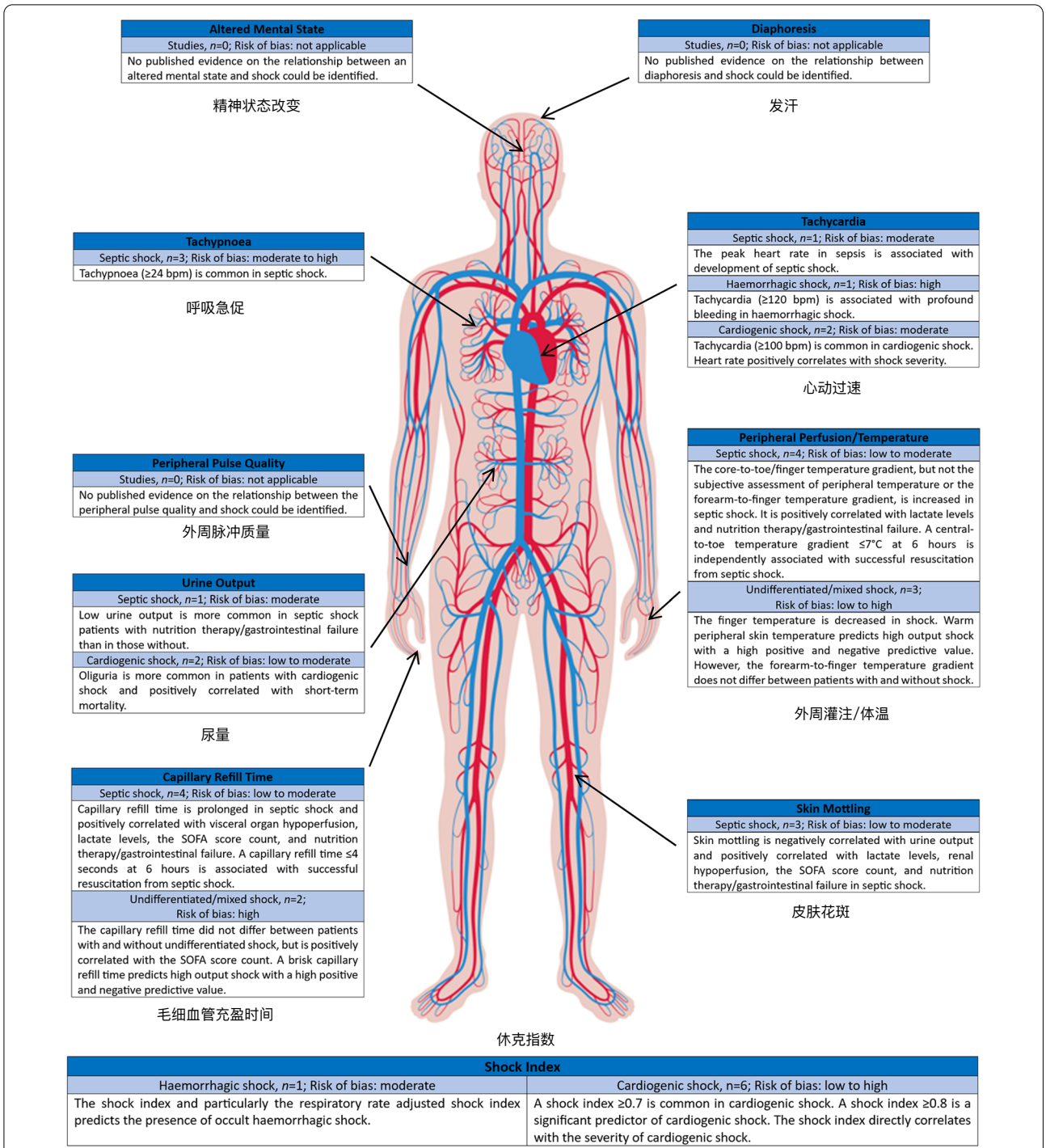

Fig. 1 Qualitative data synthesis of included studies on the relationship between ten clinical signs and the presence of shock. Icon used under license from www.stock.adobe.com

could not conclusively determine the value of clinical signs to detect compensated or occult shock states. Further research is needed to better understand the predictive value of single and particularly the combination of clinical signs as shock indicators in adults.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1007/s00134-023-07213-6.

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Author contributions
TT, MN, MWD designed the study, conducted the search, extracted data, interpreted the results, and drafted the manuscript. MT conducted the search, extracted data, and revised the manuscript for important intellectual contents. JM interpreted the results and revised the manuscript for important intellectual contents.

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