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Letter to the Editor

Evaluation of indoor hospital acclimatization of body temperature before COVID-19 fever screening

Sir,

Fever has been widely reported as one of the most common symptoms in patients with coronavirus disease 2019 (COVID-19). In a recent meta-analysis of 67 studies and 8302 patients with COVID-19, above-normal body temperature was observed in over two-thirds of positive cases [69%, 95% confidence interval (CI) 62–76%] [1]. Similar rates of fever were reported in a parallel meta-analysis based on 76 studies and totalling 11,028 patients with COVID-19 across multiple countries (72%, 95% CI 67–78%) [2], as well as in another meta-analysis of 71 articles involving 11,671 children with COVID-19 (56%, 95% CI 50–51%) [3]. Such a remarkably high burden of patients with COVID-19 presenting with fever has thus persuaded many national and international healthcare organizations to promote routine checks of body temperature as reliable means for COVID-19 screening, with the aim of limiting the risk of viral transmission in crowded and/or public indoor environments [4]. While this strategy appears easy, relatively inexpensive and straightforward at first glance, it may be plagued by some important drawbacks, such as the considerable rate of asymptomatic infections, the use of antipyretic medications, the inaccuracy of devices used for temperature scanning, and the potential impact of environmental air temperature [5]. Recently, Dzien *et al.* [6] found that a patient's forehead temperature measured immediately after entering a healthcare facility from a cooler external setting (between -5.5 and 0 °C) was approximately 3 °C lower (33.2±1.5 vs 36.1±0.8 °C) than that re-assessed 5 min after acclimatizing within the indoor environment (at 20.5 °C) [6]. To further evaluate this important aspect, a local study was undertaken to verify whether body temperature stabilization may be needed when entering healthcare buildings during periods of cool outdoor air temperatures.

This observational study was performed at the phlebotomy centre of the University Hospital of Verona, Italy, where the hospital administration established a mandatory practice of systematic screening of body temperature (at least once) of all patients, staff and other people entering any hospital buildings. In the early morning (between 7:00 and 8:30 AM) of a cool working day (19th February 2021), the forehead temperature of all consecutive outpatients entering the phlebotomy centre for routine laboratory testing was checked immediately upon entrance (i.e. within 15 s) and then rechecked 5 min after each patient had acclimatized to the indoor temperature. The following data were recorded: sex, age, time outside before entering the phlebotomy centre, and use of a hat/headgear. Forehead temperature was measured using the temperature screening terminal HIKVISION DS-K1T671TM-3XF (HIKVISION, Hangzhou, China), equipped with a vanadium oxide uncooled sensor {recognition distance 0.3–2.0 m, measuring range 30–45 °C, mean accuracy 0.1 [standard deviation (SD) 0.5] °C}. An identical recognition distance of 1 m was set for all measurements. Repeated forehead temperature values were compared using the Mann–Whitney test, Spearman's correlation and Bland–Altman analysis. Statistical analysis was performed using Analyse-it (Analyse-it Software Ltd, Leeds, UK). As repeated forehead temperature screening is mandatory before local access to hospital buildings, ethical approval and informed consent were not required.

In total, 65 patients with readable forehead temperature measurements were included in this study [mean age 62 (SD 18) years, 55% female]. The external and indoor air temperatures ranged between 8.0–9.0 °C and 22.5–24.0 °C, respectively, while the mean time spent outside before entering the phlebotomy centre was 11 (SD 6) min. The mean forehead temperature recorded upon admission to the phlebotomy centre [35.9 SD 0.3) °C] was significantly lower than that measured 5 min later [36.1 (SD 0.2) °C], displaying a mean difference of 0.28 °C (95% CI 0.23–0.33 °C; $P<0.001$), with maximum bias as high as 0.8 °C (Figure 1). Values remained unchanged after excluding patients wearing a hat/headgear ($N=16$; mean difference 0.26 °C, 95% CI 0.21–0.32 °C; $P<0.001$). Highly significant Spearman's correlation was found between the two repeated individual forehead temperature measurements ($r=0.75$, 95% CI 0.62–0.84; $P<0.001$), whilst delta forehead temperature ([5 min °C] – [entrance °C]) was not associated with sex ($r=-0.21$, 95% CI -0.43 to 0.03; $P=0.092$), age ($r=-0.06$, 95% CI -0.30 to 0.18; $P=0.612$), hat/headgear use ($r=0.09$, 95% CI -0.16 to 0.32; $P=0.495$) or reported time outside before temperature measurement ($r=-0.08$, 95% CI -0.32 to 0.17; $P=0.541$).

Although this study failed to find dramatic variations in forehead temperatures from those reported previously in another investigation performed at substantially colder environmental temperatures [6], the results of this observational study further attest that an indoor acclimatization period of approximately 5 min is necessary before systematic screening of forehead temperature. This practice would be highly

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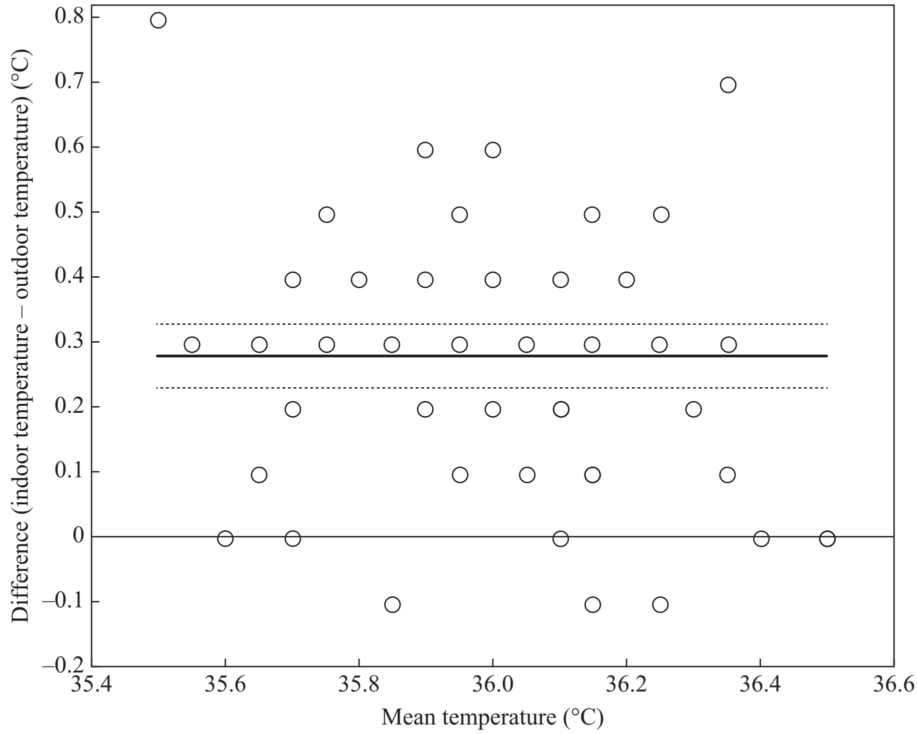

Figure 1. Bland–Altman plot of forehead temperature measurements taken immediately upon admission to a phlebotomy centre and 5 min later. The continuous line indicates mean bias, and the 95% confidence interval is indicated by the dotted lines.

advisable for preventing false-negative readings in patients or other personnel entering hospital facilities from cooler outdoor environments. This recommendation should be widespread, as temperature acclimatization was found to be independent of patient demographics, as well as time outside before temperature measurement and use of a hat/headgear.

Conflict of interest statement

None declared.

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References

[1] Mair M, Singhavi H, Pai A, Singhavi J, Gandhi P, Conboy P, et al. A meta-analysis of 67 studies with presenting symptoms and laboratory tests of COVID-19 patients. Laryngoscope 2020. https://doi.org/10.1002/lary.29207.

[2] Wong CKH, Wong JYH, Tang EHM, Au CH, Wai AKC. Clinical presentations, laboratory and radiological findings, and treatments for 11,028 COVID-19 patients: a systematic review and meta-analysis. Sci Rep 2020;10:19765.

[3] Wang JG, Zhong ZJ, Mo YF, Wang LC, Chen R. Epidemiological features of coronavirus disease 2019 in children: a meta-analysis. Eur Rev Med Pharmacol Sci 2021;25:1146–57.

[4] Zhang J, Liu S, Zhu B. Fever screening methods in public places during the COVID-19 pandemic. J Hosp Infect 2020. https://doi.org/10.1016/j.jhin.2020.11.011.

[5] Lippi G, Mattiuzzi C, Brandon H. Is body temperature mass screening a reliable and safe option for preventing COVID-19 spread? SSRN 2021. https://doi.org/10.2139/ssrn.3779727.

[6] Dzien C, Halder W, Winner H, Lechleitner M. Covid-19 screening: are forehead temperature measurements during cold outdoor temperatures really helpful? Wien Klin Wochenschr 2020. https://doi.org/10.1007/s00508-020-01754-2.

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