Do emergency medicine health care workers rate triage level of chest pain differently based upon appearance in simulated patients?

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Background and importance **There seems to be evidence of gender and ethnic bias in the early management of acute coronary syndrome. However, whether these differences are related to less severe severity assessment or to less intensive management despite the same severity assessment has not yet been established.**

Objective **To show whether viewing an image with characters of different gender appearance or ethnic background changes the prioritization decision in the emergency triage area.**

Methods **The responders were offered a standardized clinical case in an emergency triage area. The associated image was randomized among eight standardized images of people presenting with chest pain and differing in gender and ethnic appearance (White, Black, North African and southeast Asian appearance).**

Outcome measures and analysis **Each person was asked to respond to a single clinical case, in which the priority level [from 1 (requiring immediate treatment) to 5 (able to wait up to 2 h)] was assessed visually. Priority classes 1 and 2 for vital emergencies and classes 3–5 for nonvital emergencies were grouped together for analysis.**

Results **Among the 1563 respondents [mean age, 36 ± 10 years; 867 (55%) women], 777 (50%) were emergency physicians, 180 (11%) emergency medicine residents and 606 (39%) nurses. The priority levels for all responses were 1–5 : 180 (11%), 686 (44%), 539 (34%), 131 (9%) and 27 (2%). There was a higher reported priority in male compared to female [62% vs. 49%, difference 13% (95% confidence interval; CI 8–18%)]. Compared to White people, there was a lower reported priority for Black simulated patients [47% vs. 58%, difference −11% (95% CI −18% to −4%)] but not people of southeast Asian [55% vs. 58%, difference −3% (95% CI −10–5%)] and North African [61% vs. 58%, difference 3% (95% CI −4–10%)] appearance.**

Conclusion **In this study, the visualization of simulated patients with different characteristics modified the prioritization decision. Compared to White patients, Black patients were less likely to receive emergency treatment. The same was true for women compared with men.**
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Keywords: chest pain, emergency medicine, ethnicity, gender factors, triage

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Introduction

Triage is a crucial component of emergency department (ED) practice, ensuring that each patient receives timely and appropriate care [1]. Different triage scales, including those based on chief complaints and vital signs, are commonly used in triage areas of most EDs worldwide [2]. Most scales classify patients into five levels, with level 1 corresponding to life-threatening emergencies requiring immediate care in a dedicated environment and level 5 corresponding to nonurgent cases that can wait several hours before receiving initial medical care with minimal resource requirements. Triage decisions involve a combination of objective criteria, including vital parameters and subjective factors, such as the overall clinical presentation, the description of pain or the context in which the symptoms occurred.

Chest pain is a good example of a symptom that can lead to different levels of priority, accounting for 15 million annual ED visits in Europe [3], and is caused by a wide range of causes with very different prognoses, from non-cardiac parietal chest pain to acute coronary syndrome (ACS) or aortic dissection.

However, disparities in waiting times persist in the ED, particularly concerning gender and ethnicity, despite the use of triage scales [4]. Furthermore, existing evidence suggests gender [5] and even ethnic [6] biases in the management of ACS, despite women being more prone

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to hospital complications [7]. These differences may be attributed to milder severity assessments in women and non-Caucasian populations or to less intensive management despite comparable severity assessments. If we are to reduce these differences, it is essential to know whether they are secondary to disparities in severity assessment or therapeutic commitment, or both.

We wanted to study ethnic and gender disparities in severity assessment. This study primarily aims to investigate whether the presentation of characters with diverse gender or ethnic appearances in an image affects triage decisions in a standardized clinical case of chest pain in the emergency triage area.

Methods

Study design and setting

This international cross-sectional survey was conducted between 14 July and 14 August 2023. The Montpellier University Hospital Institute review board approved the study protocol (IRB N°202301477).

Selection of participants

The responders were a convenience sample of emergency physicians, residents or nurses working in an ED in France, Belgium, Switzerland or Monaco. The link to the questionnaire was distributed by the French Society of Emergency Medicine on its website and through announcements on social networks. Requests for distribution to media and nursing teams were sent through e-mails to the department heads at university and selected nonuniversity hospitals in France and to some hospitals in Belgium, Switzerland and Monaco.

Study intervention

The responders were unaware of the study's objective and were only informed that it focused on visual priority assessment.

The questionnaire used Google form and contained two sections. The first section collected information on the participants' profile, including age, gender, profession (physician, resident or nurse), location, hospital type (university, nonuniversity or private) and emergency medicine experience. The second section consisted of an image, a clinical case description and two uniform questions that remained consistent for all responders. The image associated with the clinical case was randomized into eight images. Each responder assessed a single clinical case. The respondents received the following clinical case statement: 'You are in the triage area of an ED. The patient in the picture above, who is 50 years old, was admitted. Since this morning, he/she has been reporting chest pain, which he/she says is difficult to describe, but he/she seems to be dyspneic. He/she says he/she has not made any effort, but expresses a context of anxiety linked to family problems (an argument with his teenage son again this morning). His/her only personal history is a major depressive episode 2 years ago. He/she has no known family history. He/she is not taking any medication. He/she declares having smoked about half a pack a day for 12 years, weaned off 5 years ago. His/her vital parameters are as follows: blood pressure, 135/75 mmHg; heart rate, 83 min^{-1}; peripheral oxygen saturation, 98% on room air and respiratory rate, 16 min^{-1}'.

The two questions asked were as follows: (1) to visually assess, on a scale of 0–10, the intensity of pain that the responder would assign to the patient; (2) to set the priority level at the emergency triage area by assigning a number from 1 (vital emergency requiring immediate care) to 5 (relative emergency that could wait at least 2 h for care).

Image construction

The aim of constructing the images was to ensure that the differences were solely gender and ethnic appearance. To achieve this, eight images were generated using the Midjourney website (https://www.midjourney.com). Using artificial intelligence, all eight images were generated with exactly the same request, except for gender and ethnic appearance. Genders were both male and female, and the four ethnic appearances were White, Black, North African and Southeast Asian. We have chosen these ethnic appearances because together they represent the vast majority of Europeans. The image request phrase was as follows: 'A 50 years old Black/White/North African/Asian/men/woman with a closed White shirt with the right hand on the chest, who has chest pain. His face expresses pain'. To standardize the image background, the triage area of our ED was photographed, blurred and edited to insert the characters created by Midjourney.

Objectives and end points

The main objective was to investigate whether viewing an image with characters of different ethnic and gender appearance alters the prioritization decision in the emergency triage area in a standardized clinical case of chest pain. The primary end point was a subjective priority score of 1–5. Priority classes 1 and 2 for vital emergencies and classes 3–5 for nonvital emergencies were grouped together. The secondary objectives were (1) to determine whether these differences during assessment depended on responder characteristics and (2) to show whether viewing an image with characters of different gender or ethnic appearances changes the pain assessment in this context. The secondary end point was the level of pain subjectively assessed between 0 and 10.

Statistical analyses

Quantitative data are expressed as means and standard deviations or medians and quartiles. Categorical data are presented as frequencies with percentages. The correlation between two quantitative variables was evaluated using a Student's *t*-test in the case of a normal

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distribution or a nonparametric test (Mann–Whitney *U* test or Kruskal–Wallis test in the case of multiple classes) in the opposite case. The relationship between two categorical variables was tested using the Chi-square test or Fisher's exact test when conditions for applying the Chi-square (theoretical numbers, ≥5) were not met. A multivariate analysis was performed to assess independent factors for prioritization in life-threatening emergencies (priority levels 1 and 2). Variables with a significance level of at least 0.2 were included in the logistic regression model. The unmatched win ratio method was employed as a sensitivity analysis to evaluate the robustness of results and address the limitations of conventional approaches to analyze composite end points. This method compares the outcomes of individual patients by assigning priority to more serious events based on their clinical relevance [8]. Each patient from one group (gender, ethnicity or both) was systematically paired with each patient in another group (one or all other modalities). For each pair, the patient with a higher gravity score was designated the 'winner' and the other was the 'loser'. If the outcomes were equal, the patient with a higher evaluated pain intensity won. Pairs that could not be differentiated were considered 'ties'. The win ratio was calculated as the total number of winner pairs divided by the total number of loser pairs. A win ratio of >1 indicated differences in composite outcome evaluations between groups. By applying the unmatched win ratio method, this study aims to explore potential disparities in composite end-point evaluations between ethnicities and genders. This provides insight into how specific subgroups are impacted differently in terms of overall evaluation. The significance level was set at 5% for all tests. Statistical analysis was performed using R (version 4.0.2, 2017, R Foundation for Statistical Computing, Vienna, Austria).

Results

Characteristics of study responders and global responses

During the study period, 1563 participants from 159 different cities completed the questionnaire. The baseline characteristics are depicted in Table 1. Randomization was used to judge the clinical case associated with the image with the appearance of a White male, Black male, North African male, southeast Asian male, White female, Black female, North African female and southeast Asian female image for 177 (12%), 188 (12%), 209 (13%), 186 (12%), 190 (12%), 209 (13%), 207 (13%) and 197 (13%), respectively. The mean pain intensity assessed for all responses was 5.7 ± 1.7. The priority levels for all responses were 1–5 in 180 (11%), 686 (44%), 539 (34%), 131 (9%) and 27 (2%), respectively (Fig. 1). Finally, 866 (55%) responders classified the clinical case as a vital emergency.

Table 1 Baseline characteristics of the responders

Variables	*n* (%), mean ± SD or median (Q_{25}; Q_{75})
Age (years)	36 ± 10
Gender female	867 (55%)
Profession	
Emergency physician	777 (50%)
Emergency resident	180 (11%)
Nurse	606 (39%)
Clinical emergency medicine experience (years)	5 (2; 11)
Country	
France	1300 (87%)
Switzerland	139 (9%)
Belgium	49 (3%)
Monaco	19 (1%)

Primary end point

There was a higher reported priority in male compared to female [62% vs. 49%, difference 13% (95% confidence interval; CI 8–18%)]. When clinical cases were associated with photographs depicting the characters of White, Black, North African and southeast Asian ethnic appearances, the number of responders who classified the clinical case as a vital emergency was 213 (58%), 187 (47%), 254 (61%) and 212 (55%), respectively ($P < 0.001$). Figure 1 reports the assessment of priority according to the associated picture. Figure 2 reports the assessment of priority based on gender and ethnic appearance. Compared to White people, there was a lower reported priority for Black simulated patients [47% vs. 58%, difference –11% (95% CI –18% to –4%)] but not people of southeast Asian [55% vs. 58%, difference –3% (95% CI –10–5%)] and North African [61% vs. 58%, difference 3% (95% CI –4–10%)] appearance (Table 2).

Secondary end points

The mean pain intensity rating for images of women was 5.4 ± 1.7 compared to 6.0 ± 1.6 for men ($P < 0.030$). The mean pain intensity ratings for images depicting characters of White, Black, North African and southeast Asian ethnic appearances were 5.5 ± 1.6, 5.5 ± 1.6, 5.9 ± 1.7 and 5.9 ± 1.6, respectively ($P < 0.001$). Multivariate analysis of factors associated with classification of the clinical case as a life-threatening emergency included two factors related to the responder: membership in a medical profession (physician or resident vs. nurse) and clinical experience in emergency medicine. Table 3 shows the multivariate analysis results. The win ratio using the priority level first, and then the pain level was 0.66 with a 95% CI of 0.58 and 0.74 (adjusted *P* value, <0.001), 1.08 with 95% CI of 0.94 and 1.25 (adjusted *P* value, 0.337), 1.00 with 95% CI of 0.86 and 1.14 (adjusted *P* value, 0.943), 1.23 with 95% CI of 1.07 and 1.42 (adjusted *P* value, 0.008) and 0.75 with 95% CI of 0.65 and 0.86 (adjusted *P* value, <0.001) in female vs. male, southeast Asian appearance vs. others, White appearance vs. others, North African appearance vs. others and Black appearance vs. others, respectively.

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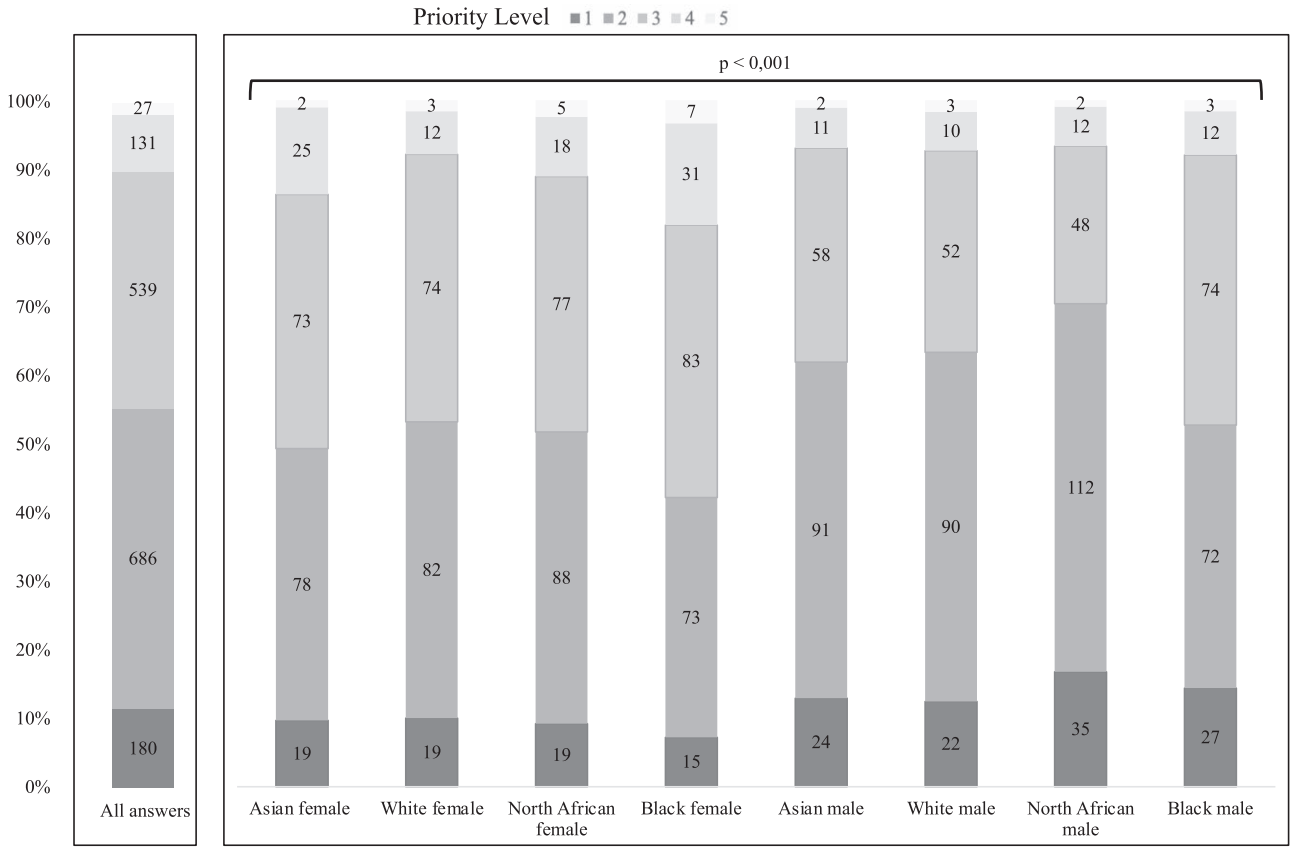
Fig. 1



Assessment of priority for all answers and according to the patient appearance.

Discussion

In this study, viewing an image with characters of different genders or ethnic appearance altered the prioritization decision of health professionals in an emergency triage area for a standardized clinical case of chest pain. The responders rated that more vital emergencies occurred in men (62%) than women (49%). Women are often considered to have less serious cases than men, even if they have the same clinical examination and paraclinical results for chest pain [5,7] and even for other pathologies [9]. This could be due to a more severe presentation of men consulting in the ED [10] or to more frequent clinical vignettes presenting males in medical education [11]. As for ethnicity, North African appearance was rated to have more vital emergencies (61%) than White (58%), southeast Asian (55%) and Black appearance (47%). When looking at the geographics of cardiovascular risk factors, North Africa, Central Asia and Central Europe have the highest risk compared to sub-Saharan Africa [12]. We could suppose a representative bias in the respondents based on their clinical experience [13]. In some cases, for example, the prognosis for men and women is different [14]. However, this field of cognition has not yet been well investigated, especially in the context of ED, where the judgment must be clear and efficient [15].

The results of the present study seem to contradict the findings of the systematic review by Dehon *et al.* [16], which showed an implicit clinician preference for Caucasians, but no impact on clinical decision-making. However, two of the nine studies showed a relationship between implicit bias and clinical decision-making. When detailing the level of priority according to ethnic appearance, clinical cases associated with images of White appearance patients are evaluated differently from clinical cases associated with images of Black appearance patients. This is consistent with the findings of previous studies that nonwhite patients have longer waiting times in EDs [17]. However, differences in the initial triage of patients might not imply the worst global outcome. Indeed, Yong *et al.* [18] found that Asian patients had worse in-hospital outcomes after ACS than Black patients despite faster care. Multivariate analysis showed that only responses associated with images of North African and southeast Asian male appearance were no different from those associated with images of White male appearance. The widest difference was observed between White men appearance and Black women

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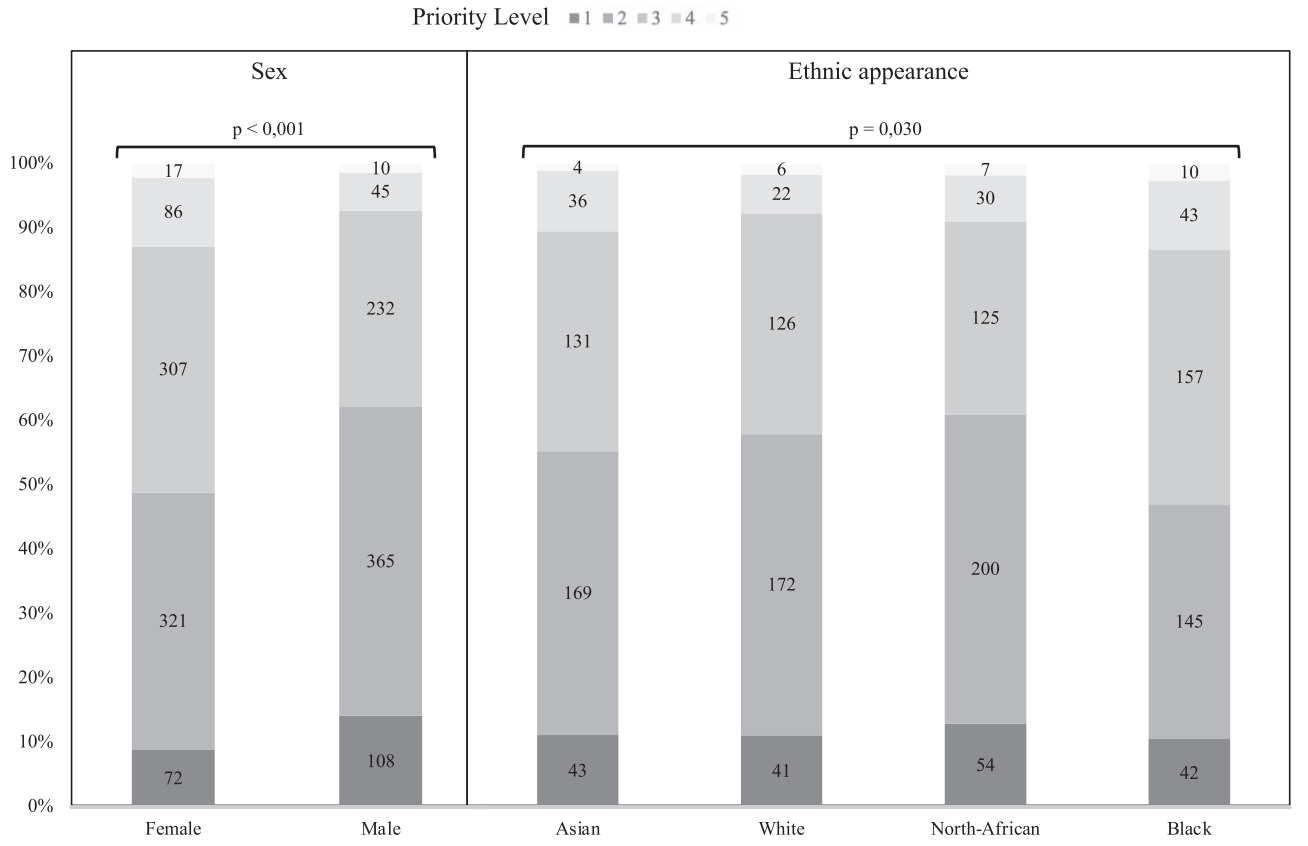
Fig. 2



Assessment of priority according to gender and ethnic appearance.

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appearance. As the win ratio can be interpreted as a relative risk, the impact of Black ethnic appearance and women's gender on prioritization is clear: 0.66 for women vs. men and 0.75 for Black appearances vs. others. All those constatations could also be linked, or come in addition with, systemic racism [19]. This must change, and more ethnic minority practitioners should be recruited in the ED [20]. Ethnic discrimination should be carefully taught to students [21].

Considering the pain levels, women were considered to experience lower pain than men. This minimization of pain in women has been reported in studies focusing on chest pain [22]. However, men and women might have the same pain perception if evaluated with a good scale [23]. However, there are differences in the way analgesics are prescribed depending on gender [24]. In this study, differences in pain assessment were also observed based on ethnic appearance. Pain perception and pain self-evaluation are more important in Black and Asian patients [25]. Even when analgesic administration seems equitable according to ethnicity or gender, the choice of a high-potency analgesic differs [26]. Moreover, several disparities in pain evaluation and treatment in the ED, based on gender and ethnicity, must be improved [27]. These differences might also be due to different presentations of ACS with gender and ethnic specificity [28].

The characteristics of the evaluators might also be a key point of patient evaluation. We found that being a physician or a resident tended to classify the patients as more severe than nurses. Marconi *et al.* [29] reported no difference between physicians in telepresence and nurses' prioritization score; however, a difference in considering triage time was observed in pediatric patients. In contrast, Burström *et al.* [30] found a better time-to-physician and shortened length of stay when having a triage physician with a registered nurse. Having a triage physician might optimize the nurse's triage skills in the case of high patient volume, even if the evaluation time is longer [31]. Moreover, the clinical experience was associated with a more severe evaluation of the patient. The optimization of triage by experience is also well-known [32]. The ability of triage should be developed in medical and nurse's education to achieve standardized competences [33]. An analysis of the rater's gender and ethnicity could have been of interest because it might be associated with patient evaluation [21].

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Table 2 Priority comparison tests based on associated images

Modality 1	Modality 2	Vital emergency of modality 1	Vital emergency of modality 2	Effect size Percentage difference 95% CI	*P* value	Adjusted *P* value
Female	Male	393 (48.9%)	473 (62.2%)	13.4% (8.4; 18.5)	<0.001	<0.001
Asian	White	212 (55.4%)	213 (58%)	2.7% (−4.8; 10.2)	0.458	0.553
Asian	North African	212 (55.4%)	254 (61.1%)	5.9% (−1.4; 13.1)	0.102	0.149
Asian	Black	212 (55.4%)	187 (47.1%)	−8.3% (−15.5; −1)	0.021	0.055
White	North African	213 (58%)	254 (61.1%)	3.1% (−4.3; 10.5)	0.390	0.506
White	Black	213 (58%)	187 (47.1%)	−10.9% (−18.3; −3.6)	0.002	**0.007**
North African	Black	254 (61.1%)	187 (47.1%)	−14% (−21.1; −7)	<0.001	<0.001
Asian female	White female	97 (49.2%)	101 (53.2%)	3.9% (−6.6; 14.4)	0.441	0.551
Asian female	North African female	97 (49.2%)	107 (51.7%)	2.5% (−7.8; 12.7)	0.622	0.702
Asian female	Black female	97 (49.2%)	88 (42.1%)	−7.2% (−17.4; 3.1)	0.149	0.201
Asian female	Asian male	97 (49.2%)	115 (61.8%)	12.7% (2.2; 23.2)	0.013	0.038
Asian female	White male	97 (49.2%)	112 (63.3%)	14.2% (3.6; 24.8)	0.006	0.019
Asian female	North African male	97 (49.2%)	147 (70.3%)	22% (11.8; 32.2)	<0.001	<0.001
Asian female	Black male	97 (49.2%)	99 (52.7%)	3.4% (−7.1; 13.9)	0.502	0.586
White female	North African female	101 (53.2%)	107 (51.7%)	−1.5% (−11.8; 8.9)	0.770	0.823
White female	Black female	101 (53.2%)	88 (42.1%)	−11.1% (−21.3; −0.8)	0.027	0.063
White female	Asian male	101 (53.2%)	115 (61.8%)	8.9% (−1.9; 19.6)	0.089	0.135
White female	White male	101 (53.2%)	112 (63.3%)	10.4% (−0.5; 21.2)	0.050	0.088
White female	North African male	101 (53.2%)	147 (70.3%)	18.2% (7.7; 28.7)	<0.001	<0.001
White female	Black male	101 (53.2%)	99 (52.7%)	−0.5% (−11.1; 10.1)	0.923	0.923
North African female	Black female	107 (51.7%)	88 (42.1%)	−9.6% (−19.7; 0.4)	0.050	0.088
North African female	Asian male	107 (51.7%)	115 (61.8%)	10.3% (−0.1; 20.7)	0.043	0.084
North African female	White male	107 (51.7%)	112 (63.3%)	11.7% (1.2; 22.2)	0.022	0.055
North African female	North African male	107 (51.7%)	147 (70.3%)	19.6% (9.5; 29.7)	<0.001	<0.001
North African female	Black male	107 (51.7%)	99 (52.7%)	1% (−9.4; 11.3)	0.847	0.872
Black female	Asian male	88 (42.1%)	115 (61.8%)	19.7% (9.5; 29.8)	<0.001	<0.001
Black female	White male	88 (42.1%)	112 (63.3%)	21.1% (10.8; 31.3)	<0.001	<0.001
Black female	North African male	88 (42.1%)	147 (70.3%)	28.7% (19; 38.4)	<0.001	<0.001
Black female	Black male	88 (42.1%)	99 (52.7%)	10.6% (0.3; 20.9)	0.035	0.077
Asian male	White male	115 (61.8%)	112 (63.3%)	1.5% (−9.7; 12.8)	0.776	0.823
Asian male	North African male	115 (61.8%)	147 (70.3%)	9.5% (−1.5; 20.4)	0.074	0.118
Asian male	Black male	115 (61.8%)	99 (52.7%)	−9.4% (−20.1; 1.4)	0.073	0.118
White male	North African male	112 (63.3%)	147 (70.3%)	7.9% (−3.2; 19.1)	0.141	0.197
White male	Black male	112 (63.3%)	99 (52.7%)	−10.9% (−21.7; 0)	0.040	0.082
North African male	Black male	147 (70.3%)	99 (52.7%)	−18.7% (−29.2; −8.2)	<0.001	<0.001

CI, confidence interval.

Table 3 Multivariate analysis of factors associated with the classification of a clinical case as a life-threatening emergency

	OR (95% CI)	*P* value
Medical profession	1.72 (1.39; 2.13)	<0.01
Clinical experience in emergency medicine	1.04 (1.03; 1.06)	<0.01
Black male appearance	0.58 (0.38; 0.90)	0.01
North African male appearance	1.32 (0.85; 2.04)	0.21
Asian male appearance	0.93 (0.60; 1.44)	0.75
White female appearance	0.63 (0.41; 0.96)	0.03
Black female appearance	0.38 (0.25; 0.57)	<0.01
North African female appearance	0.59 (0.39; 0.89)	0.01
Asian female appearance	0.53 (0.35; 0.81)	<0.01

For profession reference was nurse. For patient appearance reference was White male.
CI, confidence interval; OR, odds ratio.

Strengths

If we want to improve equity of care in emergency medicine between the different appearances of our patients, it is of major importance to carry out scientific studies analyzing differences in care [34], despite potential obstacles linked to laws on the collection of ethnic data [35,36]. Moreover, this study contains strengths that allow us to draw conclusions: First, the European cross-sectional design improves the extrapolability of our results. Second, the randomization allows good homogeneity in images shown to the respondents. Third, the patients' facial expression is an important factor for triage, and the generation of images using artificial intelligence permits them to show a face without ethical concerns [37]. Fourth, we used statistical correction for multiple tests, which permit higher confidence in our results. Finally, our results are consistent with those of actual literature on the topic, which gives us good external validity.

Limitations

First, despite the large number of respondents, the sample may not be representative of the general population: only physicians, residents and nurses motivated to answer the questionnaire are represented, and we are unable to rate the respondents, as we do not know how many eligible respondents received the invitation. Second, the ethnicity and gender appearance of the characters in the images are given by a website using an artificial intelligence principle based on the existence of numerous images found on the web. What's more, in clinical practice it's difficult to categorize patients by race according to their appearance [38]. Third, despite the standardization of queries used to generate the images, the appearance of eight characters (BMI, position, grimace and gaze) was not the same, which could influence the assessment of priority and, above all, the pain level. Fourth, we did not ask about the ethnic origin of the respondents, a factor that can influence the

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main objective. Ethnic or gender concordance is likely to have an impact on the main objective. We didn't want this question to result in a high refusal rate. Finally, although each respondent answered only one case, it is possible that some understood the main objective of the study.

Conclusion

In this study, the visualization of simulated patients with different characteristics modified the prioritization decision of a standardized clinical case of chest pain. Compared to White patients, Black patients were less likely to receive emergency treatment. The same was true for women compared with men. Further studies are needed to assess the mechanisms behind these differences in evaluation.

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Conflicts of interest

X.B. declares a competing interest as a US teacher for GE (GE Medical Systems Ultrasound) customers. For the remaining authors, there are no conflicts of interest.

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