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Exploring expressed concerns and uncanny feeling in patients with shortness of breath calling out-of-hours primary care

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Abstract

Background Patients contacting out-of-hours primary care (OHS-PC) with shortness of breath (SOB) are often concerned. Sometimes, they also have an uncanny feeling; existential anxiety that something is wrong in their body. How concerns and uncanny feeling are related to critical medical conditions that cause SOB is unknown.

We therefore explored the relation between expressed concerns and researcher's judged uncanny feeling among patients who contact OHS-PC for SOB with potential life-threatening events (LTEs) as the outcome.

Methods This is an explorative cross-sectional study. We analysed telephone triage conversations from patients with SOB who contacted Dutch OHS-PC between September 2020 and August 2021. We recorded whether patients expressed concerns and we judged whether patients had an uncanny feeling. We calculated odds ratios (ORs) for the association between (i) expressed concerns and (ii) uncanny feeling with the outcome potential LTEs.

Results Of the 1,843 patients with SOB, 43.6% patients expressed concerns and 33.0% had an uncanny feeling. Potential LTEs were similarly present among those who did and did not express concerns (OR: 1.07; 95% CI 0.84–1.37, mOR: 1.07; 95% CI 0.83–1.36), whereas potential LTEs were more often present among those with an uncanny feeling compared to those without such feeling (OR: 1.36; 95% CI 1.06–1.75, mOR: 1.35; 95% CI 1.05–1.74).

Conclusions Among patients who contacted OHS-PC with SOB, a perceived uncanny feeling of the patient was associated with a higher odd of potential LTEs, while patient's expressed concerns were not. Critical reflective interpretation is needed as uncanny feelings are difficult to judge. Nevertheless, our results implicate that further research into uncanny feelings in telephone triage could further improve the understanding of the relation with potential LTEs. Furthermore, this could be used to investigate how triage nurses may become more sensitive to what the patient is feeling but not explicitly saying such as by paying special attention to paralanguage.

Trial registration The Netherlands Trial Register, number: NL9682, registration date: 20–08-2021.

Keywords Out-of-hours, Primary care, Nursing practice, Triage, Shortness of breath, Concerns, Uncanny feeling

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Background

Shortness of breath (SOB) is among the top five reasons for contacting out-of-hours primary care (OHS-PC) and the prime reason for OHS-PC home visits by general practitioners (GPs) [1]. The "entrance complaint" SOB is therefore often selected by triage nurses in the decision support tool that is used for telephone triage in OHS-PC [2].

Telephone triage of SOB is challenging because there are multiple underlying causes possible varying from potential life-threatening such as pulmonary embolism or acute coronary syndrome to self-limiting such as an upper respiratory tract infection. Furthermore, SOB is a rather subjective symptom for which patients use different wording and patients vary in how they rate its severity [3–6]. A recent study in OHS-PC showed that both 'overtriage' and 'undertriage' are common among patients with SOB; 35% of those without a potential life-threatening event (LTE) did receive a high urgency ('overtriage'), while 46% of those who eventually showed to have a potential LTE did not receive a high urgency allocation ('undertriage') [7]. Thus, there is ample room for improvement of the telephone triage of patients with SOB, regarding both efficiency and safety, and therefore a need for factors that hold promise for improving OHS-PC triage.

Expressed concerns by patients could be such a factor. Patient's concerns are, at least partly, the reason for seeking immediate help during out-of-hours instead of waiting until the next working day. These concerns are often expressed during the triage conversations [8–13]. A previous study concluded that the self-rated worry is higher in females than in males contacting the OHS-PC [14]. These concerns might hold merit, particularly in case of an underlying LTE, but may as well be present in the absence of a LTE. In addition, the perceived severity of SOB could be influenced by the patient's concerns or emotions of fear and anxiety. We know breathlessness to be related to feelings of fear in patients contacting OHS-PC for SOB [15, 16]. Similarly, SOB can be a symptom of anxiety, i.e., anxiety is not just a moderating variable, it can be causal for example by hyperventilation. Finally, expressed concerns by patients may affect the urgency allocation by triage nurses [13, 17].

Some illnesses cause biological changes to humans, e.g., feeling 'broken' or 'different from his- or herself', which can be seen in severely ill patients [18]. In German, the word 'unheimlich' is used for this situation, and this basically refers to the absence of feeling at home in one's own body and the world [19]. In English, the word "uncanny" seems the most appropriate wording [20]. Patients feel that something is not right in their body, which is accompanied by existential anxiety, though this anxiety is not always explicitly mentioned [21]. It may be true that healthcare professionals can 'hear' the fear, through meta-communication or paralanguage [22, 23]. An interview study within Dutch and Belgian primary care, aimed at exploring how primary care professionals perceive patients' gut feelings and use this information in decision-making, suggests possible expressions which could be indicative of patient's feelings [24]. These expressions may include verbal expressions related to not trusting the situation or describing that the situation is different from normal, as well as non-verbal expressions related to the tone of voice or body language, such as paralanguage.

Whether, and how, expressed concerns and uncanny feeling impact triage and how they are related to clinically relevant medical conditions is unknown. Among adult patients calling OHS-PC with SOB, we therefore (i) recorded whether patients expressed concerns and (ii) judged whether a patient had an uncanny feeling. This to explore whether expressed concerns and judgement of uncanny feeling were associated with (i) urgency allocation, (ii) overruling of the computerized semi-automatic decision support tool, the Netherlands Triage Standard (NTS) by the triage nurse,(iii) the presence of potential LTEs as clinical outcome and (iv) accuracy of urgency allocation.

Methods

Design

This study is part of the 'Opticall study,' a multiple methods study aimed at improving telephone triage of adults calling OHS-PC with SOB. More detailed information about the 'Opticall study' is published elsewhere [25]. In this retrospective observational study, we explored whether expressed concerns and uncanny feelings were associated with potential LTEs, urgency allocation, the overruling of the urgency level as suggested by the computerized semi-automatic decision support tool (further specified under Study Setting), and accuracy of urgency allocation in patients with SOB calling the OHS-PC.

Study setting

In the Netherlands, urgent GP care is provided outside regular working hours through OHS-PC centres [26, 27]. To determine urgency and arrange appropriate care, a computerized semi-automatic decision support tool, the NTS is used [28–31]. Under the supervision of a GP, a triage nurse selects one of the 56 'entrance complaints,' one of which is SOB, and asks a number, on average five, of automatically generated questions by the NTS. Ultimately, the NTS generates an urgency level, ranging from U1 to U5 [28, 30]. U1 corresponds with an ambulance within 15 min, U2 with a GP consultation (at OHS-PC

or home visit) within 1 h, U3 with a GP consultation within 3 h, U4 with a GP consultation within 24 h and U5 with telephone advice [30]. However, the triage nurse or the supervising GP may overrule the NTS and adjust the urgency allocation, either scaling it up or down. Currently, expressed concerns or uncanny feeling are not part of the NTS, which means that this information is not used to determine an urgency level.

Inclusion and exclusion criteria

We included telephone triage conversations of two OHS-PC centres in the vicinity of Utrecht, the Netherlands, between 1 September 2020 and 31 August 2021 [32, 33]. All patients aged 18 years and older with SOB as the entrance complaint, whose call was indeed a triage call (e.g., not a consultation with ambulance personnel), and whose follow-up data about final diagnosis could be retrieved were included in this study. Patients were excluded if triage conversations were not available, if the triage was performed in another language than Dutch or English, or if the final urgency allocation was unknown.

Data collection

Data was collected from OHS-PC and patients' own GPs. At OHS-PC, information was extracted from (i) the electronic health record (EHR) and (ii) re-listened backup tapes on patient characteristics, call characteristics, symptoms, and urgency allocation. In the re-listened backup tapes, we (1) recorded whether patients expressed concerns and (2) judged whether a patient was experiencing an uncanny feeling, the latter according to the researcher (medical students or medical doctors) who re-listened the conversation.

Concerns were considered present when they were expressed during the call, either spontaneously or after inquiry by the triage nurse, otherwise they were rated absent. Here, we saw expressed concerns as a negative description of the inner state rather than the negative inner state of a patient [11]. This description of the inner state can be labelled as a description of the mental state, expressed by a first person singular and a mental verb or verb phrase, e.g. "I was a little worried" [34]. Uncanny feeling was considered present when the researcher who listened to the audio tape interpreted that the patient had an uncanny feeling during the conversation, otherwise it was rated absent. As there is no strict definition of uncanny feeling, this judgment was subjective and dependant of the researcher's interpretation of the patient's paralinguistic features and cues, which inherently involves an element of intuition. To check for inter-rater reliability, a random sample of 160 calls (8.7%) were re-listened and rated for expressed concerns or uncanny feeling of the patient by two researchers independently.

The OHS-PC data were linked with follow-up data from the patients' own GP on final diagnosis and hospitalization within 30 days of the index contact with the OHS-PC. The follow-up data included information from hospital specialist discharge letters, if applicable. The researchers were blinded to the clinical outcomes of the patients at the time of listening to the triage conversations.

Outcome measures

The primary outcome was the relation between (i) expressed concerns or (ii) presence of uncanny feeling, and the occurrence of potential LTEs. In secondary analyses, we assessed the relations with (i) urgency allocation, (ii) overruling of the NTS, and (iii) accuracy of urgency allocation.

Potential LTEs justifying high urgency (U1-U2) included the following diagnoses: pulmonary embolism, acute coronary syndrome, stroke, sepsis, anaphylaxis, pneumothorax, subcutaneous emphysema, gastro-intestinal bleeding, Takotsubo cardiomyopathy, perforated diverticulitis, respiratory insufficiency, and severe anaemia. The diagnoses COVID-19, pneumonia, asthma, and COPD exacerbation were classified as either mild to moderate (in which U3-U5 was judged adequate) or severe (justifying U1-U2 and therefore also classified as potential LTE) with the latter defined as requiring hospital admission or supplemental oxygen administration at home within 24 h of the OHS-PC index contact. The diagnosis heart failure was classified as either chronic and rather stable (in which U3-U5 was judged adequate) or as acute heart failure (justifying U1-U2 and therefore also classified as potential LTE).

Urgency allocation was dichotomized into high (U1-U2) and low (U3-U5) levels. The urgency level was considered overruled when the 'final' urgency level category (high versus low) differed from the one generated by the NTS. Overruled cases were further classified as 'scaled up' when the 'final' urgency level was higher than the NTS urgency level or 'scaled down' when the 'final' urgency level was lower than the NTS urgency level.

Data analyses

Patient and call characteristics, presented symptoms, urgency allocation and clinical diagnosis were compared between (i) those who did versus those who did not express concerns and (ii) those who did versus those who did not have an uncanny feeling according to the researcher when re-listening the triage conversation. For the comparison of dichotomous variables, Pearson's chi-square test was used, and in the case of small groups (less than 10), Fisher's exact test was used. The Independent Sample T-test was used to compare continuous variables.

These tests were also used to compare the patient characteristics of eligible triage conversations included in the analysis against eligible conversations not included in the analysis.

To assess the inter-rater agreement of 'expressed concerns' and 'uncanny feeling', Cohen's kappa statistic was computed in a random sample of 160 calls (8.7%). Two independent researchers scored dichotomized (yes/no) whether according to them there was presence of 'expressed concerns' and 'uncanny feeling'.

Odds ratios (ORs) were calculated for the relation between expressed concerns or uncanny feeling of the patient and (i) presence of potential LTEs and (ii) urgency allocation. In subgroup analyses, we stratified these analyses for sex (females and males) and calculated multivariate odds ratios (mORs) using multivariate logistic regression analyses with expressed concerns or uncanny feeling and sex as co-variates in the model and presence of potential LTEs or urgency allocation as outcomes. Finally, we added an interaction term between expressed concerns or uncanny feeling of the patient and sex to the models to assess whether the associations were different in females and males. In sensitivity analyses, we calculated ORs to analyse the relation between uncanny feeling of the patient and (i) presence of potential LTEs and (ii) urgency allocation, stratified for expressed concerns (yes/no).

The number of overruled urgency allocations was compared between (i) expressed concerns and (ii) uncanny feeling of the patient, by using the Pearson's chi-square test. We analysed whether overruling influenced the classification in high vs. low urgency levels.

Accuracy of telephone urgency allocation (high vs. low) was expressed as sensitivity, specificity, positive predictive value, and negative predictive value with corresponding 95% confidence intervals (CI) with potential LTE (yes vs. no) as the reference. Pearson's Chi-square Test was used to compare sensitivity and specificity between (i) expressed concerns and (ii) uncanny feeling of the patient.

A p-value of <0.05 was considered statistically significant. Data analysis was performed using IBM SPSS Statistics 26.0.

Ethics

The Medical Ethics Committee (MREC) Utrecht (reference number 21/361) has reviewed our study protocol. The MREC concluded that this study is not within the scope of the WMO and granted an exemption. We used a waiver for informed consent (this exception to the informed consent has been described in The Declaration of Helsinki and is further specified in the CIOMS guideline which contains a part about waiving informed consent) [35, 36]. Personal data and research data was de-identified according to the European General Data Protection Regulation (EGDPR).

Results

Of the eligible 2,012 OHS-PC triage calls, 1,843 (91.6%) calls could be included in the analysis (Fig. 1). Patients with SOB were on average 53.4 (SD 21.6) years old and 55.7% were female. Age and sex of patients excluded from the analysis were comparable to those who were included (age: 56.2 (SD 22.0) vs. 53.4 (SD 21.6) years, $p=0.051$; 56.2% vs. 55.7% female, $p=0.892$).

Of the 1,843 calls with SOB, 43.6% of patients expressed concerns, and 33.0% were judged to have an uncanny feeling. Of the 804 patients who expressed concerns, 444 (55.2%) also had an uncanny feeling. Cohen's kappa for a random sample of 160 calls was 0.256 ($p<0.001$) for expressed concerns and 0.215 ($p=0.002$) for uncanny feeling.

Baseline characteristics for calls in which concerns were and were not expressed are summarized in Table 1. GPs were more often involved in triage conversations of patients who expressed concerns (50.4% vs. 45.4%, $p=0.031$) and these patients used less often respiratory medication (21.3% vs. 28.0%, $p<0.001$), had less often wheezing (12.1% vs. 17.0%, $p=0.018$) and less often chest pain lasting less than 12 h (50.3% vs. 62.5%, $p=0.037$) compared to those who did not express concerns.

Baseline characteristics of patients with or without uncanny feeling are summarized in Table 2. Patients with uncanny feeling were on average older than those without (55.6 (SD 21.1) years, vs. 52.2 (SD 21.7) years, $p=0.002$), had more often a history of thrombo-embolic events (5.9% vs. 2.7%, $p=0.043$), more often experiences of malaise (86.1% vs. 73.2%, $p<0.001$), less often chest pain association with respiration (71.9% vs. 85.7%, $p=0.028$) and were more often unable to speak full sentences (18.4% vs. 12.9%, $p=0.004$) than those who did not have an uncanny feeling.

Relation between expressed concerns or uncanny feeling and diagnoses

A complete overview of the final diagnoses is provided in Tables S1 and S2. Those who expressed concerns less often had a mild or moderate asthma exacerbation (3.9% vs. 8.3%, $p<0.001$) and more often a diagnosis of hyperventilation/anxiety or stress (9.1% vs. 6.1%, $p=0.014$) than those who did not express concerns. Those with an uncanny feeling less often had a mild or moderate asthma exacerbation (3.9% vs. 7.5%, p = 0.003) compared to those without uncanny feeling.

Potential LTE was similarly present among patients who did and who did not express concerns (17.3% vs.

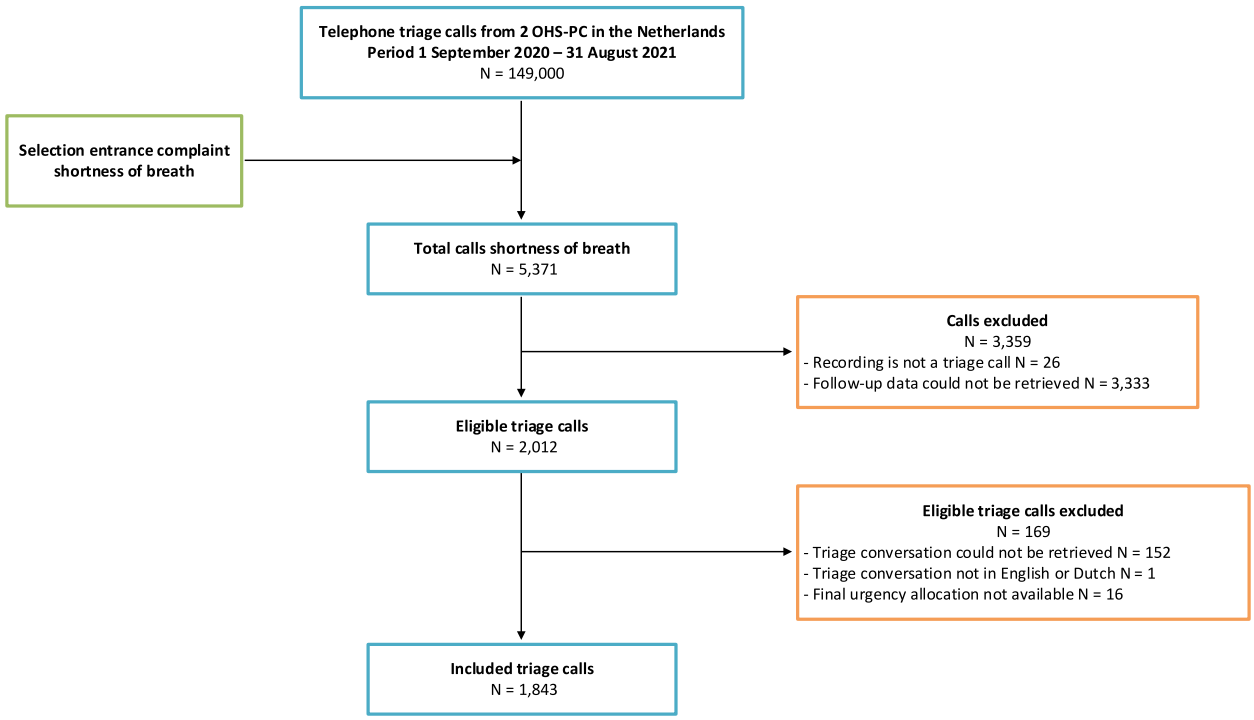

Fig. 1 Flowchart of study population

16.4% (OR: 1.07; 95% CI 0.84–1.37, mOR: 1.07; 95% CI 0.83–1.36)), both in females (14.9% vs. 15.1% (OR: 0.98; 95% CI 0.69–1.39)) and males (20.3% vs. 17.9% (OR: 1.16; 95% CI 0.82–1.65, p-value interaction term = 0.496; Table 3)).

Potential LTE was more often present among patients who were judged to have uncanny feeling (19.7% vs. 15.3% (OR: 1.36; 95% CI 1.06–1.75, mOR: 1.35; 95% CI 1.05–1.74)), in females non-significantly (16.1% vs. 14.5% (OR: 1.14; 95% CI 0.79–1.64)) and males significantly (23.8% vs. 16.4% (OR: 1.59; 95% CI 1.12–2.27, *p*-value interaction term = 0.195; Table 4)).

The relation between uncanny feeling of the patient and potential LTE did not differ between those who did express concerns (20.7% vs. 13.1% (OR: 1.74; 95% CI 1.19–2.55)) and those who did not express concerns (17.1% vs. 16.2% (OR: 1.06; 95% CI 0.68–1.66, p-value interaction term = 0.099; Table 5)).

Relation between expressed concerns or uncanny feeling and urgency allocation

In 1,663 (90.2%) of the patients, the NTS urgency level category (high vs. low) remained the 'final' urgency level (Fig. 2). In the remaining 180 (9.8%) patients, the NTS urgency level was scaled up by the triage nurse or supervising GP in 56 patients (31.1%) and scaled down in 124 patients (68.9%). In those who did and did not express concerns, the numbers of overruled, scaled up and scaled down urgencies were similar (See Table S3). A similar pattern was observed for those who were or were not judged as having uncanny feeling (See Table S4).

Patients who expressed concerns did not receive a high urgency more often than those who did not express concerns (36.2% vs. 39.6% (OR: 0.87; 95% CI 0.72–1.05, mOR: 0.87; 95% CI 0.72–1.05), irrespective of sex (Table 6).

Patients who were judged to have uncanny feeling more often received a high urgency than those without uncanny feeling (42.1% vs. 36.1% (OR: 1.29; 95% CI 1.06–1.57, mOR: 1.28; 95% CI 1.05–1.57)). This was different for females (44.7% vs. 34.2% (OR: 1.55; 95% CI 1.19–2.03)) than for males (39.2% vs. 38.6% (OR: 1.02; 95% CI 0.76–1.38, *p*-value interaction term = 0.040; Table 7)).

The relation between uncanny feeling of the patient and high urgency allocation did not differ between those who did express concerns (40.3% vs. 31.1% (OR: 1.50; 95% CI 1.12–2.01)) and those who did not express concerns (47.0% vs. 38.2% (OR: 1.43; 95% CI 1.03–2.01, *p*-value interaction term = 0.852; See Table 8)).

The accuracy of urgency allocation did not differ for those with and without expressed concerns (sensitivity: 0.53 (95% CI 0.45–0.62) versus 0.54 (95% CI 0.46–0.62), $p = 0.877$ and specificity: 0.67 (95% CI 0.64–0.71) versus 0.63 (95% CI 0.60–0.66), $p = 0.097$). Specificity was slightly less in those with uncanny feeling: 0.61

Table 1 Baseline characteristics of 1,843 patients who called the OHS-PC with SOB, stratified by expressed concerns (yes/no)

	Total *n* = 1,843	Expressed concerns *n* = 804 (43.6%)	No expressed concerns *n* = 1,039 (56.4%)	*p*-value
Patient characteristics				
Mean age in years (SD)	53.4 (21.6)	53.5 (20.9)	53.2 (22.0)	0.785
Male sex	817 (44.3%)	360 (44.8%)	457 (44.0%)	0.734
Female sex	1,026 (55.7%)	444 (55.2%)	582 (56.0%)	0.734
Call characteristics				
Call duration in min:sec (SD) (*n* = 1,829)[a]	12:52 (51:36)	14:40 (56:26)	11:29 (47:30)	0.192
Someone else called on behalf of patient (*n* = 1,840)[a]	939 (51.0%)	417 (51.9%)	522 (50.3%)	0.498
GP participated in triage (*n* = 1,841)[a]	876 (47.6%)	405 (50.4%)	471 (45.4%)	**0.031**
Medical history				
Cardiovascular disease (*n* = 916)[a]	308 (33.6%)	148 (35.0%)	160 (32.5%)	0.418
Respiratory disease (*n* = 1,005)[a]	471 (46.9%)	205 (45.4%)	266 (48.1%)	0.385
Thrombo-embolic diseases (*n* = 656)[a]	24 (3.7%)	12 (4.0%)	12 (3.3%)	0.636
Use of medication				
Cardiovascular medication use	269 (14.6%)	134 (16.7%)	135 (13.0%)	**0.027**
Respiratory medication use	462 (25.1%)	171 (21.3%)	291 (28.0%)	**< 0.001**
Antithrombotic therapy	82 (4.4%)	42 (5.2%)	40 (3.8%)	0.156
Symptoms mentioned during the call				
Ankle oedema (*n* = 95)[a]	54 (56.8%)	28 (52.8%)	26 (61.9%)	0.375
Autonomic nervous system related symptoms[b] (*n* = 1,364)[a]	693 (50.8%)	321 (51.4%)	372 (50.3%)	0.707
Chest pain (*n* = 845)[a]	499 (59.1%)	244 (60.4%)	255 (57.8%)	0.447
Coughing (*n* = 1,302)[a]	883 (67.8%)	380 (65.5%)	503 (69.7%)	0.111
Coughing blood (*n* = 1,073)[a]	48 (4.5%)	24 (5.0%)	24 (4.0%)	0.429
Coughing sputum (*n* = 641)[a]	216 (33.7%)	94 (32.3%)	122 (34.9%)	0.496
Fever (*n* = 1,261)	346 (27.4%)	159 (29.5%)	187 (25.9%)	0.157
Immobilisation (*n* = 85)[a]	58 (68.2%)	36 (72.0%)	22 (62.9%)	0.373
Malaise (*n* = 676)[a]	533 (78.8%)	279 (80.4%)	254 (77.2%)	0.309
Musculoskeletal pain (*n* = 209)[a]	168 (80.4%)	74 (74.7%)	94 (85.5%)	0.052
Palpitations (*n* = 155)[a]	99 (63.9%)	60 (63.2%)	39 (65.0%)	0.816
Shortness of breath (*n* = 1,816)[a]	1,757 (96.8%)	766 (96.1%)	991 (97.3%)	0.173
Swollen calf (*n* = 41)[a]	5 (12.2%)	3 (10.7%)	2 (15.4%)	0.645
Tingling sensations (*n* = 103)[a]	69 (67.0%)	42 (62.7%)	27 (75.0%)	0.273
Chest pain characteristics				
Chest pain association with respiration (*n* = 169)[a]	136 (80.5%)	65 (75.6%)	71 (85.5%)	0.102
Pain onset < 12 h (*n* = 291)[a]	163 (56.0%)	78 (50.3%)	85 (62.5%)	**0.037**
Pain duration > 15 min (*n* = 250)[a]	239 (95.6%)	131 (93.6%)	108 (98.2%)	0.078
Posture-specific chest pain (*n* = 35)[a]	28 (80.0%)	14 (73.7%)	14 (87.5%)	0.309
Radiation of pain (*n* = 219)[a]	128 (58.4%)	68 (57.6%)	60 (59.4%)	0.790
Severe pain (score > 7 on VAS) (*n* = 100)[a]	27 (27.0%)	7 (19.4%)	20 (31.3%)	0.245
Shortness of breath characteristics				
SOB on exertion (*n* = 706)[a]	612 (86.7%)	270 (85.4%)	342 (87.7%)	0.382
SOB at rest (*n* = 1,550)[a]	1,491 (96.2%)	654 (96.5%)	837 (96.0%)	0.629
Stridor (*n* = 1,141)[a]	38 (3.3%)	18 (3.6%)	20 (3.1%)	0.695
Unable to speak full sentences (*n* = 1,514)[a]	223 (14.7%)	108 (16.2%)	115 (13.6%)	0.161
Wheezing (*n* = 1,205)[a]	179 (14.9%)	64 (12.1%)	115 (17.0%)	**0.018**

[a] For these variables there were missing data

[b] Autonomic nervous system related symptoms consist of one or more of the following: nausea and/or vomiting, sweating, pallor/ashen skin, (near) collapse

GP General practitioner, *OHS-PC* Out-of-hours primary care, *SOB* Shortness of breath, *VAS* Visual Analogue Scale

Table 2 Baseline characteristics of 1,843 patients who called the OHS-PC with SOB, stratified by uncanny feeling (yes/no)

	Total *n* = 1,843	Uncanny feeling *n* = 608 (33.0%)	No uncanny feeling *n* = 1,235 (67.0%)	*p*-value
Patient characteristics				
Mean age in years (SD)	53.4 (21.6)	55.6 (21.1)	52.2 (21.7)	**0.002**
Male sex	817 (44.3%)	286 (47.0%)	531 (43.0%)	0.100
Female sex	1,026 (55.7%)	322 (53.0%)	704 (57.0%)	0.100
Call characteristics				
Call duration in min:sec (SD) (*n* = 1,829)[a]	12:52 (51:36)	14:53 (1:11:35)	11:52 (37:58)	0.238
Someone else called on behalf of patient (*n* = 1,840)[a]	939 (51.0%)	328 (54.0%)	611 (49.6%)	0.074
GP participated in triage (*n* = 1,841)[a]	876 (47.6%)	297 (48.9%)	579 (46.9%)	0.417
Medical history				
Cardiovascular disease (*n* = 916)[a]	308 (33.6%)	113 (37.5%)	195 (31.7%)	0.079
Respiratory disease (*n* = 1,005)[a]	471 (46.9%)	160 (48.2%)	311 (46.2%)	0.554
Thrombo-embolic diseases (*n* = 656)[a]	24 (3.7%)	12 (5.9%)	12 (2.7%)	**0.043**
Use of medication				
Cardiovascular medication use	269 (14.6%)	96 (15.8%)	173 (14.0%)	0.308
Respiratory medication use	462 (25.1%)	139 (22.9%)	323 (26.2%)	0.125
Antithrombotic therapy	82 (4.4%)	32 (5.3%)	50 (4.0%)	0.234
Symptoms mentioned during the call				
Ankle oedema (*n* = 95)[a]	54 (56.8%)	25 (55.6%)	29 (58.0%)	0.810
Autonomic nervous system related symptoms[b] (*n* = 1,364)[a]	693 (50.8%)	255 (54.3%)	438 (49.0%)	0.065
Chest pain (*n* = 845)[a]	499 (59.1%)	184 (58.4%)	315 (59.4%)	0.770
Coughing (*n* = 1,302)[a]	883 (67.8%)	266 (65.2%)	617 (69.0%)	0.171
Coughing blood (*n* = 1,073)[a]	48 (4.5%)	22 (6.2%)	26 (3.6%)	0.059
Coughing sputum (*n* = 641)[a]	216 (33.7%)	68 (32.1%)	148 (34.5%)	0.541
Fever (*n* = 1,261)	346 (27.4%)	126 (30.8%)	220 (25.8%)	0.063
Immobilisation (*n* = 85)[a]	58 (68.2%)	27 (77.1%)	31 (62.0%)	0.162
Malaise (*n* = 676)[a]	533 (78.8%)	254 (86.1%)	279 (73.2%)	**< 0.001**
Musculoskeletal pain (*n* = 209)[a]	168 (80.4%)	63 (76.8%)	105 (82.7%)	0.299
Palpitations (*n* = 155)[a]	99 (63.9%)	49 (68.1%)	50 (60.2%)	0.312
Shortness of breath (*n* = 1,816)[a]	1,757 (96.8%)	582 (96.8%)	1,175 (96.7%)	0.882
Swollen calf (*n* = 41)[a]	5 (12.2%)	3 (13.0%)	2 (11.1%)	1.000
Tingling sensations (*n* = 103)[a]	69 (67.0%)	26 (57.8%)	43 (74.1%)	0.080
Chest pain characteristics				
Chest pain association with respiration (*n* = 169)[a]	136 (80.5%)	46 (71.9%)	90 (85.7%)	**0.028**
Pain onset < 12 h (*n* = 291)[a]	163 (56.0%)	76 (58.5%)	87 (54.0%)	0.450
Pain duration > 15 min (*n* = 250)[a]	239 (95.6%)	116 (93.5%)	123 (97.6%)	0.135
Posture-specific chest pain (*n* = 35)[a]	28 (80.0%)	13 (81.3%)	15 (78.9%)	1.000
Radiation of pain (*n* = 219)[a]	128 (58.4%)	51 (56.0%)	77 (60.2%)	0.543
Severe pain (score > 7 on VAS) (*n* = 100)[a]	27 (27.0%)	7 (23.3%)	20 (28.6%)	0.633
Shortness of breath characteristics				
SOB on exertion (*n* = 706)[a]	612 (86.7%)	214 (86.6%)	398 (86.7%)	0.979
SOB at rest (*n* = 1,550)[a]	1,491 (96.2%)	516 (97.2%)	975 (95.7%)	0.145
Stridor (*n* = 1,141)[a]	38 (3.3%)	17 (4.8%)	21 (2.7%)	0.059
Unable to speak full sentences (*n* = 1,514)[a]	223 (14.7%)	92 (18.4%)	131 (12.9%)	**0.004**
Wheezing (*n* = 1,205)[a]	179 (14.9%)	46 (12.1%)	133 (16.1%)	0.069

[a] For these variables there were missing data

[b] Autonomic nervous system related symptoms consist of one or more of the following: nausea and/or vomiting, sweating, pallor/ashen skin, (near) collapse

GP General practitioner, *OHS-PC* Out-of-hours primary care, *SOB* Shortness of breath, *VAS* Visual Analogue Scale

Table 3 Association between expressed concerns and final diagnosis potential LTE of 1,843 patients with shortness of breath who called the OHS-PC, stratified by sex

Total calls	LTE *n* = 309 (16.8%)	No LTE *n* = 1,534 (83.2%)	OR (95% CI)	Multivariate OR (95% CI)
Expressed concerns	139 (17.3%)	665 (82.7%)	1.07 (0.84–1.37)	1.07 (0.83–1.36)[a]
No expressed concerns	170 (16.4%)	869 (83.6%)		
Females	**LTE *n* = 154 (15.0%)**	**No LTE *n* = 872 (85.0%)**		
Expressed concerns	66 (14.9%)	378 (85.1%)	0.98 (0.69–1.39)	
No expressed concerns	88 (15.1%)	494 (84.9%)		
Males	**LTE *n* = 155 (19.0%)**	**No LTE *n* = 662 (81.0%)**		
Expressed concerns	73 (20.3%)	287 (79.7%)	1.16 (0.82–1.65)	
No expressed concerns	82 (17.9%)	375 (82.1%)		

[a] Multivariate analysis with sex

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Table 4 Association between uncanny feeling and final diagnosis potential LTE of 1,843 patients with shortness of breath who called the OHS-PC, stratified by sex

Total calls	LTE *n* = 309 (16.8%)	No LTE *n* = 1,534 (83.2%)	OR (95% CI)	Multivariate OR (95% CI)
Uncanny feeling	120 (19.7%)	488 (80.3%)	**1.36 (1.06–1.75)**	**1.35 (1.05–1.74)[a]**
No uncanny feeling	189 (15.3%)	1,046 (84.7%)		
Females	**LTE *n* = 154 (15.0%)**	**No LTE *n* = 872 (85.0%)**		
Uncanny feeling	52 (16.1%)	270 (83.9%)	1.14 (0.79–1.64)	
No uncanny feeling	102 (14.5%)	602 (85.5%)		
Males	**LTE *n* = 155 (19.0%)**	**No LTE *n* = 662 (81.0%)**		
Uncanny feeling	68 (23.8%)	218 (76.2%)	**1.59 (1.12–2.27)**	
No uncanny feeling	87 (16.4%)	444 (83.6%)		

[a] Multivariate analysis with sex

OHS-PC Out-of-hours primary care

Table 5 Association between uncanny feeling and final diagnosis potential LTE of 1,843 patients with shortness of breath who called the OHS-PC, stratified by expressed concerns (yes/no)

Total calls	LTE *n* = 309 (16.8%)	No LTE *n* = 1,534 (83.2%)	OR (95% CI)
Total calls			
Uncanny feeling	120 (19.7%)	488 (80.3%)	**1.36 (1.06–1.75)**
No uncanny feeling	189 (15.3%)	1,046 (84.7%)	
Expressed concerns	**LTE *n* = 139 (17.3%)**	**No LTE *n* = 665 (82.7%)**	
Uncanny feeling	92 (20.7%)	352 (79.3%)	**1.74 (1.19–2.55)**
No uncanny feeling	47 (13.1%)	313 (86.9%)	
No expressed concerns	**LTE *n* = 170 (16.4%)**	**No LTE *n* = 869 (83.6%)**	
Uncanny feeling	28 (17.1%)	136 (82.9%)	1.06 (0.68–1.66)
No uncanny feeling	142 (16.2%)	733 (83.8%)	

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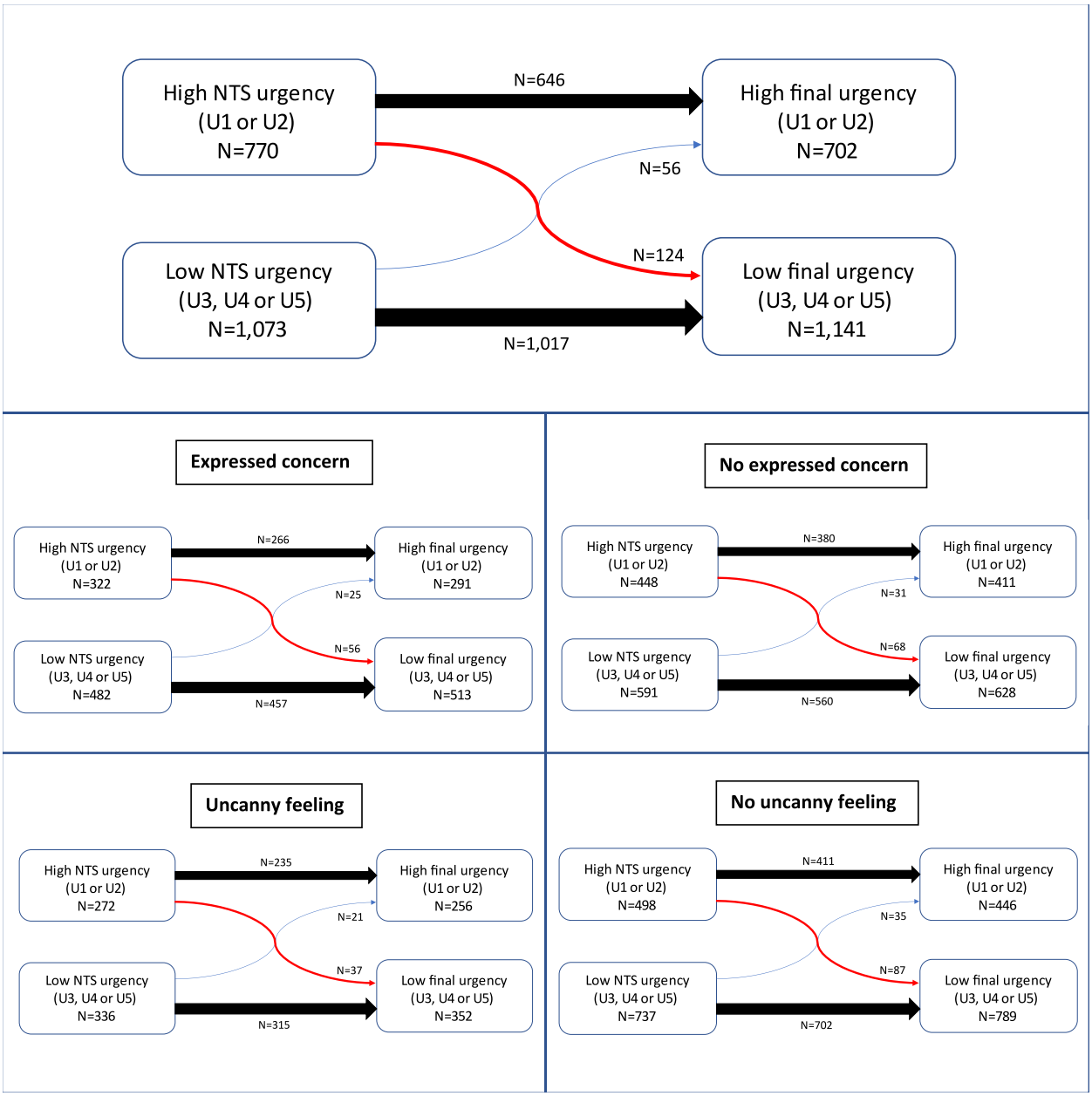

Fig. 2 NTS urgency adjustments of 1,843 patients who called the OHS-PC with SOB

(0.57–0.66) versus 0.67 (95% CI 0.64–0.70), $p=0.034$, while sensitivity was similar among those with and without uncanny feeling: 0.56 (95% CI 0.46–0.65) versus 0.52 (0.45–0.60), $p=0.553$ (see Table S5).

Discussion

More than 40% of patients with SOB expressed concerns and one-third were judged as having an uncanny feeling when contacting OHS-PC. Patients expressing concerns were not more frequently allocated a high urgency level, nor did they more often have a potential LTE as outcome compared to those who did not express concerns. Patients judged to have uncanny feeling more often received a high urgency allocation and had a higher risk of a LTE than those without such a feeling. Both expressed concerns and uncanny feeling did not affect the extent to which the NTS was overruled. Accuracy of urgency allocation was similar for those with and without expressed concerns. However, specificity of the accuracy of urgency allocation was slightly less in those

Table 6 Association between expressed concerns and urgency determination of 1,843 patients with shortness of breath who called the OHS-PC, stratified by sex

Total calls	High urgency *n* = 702 (38.1%)	Low urgency *n* = 1,141 (61.9%)	OR (95% CI)	Multivariate OR (95% CI)
Expressed concerns	291 (36.2%)	513 (63.8%)	0.87 (0.72–1.05)	0.87 (0.72–1.05)[a]
No expressed concerns	411 (39.6%)	628 (60.4%)		
Females	**High urgency *n* = 385 (37.5%)**	**Low urgency *n* = 641 (62.5%)**		
Expressed concerns	163 (36.7%)	281 (63.3%)	0.94 (0.73–1.21)	
No expressed concerns	222 (38.1%)	360 (61.9%)		
Males	**High urgency *n* = 317 (38.8%)**	**Low urgency *n* = 500 (61.2%)**		
Expressed concerns	128 (35.6%)	232 (64.4%)	0.78 (0.59–1.04)	
No expressed concerns	189 (41.4%)	268 (58.6%)		

[a] Multivariate analysis with sex

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Table 7 Association between uncanny feeling and urgency determination of 1,843 patients with shortness of breath who called the OHS-PC, stratified by sex

Total calls	High urgency *n* = 702 (38.1%)	Low urgency *n* = 1,141 (61.9%)	OR (95% CI)	Multivariate OR (95% CI)
Uncanny feeling	256 (42.1%)	352 (57.9%)	**1.29 (1.06–1.57)**	**1.28 (1.05–1.57)[a]**
No uncanny feeling	446 (36.1%)	789 (63.9%)		
Females	**High urgency *n* = 385 (37.5%)**	**Low urgency *n* = 641 (62.5%)**		
Uncanny feeling	144 (44.7%)	178 (55.3%)	**1.55 (1.19–2.03)**	
No uncanny feeling	241 (34.2%)	463 (65.8%)		
Males	**High urgency *n* = 317 (38.8%)**	**Low urgency *n* = 500 (61.2%)**		
Uncanny feeling	112 (39.2%)	174 (60.8%)	1.02 (0.76–1.38)	
No uncanny feeling	205 (38.6%)	326 (61.4%)		

[a] Multivariate analysis with sex

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Table 8 Association between uncanny feeling and urgency determination of 1,843 patients with shortness of breath who called the OHS-PC, stratified by expressed concerns (yes/no)

Total calls	High urgency *n* = 702 (38.1%)	Low urgency *n* = 1,141 (61.9%)	OR (95% CI)
Total calls			
Uncanny feeling	256 (42.1%)	352 (57.9%)	**1.29 (1.06–1.57)**
No uncanny feeling	446 (36.1%)	789 (63.9%)	
Expressed concerns	**High urgency *n* = 291 (36.2%)**	**Low urgency *n* = 513 (63.8%)**	
Uncanny feeling	179 (40.3%)	265 (59.7%)	**1.50 (1.12–2.01)**
No uncanny feeling	112 (31.1%)	248 (68.9%)	
No expressed concerns	**High urgency *n* = 411 (39.6%)**	**Low urgency *n* = 628 (60.4%)**	
Uncanny feeling	77 (47.0%)	87 (53.0%)	**1.43 (1.03–2.01)**
No uncanny feeling	334 (38.2%)	541 (61.8%)	

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with an eerie feeling, while sensitivity was similar among those with and without eerie feeling. The lower specificity observed in patients with an eerie feeling suggests a potential risk of over-triage in this group, indicating that these patients may be more likely to be inaccurately allocated a high urgency without having a potential LTE.

Comparison to literature

Concerns are sometimes described as a psychological phenomenon only, without a relationship to physical symptoms [37]. We argue that that this binary view is not always accurate. In some cases, and we suspect that coronary disease is among those, psychological and physical symptoms are not separated. Uncanny feeling is also described as psychological phenomenon. In addition, uncanny feeling may be related to the biological phenomenon of arousal of the sympathetic nervous system and elevated levels of adrenaline and noradrenaline induced by urgent underlying medical conditions causing impending hypoxaemia [4, 37]. Uncanny feeling can be linked to the physiological phenomena and related symptoms of activation of the sympathetic nervous system, which is linked to 'circulatory stress' and thus to potentially LTE outcomes.

It is striking that uncanny feeling is a phenomenon that most healthcare workers immediately recognize, while a clear definition is lacking. Furthermore, to date, there is only one study describing that healthcare professionals may detect uncanny feeling by patients based on paralanguage [24]. An uncanny feeling that healthcare professionals may experience themselves is often called 'gut feeling', a phenomenon which is much more investigated than considering the patient's uncanny feeling [24]. It would be interesting to know how well these two types of uncanny feeling align. A study that has not yet been performed.

Previous studies already mentioned that patients calling OHS-PC are often concerned [9, 13]. Yet, we found that concern was expressed in wording by only slightly more than 40% of patients who called the OHS-PC with SOB. This is consistent with a previous study that described that having concerns does not always lead to expressing them [38]. While the proportion of patients expressing concerns seemed relatively low, the proportion of patients who were judged as having uncanny feeling was relatively high.

Two Danish studies evaluated the implementation of a scale for the degree of worry in the OHS-PC telephone triage. The degree of worry was registered on an ordinal scale of one (minimally worried) to five (extremely worried) [14, 39]. Asking whether a patient was concerned by nurses or physicians led not only to additional information about the patients' medical or family history, but also to higher numbers of face-to-face consultations [14]. However, whether asking about concerns makes telephone triage safer and/or more efficient was not studied. Another study showed that higher degrees of worry were associated (in a dose–response relationship) with an increased risk of hospitalization within two days [39]. This contradicts our findings; we found no association between expressed concerns and potential LTEs. However, concerns actively expressed by patients, as in our study, may differ from concerns expressed in response to inquiry, in this Danish study. Moreover, the Danish study was conducted in patients with different complaints, and not specifically in patients with SOB.

Consistent with our findings are the results of a conversation analysis that evaluated telephone triage conversations with patients calling OHS-PC with chest discomfort and reported that interactional difficulties occurred more often when patients expressed concern [40]. In our current study, GPs were involved more often in the group that expressed concerns and the mean call duration was prolonged in that group by approximately 3 min. Interactional difficulties are most prominent when a patient is concerned, and the triage nurse just wants to give a telephone advice or when expressed concerns do not receive attention by triage nurses. Patients then tend to reiterate their concerns. The most efficient, but less frequently used, response to expressed concerns was to provide an empathetic response and build on the concerns, however, immediately followed by a further explanation of the subsequent course of the triage conversation [40].

Strengths and limitations

A strength is that data were collected from both the OHS-PC and the patient's own GP which is rather unique for OHS-PC studies. This provides the opportunity to track the clinical course of individuals with SOB including the final diagnosis. Moreover, our study is the first to evaluate expressed concerns or uncanny feeling among patients with SOB contacting OHS-PC. All telephone conversations were evaluated without the researchers being aware of the final diagnosis, thereby avoiding the risk of hindsight bias. Moreover, expressed concerns and uncanny feeling were scored when the conversation was re-listened to, rather than by asking the patient about them at a later stage. In previous studies, this approach was often used with the risk of recall bias, as patients knew their medical outcomes when asked about their concern or anxiety later. Finally, this study included a large sample of patients with SOB without strict exclusion criteria, resulting in a representative real-life study population which makes the results generalizable to healthcare settings with a similar OHS-PC facility, e.g.,

the Netherlands, Scandinavian countries, Germany, and the United Kingdom [26].

There are several limitations that need to be addressed. First, in accordance with routine practice, not all of the included patients underwent a full diagnostic work-up. This may have led to some misclassification as non-potential LTE. To reduce this misclassification, we collected data about the final diagnosis from the patient's primary care EHR up to 30 days after the index contact at the OHS-PC. It is therefore unlikely that any misclassification of significant LTEs has influenced our main findings.

Second, we had to exclude around 10% of eligible triage conversation recordings because of unavailable triage conversations or lack of information regarding final urgency allocation which could potentially have introduced selection bias. Patient characteristics of calls that were excluded from analysis were, however, comparable to those that could be included indicating that selection bias is unlikely.

Third, the inter-rater reliability was at best fair for both expressed concerns and uncanny feeling [41]. Uncanny feeling is perceived by the researcher and is at least partly based on the interpretation of the patient's paralanguage. In addition, a strict definition for uncanny feeling is lacking which also complicates scoring. However, rating of expressed concern had a similar kappa suggesting that signals of expressed concerns are not only explicit, but also more subtle and thus ambiguous [38]. Cues, such as sobbing or long hesitation, could be a sign of concerns by patients. If those cues are not further explored, these cues could be judged as expressed concerns by one researcher, while not judged as such by another researcher [42, 43]. A previous study indeed showed that cues are often not further explored during telephone triage in daily practice which is strongly focused on deriving answers to questions of the computerized decision support tool in which concerns are not incorporated [40, 44]. On the contrary, it is important to realise that routinely asking about patients' feeling and concerns, as done in previous studies in Danish OHS-PC, is unlikely to provide a more reliable picture [14, 39]. Earlier research among patients with heart failure showed that patients indicate that they are not anxious when literally asked about it, while they spontaneously refer to anxious moments later in the conversation when presenting symptoms [16].

Fourth, researchers did not re-listen the conversations under time pressure as is the case during regular triage calls. Also, the researchers are less experienced in triage conversations than the triage nurses themselves. The latter is important because earlier research suggests that interpretation of paralanguage, which might be necessary to recognize uncanny feeling, is a skill that improves with experience [23]. Both time pressure, as well as experience, could influence the judgement of an uncanny feeling of the patient. However, the magnitudes and directions of effect of these factors are unknown. On the other hand, these researchers were medical students (or medical doctors) and (relatively inexperienced) medical students are also increasingly used as triage nurses in daily practice due to shortage in triage nurses.

Implications for practice and future research

We did not find an association between expressed concern and LTEs. This seems to indicate that expressed concern is not useful for triage of patients with SOB at the OHS-PC. However, there was a significant association between uncanny feeling and LTEs in the overall population and specifically in males. This phenomenon therefore can potentially be of interest for triage of patients with SOB at the OHS-PC. Irrespective of inter-rater variability, there was a significant and likely clinically relevant association between uncanny feeling and LTEs with an OR of 1.36 (95% CI: 1.06–1.75) in the overall population and 1.59 (95% CI: 1.12–2.27) for males. However, given the exploratory nature of this study, caution is warranted interpreting these results. More research is needed before recommending its use in training and daily practice. Nevertheless, paying attention to paralanguage is always of interest to really 'hear' the patient. This is complex in the current OHS-PC in which triage nurses need to multitask; listening, interpreting, typing, and 'obey' to the computerized decision support tool [40, 45].

Besides repeating the study in another population, future research prospectively assessing the triage nurse's judgement of the patient's uncanny feeling would be a relevant next step. Another potential research direction could involve a more nuanced analysis of expressed concern and uncanny feelings. Instead of a binary coding approach, future studies could categorize expressed concern and uncanny feelings into sub-groups, such as mild, moderate, and high, and investigate whether variations in these levels correlate with different outcome measures. Additionally, conducting a similar study in a setting with in-person or video triage could provide further insights, as paralinguistic cues—important for detecting concern and uncanny feelings—are more readily observed in face-to-face interactions.

Conclusions

Among patients who contacted the OHS-PC for SOB, a perceived uncanny feeling of the patient was associated with a higher likelihood of potential LTEs, whereas the patient's expressed concerns were not. Critical reflective interpretation is needed as uncanny feelings are

difficult to judge. Nevertheless, our results implicate that further research into uncanny feelings in telephone triage could further improve the understanding of the relation with potential LTEs. Furthermore, this could be used to investigate how triage nurses may become more sensitive to what the patient is feeling but not explicitly saying such as by paying special attention to paralanguage.

Abbreviations

EGDPR	European General Data Protection Regulation
EHR	Electronic health record
GP	General practitioner
LTE	Life-threatening event
MREC	Medical Research Ethics Committee
NTS	Netherlands Triage Standard
OR	Odds ratio
OHS-PC	Out-of-hours primary care
SOB	Shortness of breath
VAS	Visual Analogue Scale

Supplementary Information

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Supplementary Material 1.

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Authors' contributions
FHR and DLZ are the lead investigators who conceived the research idea and methodology. Funding acquisition was done by FHR and DLZ. MS, ASD and MD conducted data acquisition. MS and MRT performed the analyses and wrote the first draft of the manuscript, under supervision of RPV. EdG, MvS, DCE, ASD, MD, FHR, DLZ and RPV provided intellectual input and critically revised the manuscript. All approved the last version of the manuscript.

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Data availability
The data can be made available for researchers whose proposed use of the data has been approved at request of the corresponding author, with a signed data access agreement.

Declarations

Ethics approval and consent to participate
The Medical Research Ethics Committee (MREC) Utrecht (reference number 21/361) has reviewed our study protocol. The MREC concluded that this study is not within the scope of the WMO and granted an exemption for this study. Personal data and research data was de-identified according to the European General Data Protection Regulation.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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