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Prevalence of anxiety in people with head and neck cancer undergoing radiotherapy mask fabrication: a cross-sectional study using the STAI Y-6

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Abstract

Introduction: Radiotherapy for head and neck cancer (HNC) requires a thermoplastic immobilisation mask, which can heighten anxiety, yet this remains poorly recognised and inconsistently measured. Virtual reality (VR)-based rehearsal has been proposed as a preparatory strategy, but patient receptivity is unknown. This study examined the prevalence of state anxiety at mask fabrication, the practicality of administering the six-item State-Trait Anxiety Inventory (STAI Y-6) in a busy pre-treatment workflow and patient interest in VR-based preparation.

Methods: In this cross-sectional study, 39 consecutively recruited adults with HNC at a tertiary cancer centre completed a 10-item questionnaire before their first CT simulation: the STAI Y-6 plus four study-specific items covering mask-specific anxiety, general treatment anxiety and interest in a guided VR rehearsal of the procedure. Associations between STAI Y-6 caseness and supplementary items were assessed using Monte Carlo-simulated chi-squared tests.

Results: Recruitment was 93% (39/42), completion 100% and median completion time 3.6 minutes. The mean pro-rated STAI Y-6 score was 43.3 (SD 14.1, range 20–77). Seventeen participants (44%, 95% CI 29–59%) scored ≥41, the threshold for clinically meaningful state anxiety. Participants with elevated anxiety more often reported at least some mask-specific anxiety (71% vs 32%; $p = 0.025$) and more often expressed uncertainty about VR ($p = 0.027$).

Conclusions: Nearly half of participants reported clinically meaningful anxiety at mask fabrication, and the STAI Y-6 was quick and acceptable to administer. Larger, multi-site studies with repeated assessment are needed to confirm prevalence and test targeted preparation such as VR.

Introduction

Radiotherapy (RT) is prescribed to approximately 60% of people with head and neck cancer (HNC) and requires precise targeting of the treatment field while sparing surrounding healthy tissue.[1,2] Immobilisation involves the use of a customised thermoplastic mask (Figure 1), worn during CT simulation and throughout daily treatment sessions spanning up to 6–8 weeks.[3] The fitting and daily use of a mask can be challenging for patients: studies report that 16–29% of people experience mask-related anxiety or fear, which may lead to treatment delays, refusal or premature cessation of RT.[4–6] Qualitative and mixed-methods work has identified several contributors to this anxiety, including the sensation of confinement and restricted movement, loss of control and the inability to speak or move freely during the procedure, pre-existing claustrophobic tendencies and the influence of prior experience and expectation.[7,8] Female sex and higher baseline distress have also been associated with greater mask anxiety.[9] The clinical consequences are tangible: in a regional cohort of 101 people with HNC, 10% required a sedative medication and 5% required a break from the mask during simulation,[10] and in severe cases have required systematic desensitisation before treatment can proceed.[11] Because mask anxiety is frequently under-recognised, radiation therapists correctly identify only a minority of anxious patients[6,12] systematic screening at the point of simulation is needed to identify those who would benefit from additional support before immobilisation becomes a barrier to treatment.

Systematic screening requires an instrument that is psychometrically sound yet brief enough for routine use. Validated patient-reported outcome measures (PROMs) such as the State-Trait Anxiety Inventory (STAI), Distress Thermometer and Hospital Anxiety and Depression Scale (HADS) have been widely adopted to assess anxiety in people with HNC.[13–15] However, their validity in measuring mask-specific anxiety is limited. Modified tools (e.g., adapted distress thermometers) have yielded inconsistent findings, and no standardised instrument capturing

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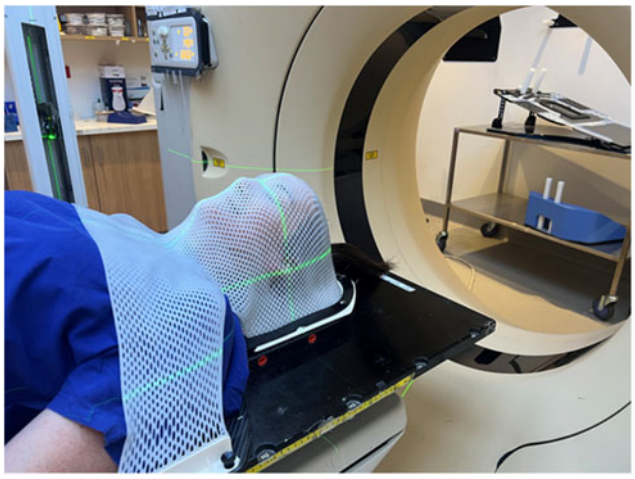


Figure 1. Patient in a customised thermoplastic mask positioned for radiotherapy.

mask anxiety has been validated.[4] The HADS and Distress Thermometer were also designed to capture generalised distress over the preceding week rather than acute anxiety at a defined moment, and the full 20-item STAI, although the reference standard for state anxiety, is impractical in a pre-simulation waiting room. The six-item short form of the STAI state scale (STAI Y-6) was derived by Marteau and Bekker specifically to retain the properties of the parent instrument while taking under two minutes to complete and correlates highly ($r > 0.90$) with the full 20-item version.[16] Subsequent work has supported its reliability and factor structure in clinical samples and has recommended it explicitly for use in fast-paced medical environments,[17–19] while pro-rating the raw score to the 20-item equivalent allows published STAI thresholds to be applied.[20] These properties make the STAI Y-6 a plausible candidate for point-of-care screening immediately before mask fabrication, although its performance in this specific context has not previously been reported.

Screening is only clinically useful if it can be linked to an intervention. Current responses to mask anxiety, anxiolytic medication, open-face mask designs and staff reassurance, are largely pharmacological, resource-intensive or applied reactively once distress has already occurred. Because mask anxiety appears to be driven substantially by anticipatory fear of an unfamiliar, confining and uncontrollable procedure,[7,8] interventions that allow patients to rehearse the procedure in advance are conceptually well matched to the problem. Virtual reality (VR)-based preparation offers one such approach. A systematic review of seven interventional studies including 376 adults found that VR-based educational sessions improved treatment knowledge and were generally associated with reduced anxiety relative to standard care, although the anxiety findings were less consistent across studies.[21] A VR simulation of the linear accelerator environment has also been shown to improve patient knowledge and self-efficacy prior to treatment.[22] However, no published VR intervention has specifically targeted mask-related anxiety in HNC; uptake of VR in routine RT remains low, and it is unclear whether people with HNC who face the additional burden of mask immobilisation would be receptive to it. Establishing both the prevalence of anxiety at mask fabrication and patient receptivity to VR is therefore a necessary first step in designing a future interventional study.

This study aimed to (1) describe the prevalence of state anxiety among people with HNC at the time of first mask fabrication using the STAI Y-6, (2) evaluate the practicality of administering the STAI Y-6 in a pre-treatment clinical workflow and (3) explore patient interest in VR-based preparation as a potential anxiety-management strategy.

Methods

Study design and setting

A single-centre, cross-sectional study was conducted from January to November 2020 in the RT department of a tertiary cancer centre across two campuses. Reporting follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.[23] Ethics approval and the ethical conduct of the study are detailed in the Ethical Standards section.

Participants

Consecutive adults (aged ≥18 years) with a confirmed diagnosis of HNC who were referred for their first course of RT requiring a thermoplastic mask were eligible. Participants were required to have sufficient English proficiency for self-report measures. People who had previously undergone RT requiring a thermoplastic mask were excluded. Participation was voluntary; verbal informed consent was obtained by the treating radiation oncologist or radiation therapist immediately prior to the CT simulation appointment and could be withdrawn at any time without consequence.

Data collection

All participants completed a 10-item questionnaire in the waiting room immediately before their CT simulation and mask fabrication. The questionnaire comprised the six-item short-form State-Trait Anxiety Inventory (STAI Y-6), which captures state anxiety 'right now, at this moment' The STAI Y-6 was selected in preference to longer instruments because it captures acute state anxiety at a defined moment rather than distress over the preceding week, requires less than two minutes to complete and retains acceptable psychometric properties relative to the full 20-item scale.[16–19] Each item is scored on a four-point ordinal scale (1 = not at all, 4 = very much so). Three items assessing the absence of anxiety (calm, relaxed, content) are reverse-scored before summation. Raw scores are pro-rated to the 20-item equivalent, yielding a range of 20–80; this conversion allows comparison with published STAI thresholds.[16–20]

Four additional questions developed by the study team were appended: two relating to anxiety (Q7, anxiety about having the mask made; Q8, anxiety about the treatment itself), each scored on a four-point ordinal scale (not at all, somewhat, moderately, very much), and two concerning VR as a preparatory tool (Q9, whether the participant would like a guided session of their CT and treatment procedure using VR; Q10, whether they felt such a session might lower their anxiety), each answered yes/no/not sure. The VR items were informed by published findings suggesting potential effectiveness.[22] Questionnaire content was developed by a multidisciplinary team comprising two radiation therapists, a head and neck radiation oncologist and a quantitative psychologist. These four items have not undergone formal psychometric validation.

Demographic and clinical data (age, sex, current smoking status, current alcohol consumption, history of psychological disorder, tumour stage, treatment prescription, treatment intent and CT simulation duration) were extracted from the electronic medical record. Radical-intent treatment was defined as a prescribed dose of ≥50 Gy delivered in 20–35 fractions, consistent with departmental protocols for definitive and adjuvant HNC

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radiotherapy; all other prescriptions were classified as palliative. Data were de-identified and questionnaire responses were collected via Qualtrics survey software.

Outcome measures

The primary outcomes were (1) the prevalence of state anxiety, defined as the proportion of participants with a pro-rated STAI Y-6 score ≥41, the established threshold for clinically meaningful state anxiety,[20,24–26] and (2) the practicality of administration, indicated by the recruitment rate, the questionnaire completion rate and the time taken to complete the questionnaire, recorded automatically by the survey software. A secondary threshold of ≥55 was also applied, consistent with recommendations for identifying severe situational anxiety, particularly in older adults.[20,26,27] Secondary outcomes were the distribution of responses to the four study-specific supplementary items: self-reported anxiety about mask fabrication (Q7), general treatment anxiety (Q8) and interest in (Q9) and perceived benefit of (Q10) a guided VR session and the association of each with STAI Y-6 caseness. These items were exploratory and are reported descriptively alongside the corresponding tests of association.

Statistical analysis

All analyses were performed using IBM SPSS Statistics (v.24.0; IBM Corp., Armonk, NY). Continuous variables are presented as means and standard deviations (SD) where approximately symmetric or medians and interquartile ranges (IQR) where skewed; categorical variables as counts and percentages. The 95% confidence interval (CI) for the proportion meeting the ≥41 threshold was calculated using the Wilson score method; these intervals are presented to convey the precision with which the sample estimates the underlying population prevalence, not as a test of any hypothesis.

Responses to the four supplementary questions were cross-tabulated by anxiety group (below vs. at or above the ≥41 threshold). Given small expected cell counts, Pearson's chi-squared test p-values were computed using two-sided Monte Carlo simulation with 10,000 replicates ($\alpha = 0.05$).[28] A priori sample size calculation was not performed, as the study was designed to estimate prevalence rather than to test a hypothesis; with 39 participants, the 95% CI around a prevalence of approximately 44% has a half-width of about ±15 percentage points. Post hoc power calculated from observed effects is uninformative and was therefore not undertaken.[29] Furthermore, given the small sample size ($N = 39$), no inferential testing of associations between anxiety and demographic or clinical variables was undertaken; subgroup analyses would be underpowered and risk Type I and II error.[29] Characteristics are tabulated descriptively for the full sample (Table 1) and stratified by anxiety group (Table 2).

Table 1. Demographic and clinical characteristics of participants ($N = 39$). IQR = interquartile range; RT = radiotherapy; SD = standard deviation

Characteristic ($N = 39$)	Value
Age, years—mean (SD, range)	65.2 (12.3, 35–88)
Sex—*n* (%)	
Female	10 (26)
Male	29 (74)
Recruitment campus—*n* (%)	
Campus 1	30 (77)
Campus 2	9 (23)
Current smoker—*n* (%)	
Yes	21 (54)
No	15 (38)
Not reported	3 (8)
Current alcohol consumption—*n* (%)	
Yes	15 (38)
No	21 (54)
Not reported	3 (8)
History of psychological disorder—*n* (%)	
Yes	11 (28)
No	27 (69)
Not reported	1 (3)
Tumour stage (T)—*n* (%)	
T0–T2	14 (36)
T3–T4	20 (51)
Tx/not reported	5 (13)
Prior surgery—*n* (%)	
Yes	21 (54)
No	18 (46)
Treatment modality—*n* (%)	
Post-operative RT	20 (51)
Chemoradiotherapy	17 (44)
RT alone	2 (5)
Treatment intent—*n* (%)	
Radical (≥50 Gy in 20–35 fractions)	35 (90)
Palliative	4 (10)
RT fractions—median (IQR, range)	33 (32–35, 5–35)
RT dose (Gy)—median (IQR, range)	66 (60–70, 20–70)
CT simulation time (min)—mean (SD, range)	89.4 (25.7, 31–145)

Results

Recruitment and questionnaire completion

Between January and November 2020, 42 eligible HNC patients were screened across the two campuses. Of these, 39 provided informed consent, yielding a recruitment rate of 93%. Three declined participation (7%). All 39 enrolled participants completed every item of the 10-item questionnaire, giving a completion rate of 100%. The median time taken to complete the questionnaire, recorded automatically by the survey software, was 3.6 minutes (IQR 1.7–6.3; range 0.6–23.4), and 26 participants (67%) completed it within five minutes. No participant reported adverse effects or distress from completing the questionnaire.

Participant characteristics

Participant characteristics are presented in Table 1. The mean age was 65.2 years (SD 12.3, range 35–88). Most participants were male ($n = 29$, 74%). Over half reported current smoking ($n = 21$, 54%),

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Table 2. Demographic and clinical characteristics by STAI Y-6 anxiety group (≥41 threshold). Percentages rounded to whole numbers. No between-group inferential testing was performed given the small sample size

Characteristic	STAI Y-6 ≥ 41 (n = 17)	STAI Y-6 < 41 (n = 22)
Age, years—mean (SD)	62.2 (14.1)	67.4 (10.4)
Sex—*n* (%)		
Female	5 (29)	5 (23)
Male	12 (71)	17 (77)
Current smoker—*n* (%)		
Yes	8 (47)	13 (59)
No	8 (47)	7 (32)
Not reported	1 (6)	2 (9)
Current alcohol consumption—*n* (%)		
Yes	8 (47)	7 (32)
No	8 (47)	13 (59)
Not reported	1 (6)	2 (9)
History of psychological disorder—*n* (%)		
Yes	6 (35)	5 (23)
No	11 (65)	16 (73)
Not reported	0 (0)	1 (5)
Prior surgery—*n* (%)		
Yes	9 (53)	12 (55)
No	8 (47)	10 (45)
Treatment intent—*n* (%)		
Radical	17 (100)	18 (82)
Palliative	0 (0)	4 (18)
CT simulation time (min)—mean (SD)	93.6 (24.7)	86.2 (26.5)

15 (38%) reported current alcohol consumption and 11 (28%) had a history of psychological disorder. Most (n = 21, 54%) had undergone surgery prior to RT. The median number of RT fractions was 33 (IQR 32–35, range 5–35) at a median total dose of 66 Gy (IQR 60–70, range 20–70). Thirty-five participants (90%) received radical-intent treatment.

Prevalence of state anxiety

The mean pro-rated STAI Y-6 score for the full sample was 43.3 (SD 14.1, median 40.0, IQR 35.0–50.0, range 20–77). Seventeen participants (44%, 95% CI 29–59%) scored at or above the ≥41 threshold for clinically meaningful state anxiety. Demographic and clinical characteristics by anxiety group are presented in Table 2.

At the higher threshold of ≥55, indicating severe situational anxiety, eight participants (21%, 95% CI 11–36%) met the criterion. Participants meeting this threshold tended to be slightly younger (mean age 61.1 years, SD 8.7) than those below it (mean age 66.2 years, SD 13.0), suggesting severe anxiety in this cohort was not concentrated among older adults.

Table 3. Responses to supplementary questions by STAI Y-6 anxiety group (≥41 threshold). Percentages rounded to whole numbers. VR = virtual reality

	STAI Y-6 ≥ 41 (n = 17) n (%)	STAI Y-6 < 41 (n = 22) n (%)	p-Value†
Q7: How anxious do you feel about having your mask made			**0.025***
Not at all	5 (29)	15 (68)	
Somewhat	8 (47)	3 (14)	
Moderately	1 (6)	3 (14)	
Very much	3 (18)	1 (5)	
Q8: How anxious do you feel about your treatment			0.41
Not at all	2 (12)	4 (18)	
Somewhat	3 (18)	7 (32)	
Moderately	6 (35)	8 (36)	
Very much	6 (35)	3 (14)	
Q9: Would you like a guided session of your CT and treatment procedure using virtual reality?			**0.027***
Yes	7 (41)	9 (41)	
No	4 (24)	12 (55)	
Not sure	6 (35)	1 (5)	
Q10: Do you feel that a guided session using virtual reality might help lower your anxiety level?			0.050
Yes	6 (35)	7 (32)	
No	2 (12)	10 (45)	
Not sure	9 (53)	5 (23)	

†Pearson's Chi-squared test with p-values computed by Monte Carlo simulation (10,000 replicates).
*$p < 0.05$; given the small sample and the exploratory nature of these comparisons, p-values are presented as descriptive indicators rather than confirmatory tests.

Supplementary questions

Table 3 presents responses to the four supplementary questions by anxiety group (≥41 threshold), with p-values computed by Monte Carlo-simulated chi-squared tests (10,000 replicates). An association was observed between STAI Y-6 caseness and self-reported mask anxiety (Q7; $p = 0.025$): among the 17 participants scoring ≥41, 12 (71%) reported at least some degree of mask-specific anxiety, compared with 7 (32%) of the 22 below the threshold. Given the small sample and the number of cells with low expected counts, this association is best regarded as exploratory rather than confirmatory. No association was found with general treatment anxiety (Q8; $p = 0.41$).

Interest in a guided VR session (Q9) was associated with the anxiety group ($p = 0.027$). Overall, 16 of 39 participants (41%) indicated they would like a VR session, 16 (41%) declined and 7

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(18%) were unsure. The association was driven by a marked difference in uncertainty: 6 of 17 (35%) in the elevated-anxiety group were 'not sure' compared with only 1 of 22 (5%) below the threshold. A similar pattern emerged for Q10 (whether VR might lower anxiety; $p = 0.050$), with 9 of 17 (53%) in the elevated-anxiety group unsure, compared with 5 of 22 (23%) below the threshold. Overall, the majority of the sample either did not believe or were unsure whether a guided VR session would help relieve their anxiety (67% combined). As with Q7, these comparisons involve small cell counts and are reported as exploratory.

Discussion

This study found that 44% (95% CI 29–59%) of people with HNC reported clinically meaningful state anxiety (≥41 on the STAI Y-6) immediately before their first thermoplastic mask fabrication and that the STAI Y-6 could be administered within a busy pre-treatment workflow. A recruitment rate of 93%, a questionnaire completion rate of 100% and a median completion time of under four minutes indicate that people with HNC are both willing and able to engage with brief anxiety screening at this point in the pathway and that the instrument adds little to appointment time. These indicators establish acceptability and feasibility of administration rather than clinical utility: they do not demonstrate that screening changes management, nor that services would have the capacity to respond to a positive result. Establishing that link is a necessary next step and requires a study in which screening is embedded within a defined care pathway.

Our prevalence estimate sits toward the upper end of published figures. In a cross-sectional study by Nixon et al. (2018), 26% of 77 people with HNC reported moderate-to-severe anxiety during mask fabrication when screened with a modified distress thermometer.[4] A subsequent prospective study by Nixon et al. (2019) using the full 20-item STAI (Form Y-1) identified 36% with moderate-to-severe anxiety at simulation.[9] More recently, Burns et al. (2022) found that 43% met the threshold for clinically significant anxiety using the STAI Y-1 ≥40 across a multi-centre cohort.[12] Because instruments (full STAI Y-1 vs. pro-rated STAI Y-6) and thresholds differ, direct numerical comparisons should be interpreted with caution; nonetheless, the consistency of elevated rates underscores the need for routine screening.

The timing of our assessment immediately before the first mask application likely captures a period of heightened anticipatory distress. Notably, the comparison study that measured anxiety during rather than before mask fabrication reported a somewhat lower rate,[9] raising the possibility that anticipatory 'fear of the unknown' peaks before the procedure begins and attenuates once patients experience the mask and find it tolerable; Burns et al. similarly described a declining anxiety trajectory across the treatment course.[12] If anxiety is indeed highest in the anticipatory window, this strengthens the rationale for preparation delivered before the simulation appointment (VR rehearsal, video walk-throughs or structured verbal preparation) rather than reactive management once distress has already occurred. Because anxiety was measured at only a single time point, we cannot determine whether the level we observed represents a transient peak or a sustained elevation. Future studies should incorporate repeated assessments from referral through simulation to treatment completion.

The association between STAI Y-6 caseness and mask-specific anxiety (Q7; $p = 0.025$) may suggest that the STAI Y-6 captures anxiety that is at least partly linked to the mask experience, rather than solely to generalised treatment-related distress. This interpretation is supported by the absence of an association with broader treatment anxiety (Q8; $p = 0.41$). However, with 39 participants and several cells containing fewer than five observations, the comparison is underpowered, and the finding should be regarded as hypothesis-generating rather than established; replication in a larger sample is required before the STAI Y-6 could be relied upon as a proxy for mask-specific anxiety.

The association with interest in VR (Q9; $p = 0.027$) also warrants careful interpretation. Across the full sample, 41% expressed interest in a guided VR session, 41% declined and 18% were unsure. The proportion expressing interest was virtually identical (41%) across anxiety groups; the difference between groups was driven by uncertainty. Among those with elevated anxiety, 35% responded 'not sure' compared with only 5% below the threshold, while those below the threshold were more likely to decline outright (55% vs. 24%). This suggests that people with higher anxiety may be open to novel preparatory tools but lack sufficient information or confidence to commit. Targeted education about VR-based preparation could help bridge this gap, although with only one 'not sure' response in the lower-anxiety group, this pattern requires confirmation in a larger sample.

These VR-related questions were included specifically to gauge patient receptivity ahead of a planned (and subsequently completed) interventional study. The existing evidence base provides a rationale: Wang et al. (2022) demonstrated that a VR simulation of the linear accelerator environment improved patient knowledge and self-efficacy prior to RT,[22] while a systematic review of seven interventional studies involving 376 adults found that VR-based educational sessions consistently improved treatment knowledge, with more variable but generally favourable effects on anxiety.[21] However, none of these studies focused specifically on mask-related anxiety in HNC. Our finding that 41% of participants expressed interest in VR, with a further 18% uncertain, suggests sufficient receptivity to justify a feasibility trial of VR-based mask familiarisation in this population.

Persistently elevated anxiety has been associated with malnutrition and cachexia,[30] greater psychiatric contribution to opioid prescribing after diagnosis,[31] and disrupted treatment sessions,[32] all of which can jeopardise loco-regional control. Beyond VR, a 2024 scoping review of publicly available patient education materials for immobilisation masks found that many resources were limited in scope and that materials produced by cancer foundations and organisations were the most likely to discuss coping strategies for mask anxiety.[33] A 2025 randomised controlled trial reported that a personalised open-face mask combined with styrofoam fixation improved patient comfort relative to a conventional perforated head, neck and shoulder mask without compromising set-up accuracy, although the accompanying reduction in anxiety was a non-significant trend only.[34]

Given the small sample size, we deliberately omitted formal inferential testing of associations between anxiety scores and demographic or clinical variables. Descriptively, some patterns are nonetheless worth noting. Participants meeting the ≥41 threshold were on average five years younger than those below it (62.2 vs. 67.4 years), were slightly more likely to be female (29% vs. 23%) and more often reported a history of psychological disorder (35% vs. 23%); all 17 were receiving radical-intent treatment, whereas all four participants treated with palliative intent scored below the threshold. The direction of these differences is broadly consistent with the wider literature, in which female sex and pre-existing psychological morbidity have been associated with higher anxiety

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and mask anxiety in HNC,[8,9] although reported relationships with age have been less consistent. With only 39 participants, however, subdividing the sample across multiple strata would render any tests underpowered and inflate the risk of spurious findings, and none of these differences should be read as evidence of an effect. Larger, multi-centre cohorts are required before demographic or clinical factors can be examined robustly; a recent 512-patient study has begun this work by deriving a brief mask anxiety screening measure from multivariable predictors.[8]

Limitations

This study has several limitations. First, the small convenience sample from a single centre (two campuses) limits statistical power and generalisability and means that the supplementary question associations should be considered exploratory findings requiring replication; with 39 participants, the 95% CI around the prevalence estimate spans approximately 30 percentage points and a sample of roughly 150 would be required to estimate prevalence to within ±8 percentage points. Second, anxiety was assessed at only one pre-treatment time point. Third, although the STAI Y-6 is a validated measure of state anxiety, it was not designed to capture mask-specific anxiety; the supplementary items added for this purpose have not been formally validated. Fourth, potential selection and response biases were not fully explored. Fifth, recruitment took place between January and November 2020, during the first year of the COVID-19 pandemic. Anxiety and distress were elevated among cancer patients receiving radiotherapy during this period,[35] and mask-related distress specifically has been reported to be higher in people with HNC during the pandemic than before it,[36] so our prevalence estimate may be higher than would be observed under normal conditions. Practice has also evolved since 2020, with wider availability of open-face mask designs, more established psycho-oncology screening pathways and a greater range of digital preparation resources; the level of unmet need described here may therefore have changed.

Conclusions

Nearly half of the people with HNC in this sample reported clinically meaningful state anxiety at the point of first thermoplastic mask fabrication, and the six-item STAI Y-6 proved quick and acceptable to administer within a routine simulation workflow, achieving 93% recruitment and 100% completion. The observed association between higher STAI Y-6 scores and self-reported mask anxiety supports the instrument's use as a screening trigger at simulation. Future studies should address three specific areas. First, a stable prevalence estimate is needed: a single-centre estimate of this size is imprecise; larger multi-site sampling would additionally establish whether prevalence varies with case mix, immobilisation technique and local preparation practice. Second, the trajectory of anxiety from referral through simulation to treatment completion is not established, and repeated measurement is needed to determine when the burden is greatest and therefore when support should be delivered. Third, receptivity to preparatory tools such as VR is heterogeneous; a substantial minority in this study were uncertain rather than opposed, so trials should test whether targeted information and rehearsal convert uncertainty into engagement and should identify which patients benefit most. Addressing these questions would move the field from documenting that anxiety exists at mask fabrication towards delivering support that demonstrably reduces it.

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Nigel Anderson, Karla Gough and Lachlan McDowowell have (a) completed a secondary review and analysis of the published literature and data, assisting with interpretation of the literature reported, (b) provided a critical review of the manuscript and (c) provided final approval of the version to be published.

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Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national guidelines on human experimentation (National Health and Medical Research Council National Statement on Ethical Conduct in Human Research) and with the Helsinki Declaration of 1975, as revised in 2008 and approved by the institutional Human Research Ethics Committee (HREC reference number redacted for blinded review). Verbal informed consent was obtained from all participants.

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