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AI-Based Virtual Triage and Telemedical Health Care for Ukrainian War Refugees and Displaced Persons

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Introduction

With 41 million people, Poland has 1.35 million Ukrainians who were displaced by the 2014 Russian annexation of Crimea or were labor migrants and 2.38 million more who fled from the 2022 Russian invasion of Ukraine.[1,2] In 2021, Poland implemented a virtual triage and care referral (VTCR) platform in Polish and Ukrainian languages to improve continuity of afterhours and weekend health care access. This artificial intelligence (AI)–based VTCR platform assisted with automated symptom evaluation and referral to acuity level–appropriate telemedical, virtual, or in-person care. We examined mental health symptom (MHS) reporting by Polish and Ukrainian patients in the Russia-Ukraine War's first year.

Methods

This cross-sectional study evaluated VTCR use from September 2022 to August 2023, with MHS being the chief concern. Infermedica deemed this study exempt from ethics review because patients consented in all VTCR encounters for their deidentified, aggregated data to be used for research purposes.

The AI-based VTCR platform conducts evidence-driven analyses of 800 diseases and 200 risk factors, evaluating 1500 symptoms and suggesting probable conditions that match clinical presentation and history. It conveys an analysis of reported symptoms and refers to the appropriate acuity-based care: self-care, outpatient care, or emergency care.

The VTCR platform did not collect personal identifiers, including migration dates. However, demographic changes during the study period were attributed to war refugees and displaced persons. From 2014 to 2021, the mean annual number of Ukrainians granted residency permits by Poland was 162 998. In 2022 to 2023, this number increased to 1 429 256 per year.[3] Pre-war Ukrainian migration to Poland involved circular mobility of impermanent migrants with residential ties to Ukraine. This migration was disrupted by the 2022 invasion, making most Ukrainians in Poland today de facto refugees or displaced persons.

P values were calculated with *z* tests using BigQuery (Google Cloud) and online spreadsheets. Two-sided $P < .05$ indicated statistical significance.

Results

Of 12 594 VTCR encounters analyzed, 10 334 (82.1%) were in Polish and 2199 (17.5%) in Ukrainian. Ukrainian patients had a mean (SD) age of 35 (13.2) years and included 1688 females (76.8%) and 511 males (23.2%). Polish patients had a mean (SD) age of 33 (13.4) years and included 6424 females (62.2%) and 3910 males (37.8%). Compared with Poles, Ukrainians were more often females and older, possibly reflecting younger males remaining in Ukraine to fight the war (**Table 1**).

Ukrainians reported higher incidences of anxiety, insomnia, nervousness, stress-related gastric symptoms, and fear of dying than Poles (**Table 2**). Differences in suicidal ideation and intent were

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not significant. Ukrainians were prediagnosed more frequently with generalized anxiety disorder (62 [2.8%] vs 167 [1.6%]; $P < .001$) and were more likely to have MHS (619 [28.2%] vs 1735 [16.8%]; $P < .001$) than Poles. Ukrainian VTCR use (2199 encounters [17.5%]) was almost twice that expected based on population size in Poland (9.1% [3.73 million]; $P < .001$).

Discussion

Mental health care seeking is often delayed relative to physical concerns, and MHS were likely underreported.[4] This study's findings align with results of a 3-nation analysis of free public use of the VTCR platform 1 year before and after Russia's invasion. MHS reporting among Ukrainians and Poles increased, with little change among Italians, suggesting that those more directly exposed to the war were more traumatized.

The study has limited generalizability because VTCR users were younger and included more females than the general population and may differ in health and digital literacy and/or technology access. Furthermore, clinical validation of VTCR's accuracy was not possible but should be integral to future studies.

Table 1. Age and Gender of Patients by Language

Age group and gender	Patients, No. (%)		*P* value
	Polish (n = 10 334)	Ukrainian (n = 2199)	
18-29 y			
Male	1857 (18.0)	236 (10.7)	<.001
Female	3022 (29.2)	613 (27.9)	.18
30-44 y			
Male	1405 (13.6)	179 (8.1)	<.001
Female	2442 (23.6)	726 (33.0)	<.001
45-59 y			
Male	416 (4.0)	68 (3.1)	.048
Female	633 (6.1)	246 (11.2)	<.001
≥60			
Male	232 (2.2)	28 (1.3)	.006
Female	327 (3.2)	103 (4.7)	<.001
Total			
Male	3910 (37.8)	511 (23.2)	<.001
Female	6424 (62.2)	1688 (76.8)	<.001

Table 2. Most Prevalent Mental Health Symptoms Among Patients by Language

Symptom	Patients, No. (%)		*P* value
	Polish (n = 10 334)	Ukrainian (n = 2199)	
Anxiety	335 (3.2)	137 (6.2)	<.001
Episodes of depressed mood	324 (3.1)	80 (3.6)	.19
Irritability	301 (2.9)	89 (4.0)	.008
Generalized anxiety disorder	167 (1.6)	62 (2.8)	<.001
Insomnia	149 (1.4)	63 (2.9)	<.001
Nervousness or weepiness	129 (1.2)	53 (2.4)	<.001
Fear of specific object, situation, or action	92 (0.9)	31 (1.4)	.03
Stress-related gastric symptoms	58 (0.6)	28 (1.3)	<.001
Fear of dying	48 (0.5)	25 (1.1)	<.001
Fear of insanity	42 (0.4)	14 (0.6)	.13
Agitation	39 (0.4)	28 (1.3)	<.001
Suicidal thoughts	38 (0.4)	7 (0.3)	.38
Suicidal intent	13 (0.1)	2 (0.1)	.36

Refugees and displaced persons are at an elevated risk for psychological and somatic problems, which are more effectively managed through early detection and treatment.[4-6] AI-based VTCR enables nations to monitor population needs and automate health care referrals; combined with virtual or telemedical care delivery, it can be valuable in meeting the needs of citizens and migrants displaced by military conflicts or climate change.

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SUPPLEMENT.

Data Sharing Statement