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RESEARCH ARTICLE



# The iCREATE registry: a model for strengthening injury surveillance in the Republic of Moldova

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## ABSTRACT

**Introduction.** Injuries represent a major public health issue, causing approximately 16,000 deaths globally each day (10% of all deaths), which is 32% more than the combined total caused by malaria, tuberculosis, and HIV/AIDS. Over the past 15 years, the WHO and regional initiatives have supported the piloting of trauma registries in low- and middle-income countries as essential tools for monitoring, planning, and prevention.

**Objective.** This article aims to assess the feasibility and utility of implementing a national trauma registry in the Republic of Moldova, in order to improve injury surveillance and emergency service planning.

**Materials and methods.** In 2018, the pilot iCREATE trauma registry was tested for the first time in three countries: Moldova, Armenia, and Georgia. The data collection instrument was developed based on WHO recommendations, ICD-10, and IDB-JAMIE standards under the guidance of partners from the University of Iowa and Babeș-Bolyai University, Cluj-Napoca. All trauma cases from the Institute of Emergency Medicine and the *Valentin Ignatenco* Municipal Clinical Children's Hospital in Chișinău were included in the registry.

**Results.** The analyzed sample consists of 7,942 individuals, predominantly male (57.3%). The most represented age groups were 19-29 years (17.8%) and 30-39 years (17.6%), while individuals aged 70 and above accounted for 11% of the total. Most incidents occurred in urban areas (76.9%). Of the total patients, 52.4% were treated and discharged, while 37.5% required hospitalization. Injuries occurred primarily at home (55.4%) and on public roads (24.7%). The leading mechanism of injury was falls (68.2%), followed by other causes (12.2%) and cut/pierce injuries (10.0%). The most frequently affected body regions were the head/skull (12.5%) and knee (11.8%), followed by the hip (6.7%) and wrist (6.4%). Fractures were the most common injury type (34.5%), followed by contusions (23.0%) and open wounds (14.7%). Several gaps in data collection and reporting were identified and should be considered in future efforts to enhance trauma surveillance.

**Conclusions.** The data highlight the need to develop a national trauma registry as an essential tool for monitoring, prevention, and effective intervention, alongside health promotion campaigns targeting vulnerable groups and the involvement of relevant stakeholders.

**Keywords:** registry, model, trauma, prevention.

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## Key messages

### What is not yet known on the issue addressed in the submitted manuscript

Although injuries represent a major public health issue in the Republic of Moldova, to date, there have been no systematized and continuous national data on the types, causes, and consequences of trauma. Moreover, the impact of a national trauma registry on injury monitoring and prevention has not yet been evaluated.

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### The research hypothesis

The implementation of a national trauma registry using the iCREATE model will enable the collection of standardized, detailed, and comparable data on injuries, thereby improving surveillance, supporting evidence-based decision-making, and facilitating the development of effective prevention and intervention policies.

### The novelty added by manuscript to the already published scientific literature

To our knowledge, this is the first study to describe the pilot implementation of an international trauma registry in Moldova, showcasing its role in strengthening national injury surveillance and prevention initiatives.

## Introduction

Injuries are a major global public health concern, accounting for approximately 10% of the world's deaths each year and leaving millions with long-term disabilities [1]. Accurate and timely data are essential to understand the burden of injuries, identify risk factors, and develop effective prevention strategies. However, many countries, especially low- and middle-income countries, face significant challenges in collecting and analyzing high-quality injury data due to fragmented health information systems and under-reporting [2].

An injury registry serves as a systematic and continuous data collection tool designed to capture detailed information on injuries, including their causes, severity, and outcomes. Registries play a crucial role in strengthening injury surveillance by providing comprehensive, standardized, and comparable data that can inform policy, guide resource allocation, and evaluate intervention effectiveness [3-5]. Moreover, they facilitate international comparisons and contribute to global efforts in injury prevention and trauma care improvement [6].

Injury registries represent a cornerstone solution by providing systematic, continuous, and standardized data collection on injury patterns, mechanisms, and outcomes [7]. Recent evidence underscores the transformative potential of registries in strengthening injury surveillance: in Brazil, the establishment of a national trauma registry in 2021 has enabled integration across hospitals, prehospital services, and law enforcement data. Initial evaluations have shown improved policy responsiveness and identification of regional injury trends [8]. The National Trauma Registry of Norway (NTR), covering all trauma-receiving hospitals, has demonstrated significant contributions to quality improvement and benchmarking through detailed tracking of more than 78,000 cases from 2015 to 2023 [9]. In the United States, linkage between the Iowa trauma registry and workers' compensation data has enhanced the identification of agricultural injuries and informed targeted prevention efforts [10].

Implementing robust injury registries represents a strategic model to enhance national and regional surveillance capacities. By integrating clinical, epidemiological, and de-

mographic data, registries enable a better understanding of injury patterns and support evidence-based decision-making. This article explores the importance of injury registries as a cornerstone of modern injury surveillance systems and highlights best practices and lessons learned from successful implementations.

## Material and methods

**Data and study design.** This study examines patients treated for injuries who presented to the Emergency Departments of two major tertiary care hospitals in Chișinău, the capital of the Republic of Moldova (population ~800,000), during 2018: the Emergency Medicine Institute (EMI) and the *Valentin Ignatenco* Municipal Children's Hospital (MHC). The data were sourced from the iCREATE Injury Registry, piloted for the first time in Moldova. The data collection instrument – a structured questionnaire – was developed in alignment with international standards, drawing on recommendations from the World Health Organization (WHO), the International Classification of Diseases, 10th Revision (ICD-10), the Injury Database-Joint Action on Monitoring Injuries in Europe (IDB-JAMIE) project, and the Iowa Emergency Department Registry. The pilot was nationally coordinated by the *Nicolae Testemițanu* State University of Medicine and Pharmacy, and internationally supported by the Department of Public Health of *Babeș-Bolyai* University (Cluj-Napoca, Romania) and the College of Public Health at the University of Iowa (USA) to strengthen research capacity on injury and violence prevention in three low- and middle-income countries: Armenia, Georgia, and Moldova. The research project, “iCREATE: Increasing Research Capacity in Eastern Europe,” was approved by the Ethics Committee of *Nicolae Testemițanu* State University of Medicine, decision No. 43 of March 15, 2018.

**Settings and population.** A sample of 7,870 patients of all ages, with different types of injuries who received care at EMI and MHC in Chișinău between 1 March 2018 and 28 February 2019, was included in the analysis.

**Data collection process.** Data were manually extracted from patients' medical records by four resident physicians who had received specific training in data collection and coding protocols. The variables collected were defined ac-

cording to the iCREATE Injury Database Project framework. Following data extraction, the information was entered into electronic databases using the REDCap (Research Electronic Data Capture) platform. The study questionnaire comprised a core section and five supplementary modules, incorporating both open- and closed-ended items. The core section gathered general demographic data, medical care details, contextual information about the injury event, and specifics regarding injury type and anatomical location. The five supplementary modules addressed distinct categories of injuries, including those resulting from road traffic incidents, self-harm, interpersonal violence, sports activities, and traumatic brain injuries (TBI) within the preceding 12 months.

**Statistical analysis.** The statistical analysis was performed by evaluating the quantitative and qualitative characteristics of the patients enrolled in the study, according to the indicators provided in the iCREATE Registry Database. Data were analyzed using Microsoft Excel and SPSS 20.

## Results

**Sample characteristics.** A total of 7,870 patients were included in the dataset. The age distribution, categorized by a binary variable, shows that 11.3% (n = 889) of patients were aged 0-17 years (children and adolescents), while the majority, 88.7% (n = 6,971), were aged 18 years and above (adults): adults aged 20-39 years (33.8%), followed by middle-aged adults (26.2%) and seniors aged 60 and above (25.9%).

Regarding sex distribution (sex variable), 57.2% (n = 4,504) of the patients were identified as male and 41.6% (n = 3,275) as female.

Nearly two-thirds of the patients were not employed at the time of data collection (64.0%, n = 5,036), while 21.3% (n = 1,679) were employed in skilled labor. Only 5.0% (n = 393) were employed in professional occupations, and 1.3% (n = 99) in manual labor. Regarding other social roles, 22.9% (n = 1,802) were classified as retirees, 11.1% (n = 877) were students, and 0.3% (n = 21) were homemakers (Table 1).

**General characteristics of injuries among patients treated at the Emergency Department.** Most injuries across all age groups occurred in urban areas, accounting for 6,049 cases (Table 2). The proportion of urban injuries was consistently high, particularly among adults aged 20-39 (n = 2,081) and middle-aged adults 40-59 (n = 1,526). Another 1,707 injuries were recorded in rural areas, and only 6 cases in metropolitan zones.

The overwhelming majority of injuries were unintentional (n = 7,123; 90.6%) across all age categories. Assault-related injuries were the most common intentional injuries (n = 548), particularly affecting teens (n = 47) and young adults (n = 285). Intentional self-harm was rare (n = 35), primarily occurring in the adult population. Other types of violence, as well as undetermined or unspecified intents, represented a small proportion of cases.

Falls were the leading injury mechanism, with 5,282 cases (67.1%), especially common among seniors (n = 1,627) and middle-aged adults (n = 1,388). Cut or piercing injuries (n = 845) and road traffic injuries (n = 370) were more prevalent among adults and teens. Other mechanisms (burns, poisoning) were relatively rare. Notably, 398 cases had an unknown mechanism, particularly among children and adolescents.

**Table 1.** Demographic characteristics of iCREATE Registry patients

Age in years	N	%
0-5	236	3.0
6-11	321	4.1
12-17	332	4.2
18-23	742	9.4
24-29	750	9.5
30-35	951	12.1
36-41	662	8.4
42-47	602	7.6
48-53	553	7.0
54-59	680	8.6
60-65	751	9.5
65+	1,287	16.4
Total	7,867	100.0
Missing	3	0.0
Total	7,870	100.0
Sex		
Male	4,504	57.2
Female	3,275	41.6
Unknown	87	1.1
Total	7,866	99.9
Missing	4	0.1
Total	7,870	100.0
Employment		
None	5,036	64.0
Manual	99	1.3
Skilled	1,679	21.3
Professional	393	5.0
Unknown	497	6.3
Total	7,704	97.9
Missing	166	2.1
Total	7,870	100.0
Another social role		
Homemaker	21	0.3
Retiree	1,802	22.9
Student	877	11.1
Not applicable	4,115	52.3
Total	6,815	86.6
System	1,055	13.4
Total	7,870	100.0

**Note:** iCREATE: Increasing Research Capacity in Eastern Europe – abbreviation of the project; N – absolute number; % – percent. Specific statistical indicators ( $\chi^2$  (Chi-square) – Pearson's chi-squared test statistic; p-value – statistical significance indicator; Likelihood Ratio – alternative to Pearson's  $\chi^2$ ; Fisher's Exact Test – exact test used for small sample sizes) were applied in the five supplementary modules of the iCREATE Registry.

**Table 2.** General characteristics of injuries among patients treated at the Emergency Department

Injury particularities		Age groups							Total
		Infant (0-1 y/o)	Toddler (2-4 y/o)	Child (5-12 y/o)	Teen (13-19 y/o)	Adult (20-39 y/o)	Middle age adult (40-59 y/o)	Senior (60+)	
		N	N	N	N	N	N	N	
Injury occurrence	Urban area	63	106	385	398	2,081	1,526	1,490	6,049
	Rural area	7	10	30	72	548	509	531	1,707
	Metropolitan area	0	0	0	0	4	2	0	6
	Unknown	2	4	10	17	25	28	19	105
Total		72	120	425	487	2,658	2,065	2,040	7,867
Intent	Unintentional	72	116	412	424	2,273	1,875	1,951	7,123
	Intentional self-harm	0	1	0	2	26	2	4	35
	Assault	0	2	6	47	285	148	60	548
	Other violence	0	0	0	1	1	2	1	5
	Undetermined intent	0	0	3	4	4	2	3	16
	Other specified intent	0	0	0	0	2	1	2	5
	Unspecified intent	0	1	4	9	69	35	18	136
Total		72	120	425	487	2,660	2,065	2,039	7,868
Injury mechanism	Road traffic injuries	2	2	14	28	154	107	63	370
	Fall	61	90	295	261	1,560	1,388	1,627	5,282
	Cut/pierce	2	3	21	61	394	214	150	845
	Poisoning	0	0	0	1	1	2	0	4
	Thermal mechanism (burn/scald)	0	0	0	0	2	2	0	4
	Other	5	11	42	81	427	256	144	966
	Unknown	2	14	53	55	122	96	56	398
Total		72	120	425	487	2,660	2,065	2,040	7,869
Occurrence place	home	55	71	169	159	1,264	1,208	1,459	4,385
	institutions	1	7	47	43	23	20	12	153
	sports and recreational areas	2	8	37	68	227	50	24	416
	streets and highways	6	9	58	108	906	584	411	2,082
	commercial areas	1	2	2	2	25	19	8	59
	countryside	0	0	2	4	20	24	22	72
	other/unspecified	7	23	110	103	195	160	104	702
Total		72	120	425	487	2,660	2,065	2,040	7,869
Mode of transport	by ambulance	39	54	160	208	1,017	823	1,095	3,396
	by private transport	26	62	219	244	1,579	1,160	849	4,139
	other/unknown	7	4	46	35	64	82	96	334
Total		72	120	425	487	2,660	2,065	2,040	7,869
Treatment and follow-up	treated and released	2	8	33	208	2,086	1,401	1,094	4,832
	treated and admitted to the hospital	69	112	390	273	523	631	917	2,915
	other/unknown	0	0	0	1	26	17	10	54
Total		71	120	423	482	2,635	2,049	2,021	7,801
Activity when injured	Paid work	0	0	1	3	48	46	21	119
	Unpaid work (includes domestic/home construction, repair)	0	0	1	12	292	300	199	804
	Education	0	4	33	46	18	4	0	105
	Sports and exercise during leisure time or professional sports	0	2	10	56	179	32	3	282
	Leisure or play	14	36	109	79	263	139	219	859
	Vital activity	45	57	154	108	844	755	951	2,914
	Being taken care of	0	0	0	0	4	2	4	10
	Travelling not elsewhere classified	1	1	18	51	476	357	280	1,184
	Other	2	1	8	13	39	35	38	136
	Unspecified activity	10	17	89	110	491	385	305	1,407
Total		72	118	423	478	2,654	2,055	2,020	7,820

**Note:** N – absolute number; specific statistical indicators ( $\chi^2$  (Chi-square) – Pearson's chi-squared test statistic; p-value – statistical significance indicator; Likelihood Ratio – alternative to Pearson's  $\chi^2$ ; Fisher's Exact Test – exact test used for small sample sizes) were applied in the five supplementary modules of the iCREATE Registry.

Injuries occurring at home dominated (55.7%), especially among older adults (55+ years). The second leading location was the street or highway (26.5%), particularly among middle-aged adults (44-65 years). Sports and recreational injuries (5.3%) were more common among younger adults, while institutional injuries (schools, prisons, or long-term care) accounted for 1.9% of cases. The injury location was unspecified in 614 cases (7.8%).

Private transport (52.6%) was the most common mode of reaching medical care, followed by ambulance use (43.2%). Ambulance transport increased at the extremes of age, especially among young children (0-10 years) and older adults (65+ years). Middle-aged individuals (44-65 years) predominantly used private transport, possibly reflecting accessibility, self-reliance, or lower perceived severity of injury.

Most cases were treated and released (n = 4,832; 61.9%), while over one-third (37.4%) required hospital admission, suggesting a substantial burden of moderate to severe injuries. Children and young adults (0-32) were more likely to be hospitalized, with low proportions treated and released (under 8%). Middle-aged adults (44-54 years) had the highest rate of outpatient treatment (nearly 80%). Older adults (65+) had higher admission rates: 917 admitted vs. 1,094 released (approximately 46% admitted).

The most frequently reported activity during injury was "vital activity" (e.g., walking, moving around), with 2,914 cases (37.3%), especially common among seniors (n = 951) and adults aged 20-59 years. Leisure and play activities accounted for 859 cases, mostly among children and seniors. Unpaid work was reported in 804 cases, while paid work was less common (n = 119). Sports-related activities (n = 282) were more prevalent in the 20-39 age group. Travel-related injuries accounted for 1,184 cases (15.1%), and 1,407 cases had unspecified activity.

**Injury particularities.** The most frequent injury types across all age groups were fractures, with a total of 2,693 cases (34.2%), especially prevalent among seniors (n = 951), middle-aged adults (n = 722), and adults aged 20-39 (n = 630) (Table 3). Contusions and bruises were recorded in 1,816 cases (23.1%), most commonly among adults aged 20-39 (n = 690). Sprains and strains accounted for 1,188 cases (15.1%), again mainly affecting working-age adults. Open wounds and abrasions represented 1,162 cases (14.8%), with the highest frequency in the 20-39 age group. Concussions or brain injuries occurred in 409 patients, more often in children and older adults. Injuries to muscles, tendons, or nerves were recorded in 190 cases, notably among adults and middle-aged individuals. Dislocations/subluxations were relatively rare (n = 51), as were multiple injuries (n = 88) and injuries to internal organs (n = 3).

**Table 3.** Injury particularities among age group

Type of injury/ age group	Infant (0-1 y/o)	Toddler (2-4 y/o)	Child (5-12 y/o)	Teen (13-19 y/o)	Adult (20-39 y/o)	Middle-aged adult (40-59 y/o)	Senior (60+)	Total
	N	N	N	N	N	N	N	N
Contusion, bruise	35	37	87	130	690	446	391	1,816
Open wound and abrasion	3	9	32	68	527	298	225	1,162
Fracture	9	47	199	135	630	722	951	2,693
Dislocation and subluxation	1	2	18	6	8	7	9	51
Sprain and strain	0	3	9	64	531	329	252	1,188
Concussion/brain injury	20	16	58	38	114	93	70	409
Foreign body	0	1	2	0	5	2	2	12
Burns and scalds	0	0	0	0	0	2	0	2
Injury to muscles, tendons, blood vessels, and nerves	2	3	13	28	59	64	21	190
Injury to internal organs	0	0	0	0	2	1	0	3
Poisoning	0	0	0	1	0	0	0	1
Multiple injuries	0	0	0	4	30	25	29	88
Other	2	2	6	13	59	74	88	244
Unknown	0	0	1	0	5	2	2	10
Total	72	120	425	487	2,660	2,065	2,040	7,869

**Note:** N – absolute number; specific statistical indicators ( $\chi^2$  (Chi-square) – Pearson's chi-squared test statistic; p-value – statistical significance indicator; Likelihood Ratio – alternative to Pearson's  $\chi^2$ ; Fisher's Exact Test – exact test used for small sample sizes) were applied in the five supplementary modules of the iCREATE Registry.

Referring to the injured body part, injuries to the head and skull were the most reported across all age groups, totaling 977 cases (12.4%), with a notably higher frequency among infants, toddlers, and young children. Injuries to the upper extremities, particularly fractures and trauma to the fingers (n = 508), hands (n = 392), and wrists (n = 388), were highly prevalent, especially among adolescents and

working-age adults. Lower limb injuries also constituted a significant burden: the knee was involved in 527 cases, the ankle in 927 cases, and the lower leg in 318 cases. Other body regions also showed notable patterns but with fewer cases. Chest wall injuries (n = 329) were more frequent among adults. Pelvic (n = 48) and hip injuries (n = 249) showed an age-related increase, being disproportionately

higher among older adults and seniors. Multiple body part injuries were recorded in 96 cases, mostly in adults. Spinal injuries (thoracic/lumbar) were observed in 200 cases, with a gradual increase in frequency in older age groups.

Out of the 7,870 patients included in the dataset, the vast majority, 94.5% (n = 7,221), sustained a single injury treated in the emergency department.

**Transport module.** Of the total recorded cases, 348 (4.4%) contained valid information on the mode of transport involved. The most frequently reported mode of transportation was light motor vehicles, accounting for 43.1% of the cases. Pedestrians represented the second-largest group (27.3%), followed by users of two-wheeled motor vehicles (11.8%). All other transportation categories, such as bicycles, heavy motor vehicles, and non-motorized devices, each accounted for less than 3% of cases. Analyzing transportation mode by age group, children aged 0-10 years were most often involved as pedestrians or as passengers in light motor vehicles; adolescents and young adults (11-32 years) were more frequently associated with bicycles, two-wheeled motor vehicles, and light motor vehicles, and among older adults (65+ years), pedestrian involvement remained prominent. The results indicate a significant association between age group and transportation mode:  $\chi^2 = 86.221$ ,  $p = 0.015$ , Likelihood Ratio:  $p = 0.017$ , Fisher's Exact Test:  $p = 0.004$ , meaning that the distribution of transportation modes varies significantly across age groups and that age influences how individuals move through the environment and which type of transportation they are likely to use when involved in an incident.

The most frequently injured individuals were drivers, riders, or operators, accounting for 36.6% of the cases. Passengers represented 30.6%, and pedestrians made up 28.3%. When examining the injured roles across age groups, several age-related trends emerge: children (0-10 years) were more often injured as passengers (n = 9), with a small proportion as pedestrians; adolescents and young adults (11-32 years) were injured more often in driver/operator roles; middle-aged adults (33-54 years) had the highest involvement as drivers/riders, while pedestrians and passengers were more evenly distributed across age groups; older adults (65+ years) were less represented overall, but when involved, were primarily pedestrians or passengers. The role in transport-related injuries significantly varied by age group ( $\chi^2 = 69.903$ ,  $p < 0.001$ ).

The most frequent counterpart was a light motor vehicle, involved in 52.5% of the incidents, and across all age groups (11 to 65+ years), it appeared as the most frequent counterpart.

Out of 333 valid cases analyzed for seatbelt use, only 25.5% (n = 85) of individuals were reported to have worn a seatbelt at the time of the incident, while 15.3% (n = 51) did not. Seatbelt use was highest among adults aged 22 to 43 years and lowest among children (0-10 years) and older adults (65+ years). The relationship between age and seatbelt use was statistically significant ( $\chi^2 = 38.462$ ,  $p = 0.000$ ).

The overall use of child restraints was extremely low:

only 7.3% (n = 21) reported using them, while 10.4% (n = 30) did not. Most cases of child restraint use were concentrated in the 0-10-year age group, with limited use among adolescents and young adults.

For helmet use, 309 valid responses were available. Of these, 20.1% (n = 62) of individuals reported wearing a helmet, while 12.6% (n = 39) did not. Helmet use was most common among individuals aged 11 to 32 years, a group likely to include cyclists, motorcyclists, and scooter riders.

**Intentional self-harm module.** Only 33 valid cases (0.4% of the total) had identified proximal risk factors. Most of the dataset (99.6%, n = 7,837) had missing data for this variable. Analyzing the proximal risk factors (individual-level circumstances close in time to an event, possibly a suicide attempt or other critical health event) in relation to age groups, over 40% of the identified risks were unspecified. Although the numbers are small, psychological conditions and unspecified risks tended to be reported more often in younger to middle-aged adults (22-43 years). There was no statistically significant association between age groups and the type of proximal risk factor in this dataset.

Among the 33 valid cases, only 1 individual (3%) had a recorded history of previous self-harm, and this person was aged 33-43 years. The majority of responses were unknown (75.8%), with the age group 22-32 having the most "unknown" responses.

**Violence module.** Only 525 cases (6.7%) had valid data regarding the victim's relationship to the perpetrator. Violence was most frequently perpetrated by strangers (57.9%) and acquaintances/friends (19.8%), while intimate partner or family violence represented a smaller but significant proportion. Age plays a decisive role: younger individuals (22-43 years) were predominantly victims of stranger violence, whereas older adults experienced more family- or intimate partner-related violence. There was a statistically significant association between age group and victim-perpetrator relationship ( $p < 0.001$ ).

Among 503 valid cases where the sex of the perpetrator was known, male individuals were overwhelmingly the primary aggressors, involved in 69% of cases, while female perpetrators represented only 3%. Statistical analysis showed no significant association between the perpetrator's sex and the age group involved ( $p > 0.05$ ).

Adult perpetrators (25-64 years) were the primary aggressors, responsible for nearly 38% of recorded cases, across the 22-54 years victim/incident age range, peaking in the 33-43 years (n = 50) and 44-54 years (n = 39) groups. Adolescent perpetrators were most frequently associated with victims aged 11-21 years (n = 17) and 44-54 years (n = 3). Elderly and child perpetrators were rare, with a sporadic distribution across all age groups.

Among 533 valid cases with a recorded assault context, the vast majority (84.4%) were classified as physical assaults, with a marked concentration among young and middle-aged adults. Other contexts, such as robbery, gang violence, or sexual assault, were relatively rare and inconsistently distributed across age groups. There was no sta-

tistically significant association between the victim's age group and the context in which the assault occurred.

**Sport module.** Out of 7,870 total cases, only 271 cases (3.4%) had valid responses regarding the purpose of sport. Most reported injuries occurred during leisure-time activities (59%), particularly among youth and young adults (11-32 years). The purpose of sport was significantly associated with age group ( $\chi^2 = 25.625$ ,  $p = 0.004$ ), with performance sports injuries being more prevalent in younger age brackets. No statistically significant association was found between age group and history of previous injury.

**TBI module.** Out of all injury cases, 2.6% of the sample (203 cases) had a recorded loss of consciousness. In nearly 41% of valid cases, loss of consciousness was confirmed, while in almost half, it was absent. Most episodes were brief (under 30 min), typical of mild TBI; only 2 patients (1%) had prolonged or severe loss of consciousness.

Out of 7,870 total cases, only 273 (3.5%) had documented GCS scores. Most patients presented with mild TBI (GCS 15), 218 cases (79.9%), while scores of 13 or below (moderate to severe TBI) were recorded in 14 cases (5.1%)

Among recorded TBI diagnoses ( $n = 174$ ), mild traumatic brain injury (concussion) was the predominant form, representing more than 85% of valid cases. Severe forms, such as skull fracture, laceration/contusion, and other intracranial injuries, were extremely rare, each accounting for less than 3%.

## Discussion

The present study highlights critical trends in injury epidemiology across different age groups, with clear implications for prevention and healthcare planning. Our findings are consistent with global data indicating that most injuries treated in Emergency Departments (EDs) are unintentional, fall-related, and occur in domestic environments or public spaces [1].

Falls, particularly among older adults, remain a leading cause of injury-related morbidity and hospitalization. In our dataset, seniors were disproportionately affected by falls and required more frequent hospital admissions, a trend also reported in previous studies across high-income and middle-income countries [11-13]. These findings reinforce the urgent need for age-friendly environments and fall-prevention strategies, such as home safety modifications, balance training, and medication review programs [7].

Fractures emerged as the predominant injury type across all age groups, with the highest prevalence in the elderly population. This aligns with data showing increased bone fragility due to osteoporosis in older adults, making them particularly susceptible to fractures following even minor trauma [6, 9]. In contrast, soft tissue injuries, including sprains, contusions, and lacerations, were more frequent among younger, active adults, often resulting from physical activity, road traffic incidents, or occupational hazards [9, 14].

Adults aged 20-59 constituted the largest proportion of injury cases. This may reflect their higher levels of mobil-

ity, occupational exposure, and engagement in physically demanding activities, which increase the risk of injury [15, 16]. Public health policies should thus not only focus on injury prevention in the elderly but also address risk factors among the working-age population, such as promoting workplace safety, road traffic regulation, and urban planning that encourages safe mobility.

While this study contributes valuable insights into injury patterns, it also highlights the need for robust injury surveillance systems and standardized reporting protocols, which would allow for more granular analyses by injury mechanism, severity, and long-term outcomes [4, 17]. Such registries are critical for informing targeted interventions and evaluating the effectiveness of prevention programs.

Head injuries, disproportionately observed among infants and toddlers, are in line with existing literature pointing to the anatomical and developmental vulnerabilities of young children, such as a larger head-to-body ratio, immature motor control, and limited environmental awareness [13, 18, 19]. These findings reinforce the urgent need for enhanced safety standards in homes, childcare settings, and playgrounds, including soft surface materials and parental education on fall risks.

In contrast, extremity injuries, particularly to the hands, wrists, knees, and ankles, were most prevalent in working-age adults. These injury types reflect high exposure to occupational hazards, manual labor, and recreational physical activities. Previous studies have similarly documented the high burden of upper and lower limb injuries in economically active populations, often linked to falls, overexertion, or machinery-related trauma [9, 20]. These findings support the ongoing need for occupational safety training, ergonomic interventions, and regulations targeting workplace hazards.

Our data further highlight distinct transportation-related injury patterns by age group, with implications for mobility and urban safety policies. Children, often injured as passengers or pedestrians, require age-appropriate transport safety strategies, such as school zone traffic control, child restraint systems, and road-crossing education programs [21-24]. In contrast, adults were more frequently injured as drivers or riders, pointing to the need for driver-focused risk mitigation, including alcohol and distraction prevention, fatigue management, and enforcement of speed limits.

Pedestrian injuries, although present across all age groups, showed a slight peak in older adults, likely due to slower gait, visual or cognitive impairments, and increased street-crossing difficulty. These results support targeted infrastructure improvements like longer crosswalk signal times, better lighting, and tactile paving, to protect vulnerable road users.

Furthermore, the analysis found that motorized vehicles, especially light motor vehicles, were the dominant agents in transport-related injuries, mirroring global road safety concerns [4]. Policies focusing on vehicle design improvements, occupant protection systems, and traffic law enforcement remain essential.

A notable limitation in our dataset was the scarcity of complete information on intentional injuries, particularly self-harm history, which limits a comprehensive understanding of mental health-related trauma. However, the available data reveal a concerning pattern of interpersonal violence, disproportionately involving young adult males as perpetrators. These findings echo broader global trends that link male gender and young age to elevated rates of aggressive behavior and injury infliction [6, 23]. This highlights the importance of early violence prevention, youth support programs, and mental health screening, especially for at-risk groups.

**Limitations of the study.** As with any observational study relying on registry data, our research faced several important limitations that should be acknowledged.

First, our analysis draws exclusively on data collected from the Emergency Departments of two major hospitals in Chişinău. This approach, while valuable for capturing a substantial number of injury cases, inevitably misses a wider spectrum of injuries, like those treated in primary care, minor injuries managed at home, or even severe cases that never reach the hospital.

Another challenge was the incomplete nature of several key variables. For example, information about the intent behind injuries, such as whether they resulted from self-harm or assault, was frequently missing or unknown. In the case of self-harm history, valid data were available for less than one percent of cases. Similar gaps appeared for contextual factors, like the activity at the time of injury or the use of protective equipment. These data limitations made it difficult to explore complex risk environments or to draw detailed conclusions about intentional injuries, mirroring challenges reported in other trauma registry studies.

The study's retrospective and observational design also brings inherent limitations. By relying on medical records completed after the fact, we were only able to observe associations, not establish direct cause-and-effect relationships between risk factors and injury outcomes. This means that while our findings reveal important patterns, such as the higher frequency of falls among older adults or the link between age and transportation-related injuries, prospective studies would be needed to confirm these relationships and to test the effectiveness of targeted interventions.

Lastly, it is important to recognize that the findings from this urban, hospital-based sample may not fully reflect the situation in rural areas or across the entire country. Differences in access to care, injury mechanisms, and reporting practices mean that caution should be used when generalizing our results beyond the study setting.

## Conclusions

Our findings highlight that injuries vary significantly by age, with falls being most common among seniors, head injuries among young children, and extremity injuries among working-age adults. Transport-related injuries also differ by age and role, emphasizing the need for targeted prevention strategies. Improved data collection, especially on violence

and self-harm, is essential to strengthen injury surveillance and guide effective interventions. The iCREATE Registry demonstrates the feasibility and potential impact of establishing a national trauma registry in Moldova. Addressing gaps in data completeness, expanding coverage to additional healthcare settings, and improving standardized reporting will be crucial for strengthening injury surveillance and prevention efforts in the future.

## Competing interests

None declared.

## Authors' contribution

The authors contributed equally to the elaboration and writing of the manuscript. All authors critically reviewed the manuscript and approved the final version for publication.

## Informed consent for publication

Obtained.

## Ethics approval

The study was approved by the Research Ethics Committee of *Nicolae Testemiţanu* State University of Medicine and Pharmacy (minutes No 43, from March 15, 2018).

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